

Appendix V

Record of sampling action

The following notes describe the soil, sediment, leachate and water sampling undertaken as part of this investigation by John Williams (Laboratory Manager, Taranaki Regional Council, and Glenn Stevens (Scientific officer-geohydrologist). Sampling was undertaken in accordance with the protocols developed by the Council and attached to this report as Appendix III.

At least two representatives from the local Dioxin Investigation Action Group (DIAG) were present at all times during the sampling. Paddy Burt attended all sampling, with Ted Burroughs at the majority of the sites. Other representatives from DIAG were present on various occasions as well.

Field sketches and photographs were taken at each site detailing specific locations of the sampling. These records are held by the Council.

Sites A and B. Lawry Street/Seaview Road

A water and sediment sample was collected from the Mangaotuku Stream immediately downstream of the site

The water sample (4007) was collected from mid-stream and below the water surface directly into a 1 L glass bottle with a teflon lined lid. A fresh had occurred in the stream as a result of rainfall the preceding night, however the flow had largely receded by the time of sampling.

A stream sediment sample (4006) was collected directly from the stream bed. A number of scoops were collected with a 100 mL glass jar and a sampling pole and placed into a 1 L glass jar with an aluminium foil lined plastic lid. Excess water was decanted.

Composite soil samples were collected from adjacent to Devon Street West and Lawry Street (4005) and Seaview Road (4008). Both soil samples comprised of a number of soil plugs collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jar with an aluminium foil lined plastic lid. The soil sample from adjacent to Lawry Street and Devon Street West comprised of six soil plugs and the sample from adjacent Seaview Road comprised of four soil plugs.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

Site C. Pylon 3

Sampling at this site consisted of a composite surface soil sample from adjacent and below Pylon 3 with the remaining samples all collected from the beach cliff face (the down gradient part of the site). These sample sites comprised all the seepage points that were identified by an inspection undertaken by Inspectorate staff.

The composite surface soil sample (4058) was collected from beneath and adjacent to Pylon 3. The location of the soil sample was specified by Mr Andrew Gibbs of DIAG, and was intended to sample surface soil that had been undisturbed, at least since the pylons had been constructed. Aerial photos show the pylons being constructed in 1970.

The composite soil sample comprised of six soil plugs collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jars with an aluminium foil lined plastic lids.

Vegetation, typically long grass and gorse, and the top 25 to 30 mm of soil was removed with a spade and a stainless steel trowel prior to collecting the soil plugs.

A sediment sample (4031) was collected from below a small seep adjacent to the Back Beach access track, approximately 50 m from where the track reaches the beach. The sample was collected from immediately below the seep with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

A sediment sample (4032) was collected from below a small seep on the coastal cliff face below Pylon 3. The sample was collected from immediately below the seep with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

A sample (4030) was collected of sediment from the invert of a pipe that discharges near the top of the beach access track below Pylon 3. The sample was collected directly from the pipe with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid. There was no discharge from the pipe at the time of sampling. It is unclear where the pipe connects to.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

D and P. Residential properties – Rangitake Drive

There are a number of residential properties along Rangitake Drive that back on to the Herekawe Stream. These properties are part of a subdivision that was undertaken in the mid 1970's. It is alleged that drums of contaminated wastes were disposed in the vicinity of these properties during the construction of the subdivision and building sites.

Aerial photographs taken prior to the construction of the residential subdivision show a gully extending from the Herekawe Stream up to the IWD site. This gully has been filled in with the construction of the subdivision. It is assumed that stormwater is now piped and discharges via the outfall to the Herekawe Stream approximately below 38 Rangitake Drive. (Roading chip is present in the outfall indicating stormwater from at least the road gutters discharges to the Herekawe Stream via the outfall).

26A Rangitake Drive

There are three small seepage zones on the lower grassed terrace at the rear of the section. There are reeds growing around these seepage zones. Iron oxide staining is present around these seepage zones.

Aerial photographs indicated that prior to the construction of the residential subdivision in the gully above, a stream draining from the vicinity of the IWD site flowed down the northern side of the property. There is a drainage channel/ditch that correlates to the area where the small stream is originally shown joining the Herekawe Stream on the aerial photographs.

A composite surface soil sample (4045) was collected from grassed terraces at the rear of the section. The sample comprised of six soil plugs collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jar with an aluminium foil lined plastic lid.

A composite sediment sample (4044) of iron oxide stained sediments from below the three seepage zones on the lower grassed terrace was collected with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

A sediment sample (4047) was collected from an area of iron oxide staining in a drainage channel/ditch in the north-western corner of the section. Some "nova-flow" drainage pipe discharges at the base of the channel. The sample was collected with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

A stream sediment sample (4046) was collected directly from the streambed approximately 30 m downstream of 26A Rangitake Drive. The sample was collected with a 200 mL glass jar and sampling pole into a 1 L glass jar with an aluminium foil lined plastic lid.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

32 Rangitake Drive

A composite sediment sample (4050) was collected from damp areas of soil underneath vegetation, possibly representing seeps, on the steep bank by the Herekawe Stream. A composite sediment sample from five locations was collected with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

34 Rangitake Drive

A composite surface soil sample (4049) was collected from the lower grassed terrace at the rear of the section. The sample comprised of six soil plugs collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jar with an aluminium foil lined plastic lid.

A soil/sediment sample (4051) was collected from a possible seepage zone at rear of section and approximately 1.0 m from Herekawe Stream. An iron oxide precipitate "slick" was observed immediately below this area on the Herekawe Stream. The vegetation was cleared with a spade and the sample collected with a stainless steel trowel into a glass 1 L jar with an aluminium foil lined plastic lid.

A sediment sample (4052) from the Herekawe Stream was collected from approximately 15 m downstream of the stormwater outfall and below the boundary of 34 and 36 Rangitake Drive. The sample was collected with a 200 mL glass jar and sampling pole into a 1 L glass jar with an aluminium foil lined plastic lid.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

44 Rangitake Drive

A composite surface soil sample (4060) was collected from this section. The location of this soil sample was specified by Mr Andrew Gibbs of DIAG, and its purpose was to sample surface soil that had been undisturbed, at least since the establishment of the subdivision in the mid 1970's. The sample comprised of six soil plugs collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jars with an aluminium foil lined plastic lids. The vegetation and the top 25 to 30 mm of soil was removed with a spade and a stainless steel trowel prior to collecting the soil plugs.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

G. Marfell Park

A water sample (Reference number 4000) was collected from the leachate pipe directly into a 1 L glass bottle with a teflon lined lid.

A sediment sample (4002) was collected from immediately below the discharge pipe with a stainless steel trowel and placed in a glass jar with an aluminium foil lined lid. The sediment was collected from above the water level present in the Mangaotuku Stream at the time.

A water sample (4001) was collected from the Mangaotuku Stream approximately 50 m downstream of the discharge pipe. The sample was collected from mid-stream and below the water surface directly into a 1 L glass bottle with a teflon lined lid. A fresh had occurred in the stream as a result of rainfall the preceding night, however the flow had largely receded by the time of sampling.

Concerns were raised about iron oxide staining present on the concrete footpath at the corner of Endeavour and Grenville streets. This site is approximately 400 m north-northwest from the landfill site, and as such is close to the down gradient direction (difficult to tell as much of the topography has been modified and/or is obscured by houses).

A soil sample (4057) was collected from corner of Endeavour and Grenville streets with a stainless steel trowel into a glass jar with an aluminium foil lined lid. Site constraints were such that the sample was collected from within 5 m of a wooden fence (possibly creosote stained) and the road.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

H and I. Ngamotu Domain/Squire Place

The landfill site is on the western side of a gully formed by the Mangaherurangi Stream. Adjacent to the landfill site the Mangaherurangi Stream comprises a swamp/wetland area. There are two culverted earth crossings, one near the top of the landfill area and the other below. The upper crossing is immediately down gradient of the Squire Place site.

Water and sediment samples were collected from adjacent to each of these culverted crossings. A third sediment sample was collected from the true left of the

swamp/wetland area and approximately 10 m downstream of a pipe located adjacent to a steep bank that separates the sports fields from the archery lawn. The pipe is assumed to be for stormwater however this has not been confirmed. There was no discharge from the pipe at the time of sampling.

The water samples (4003 and 4022) were collected from mid-stream and below the water surface directly into 1 L glass bottles with a teflon lined lids.

The sediment samples (4004, 4023 and 4024) were collected with a pre-cleaned stainless steel trowel and placed in a glass jars with an aluminium foil lined lids.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

J. Belt Road

A composite surface soil sample (4026) was collected from above the alleged location of the trench. The sample comprised of six soil plugs collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jar with an aluminium foil lined plastic lid.

Following further discussion with members of DIAG, a second composite soil sample was collected from a small grassed depression adjacent to where the fill material had been placed. The sample comprised of six soil plugs collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jar with an aluminium foil lined plastic lid.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

L. Tahurangi Place

A composite soil sample (4043) was collected from along the rear (up gradient) boundary of the site. By necessity the composites were collected from within 5 m of a fence and, in some cases, old car tyre retaining walls. The sample comprised of six soil plugs collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jar with an aluminium foil lined plastic lid.

A composite soil sample (4054) was collected from below the house. These soils were considered to most likely represent surface soils at the property that had not been modified as a result of the landscaping of the section. The sample comprised of six soil plugs collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jar with an aluminium foil lined plastic lid. The cores were taken at points furthest from the tanalised wood foundation posts as possible.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

M. Beach Road – 1

A composite soil sample from the alleged site and a sediment sample from the adjacent wetland area were collected.

The composite soil sample (4009) was collected from a sloping grassed area immediately up gradient of a farm track. Six soil plugs were collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jar with an aluminium foil lined plastic lid.

The sediment sample (4010) was collected from the wetland area adjacent to, and down gradient of, the alleged disposal site. The sediment sample was collected from 0.2 m below ground level with a stainless steel trowel and placed in a glass jar with an aluminium foil lined lid.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

P. see under D.

Q. Rifle Range Road/ Bewley Road

The river water sample (4035) was collected from the true right of the Waiwhakaiho River approximately 25 m upstream of the Mangaone Stream confluence. The sample was collected from below the water surface directly into a 1 L glass bottle with a teflon lined lid.

A number of service pipes cross the Waiwhakaiho River on a trestle opposite Vickers Road. A stormwater pipe discharges to the Waiwhakaiho River immediately upstream of the trestle. The sediment sample (4039) was collected from immediately below this stormwater pipe. There was no discharge from the pipe at the time of sampling. The composite sediment sample (4038) was collected from a seepage zone with iron oxide staining approximately 10 m upstream of this stormwater pipe. The sediment sample was collected with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

The groundwater sample (4037) was collected from monitoring bore GND0548. This bore is located where the leachate from the Bewley Road "landfill" previously discharged. The bore is 5.1 m deep. At the time of sampling the groundwater level was 1.9 m below the standpipe rim, which is approximately at ground level. 20 L was purged using a stainless steel bailer prior to the collection of a sample in a 1 L glass bottle with a teflon lined lid.

There is a stormwater pipe with flap (to prevent back flow during a flood event) on the true right bank of Waiwhakaiho River approximately 50 m upstream of Struthers Place. The water sample (4040) of the discharge from this pipe was collected directly into a 1 L glass bottle with a teflon lined lid. The sediment sample (4041) was collected from immediately below this stormwater pipe with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

The composite sediment sample (4042) was collected from below a seepage zone with iron oxide staining on true right bank of Waiwhakaiho River near Constance Street. The sediment sample was collected with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

V. Centennial /2: Paritutu Gully

The water sample (4033) was collected from the remaining concrete sump at the bottom of the pipe directly into a 1 L glass bottle with a teflon lined lid.

The composite sediment sample (4034) was collected from immediately below the seeps with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

X. Roto Street

Water and sediment samples were collected from the stream. A water sample from one of the seeps and a composite sediment sample from the seepage zone were collected. Two composite surface soil samples were also collected, one from immediately up gradient of the seepage zone and the other from near the head of the gully.

The water sample (4016) was collected from the stream immediately downstream of the site. The sample was collected using a stainless steel jug and transferred to a 1 L glass bottle with a teflon lined lid.

The stream sediment sample (4019) was collected directly from the stream bed with a stainless steel trowel into a 1 L glass jar with an aluminium foil lined plastic lid. Excess water was decanted.

The composite sample of iron oxide stained sediments (4020) was collected from below the seepage zone with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid. A total of six sample points were composited.

Two composite soil samples (4016 adjacent to the seepage zone and 4021 near the head of the gully) were collected. Each sample comprised of six soil plugs collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jars with an aluminium foil lined plastic lids.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

Z. Ngahoro

A composite surface soil sample was collected from a sloping grassed area at, and immediately down gradient of, the site. Sediment samples were collected from the adjacent swampy/wetland areas to the north and south of the site.

The composite surface soil sample (4013) comprised of six soil plugs were collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jar with an aluminium foil lined plastic lid.

The sediment samples (4014 to the north and 4015 to the south) were from 0.2 m below the surface with a stainless steel trowel and placed in a glass jar with an aluminium foil lined lid.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

Site Zh. Car Park site

A composite sediment sample (4056) was collected from immediately below the seepage zone with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

Site Zi. Pylon 4 (Herekawe cliff site)

Previous investigations at the IWD site have determined the presence of an andesite high peak or ridge under the western part of the property, with groundwater flowing to the coast around either side of the andesite high. The gully extending to the coast corresponds to the zone of groundwater flow to the south of the andesite high.

Sampling at this site consisted of a composite surface soil sample from adjacent and below Pylon 4. A water sample from the small stream and sediment samples from the top and near the base of the waterfall were also collected. No other seepage points were identified during an inspection of the area undertaken by Inspectorate staff.

The composite surface soil sample (4059) was collected from beneath and adjacent to Pylon 4. The location of the soil sample was specified by Mr Andrew Gibbs of DIAG, and its purpose was to sample surface soil that had been undisturbed for at least since the pylons had been constructed. Aerial photos show the pylons being constructed in 1970. The sample comprised six soil plugs collected with a 25mm diameter 75 mm long soil corer into a glass 1 L jars with an aluminium foil lined plastic lids. Vegetation, typically long grass and gorse, and the top 25 to 30 mm of soil was removed with a spade and a stainless steel trowel prior to collecting the soil plugs.

A water sample (4028) was collected from a small grassy pool above waterfall, approximately 30 m from cliff edge. The sample was collected directly into a 1 L glass bottle with a teflon lined lid.

A sediment sample (4029) was collected from seepage zone 2 to 3 m from the cliff edge at the top of waterfall. A composite sample was collected from the seepage zone with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

A sediment sample (4027) was collected from the face of the waterfall, approximately 2 m above shore line with a stainless steel trowel and placed into a 1 L glass jar with an aluminium foil lined plastic lid.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

Dow AgroSciences stormwater discharge to Herekawe Stream

Stormwater from the Dow AgroSciences site discharges to the Herekawe Stream from a outfall located on the true right bank of the Herekawe Stream and immediately downstream of Centennial Drive. This discharge is licensed by Resource Consent 4108.

At the time of sampling a small flow was discharging from the outfall. A water sample (4055) was collected with a stainless steel jug into a 1 L glass bottle with a teflon lined lid.

All sampling equipment and containers had been pre-cleaned prior to sampling as per the sampling protocols.

Dow AgroSciences groundwater sampling (Sites F, U, Zf, and Zg)

The Dow AgroSciences (NZ) Ltd property is located at 82 Paritutu Road, New Plymouth. In 1994 a large number of groundwater monitoring bores were installed across the site. Eight of these bores were utilised for the present investigations, two adjacent to each of 4 areas identified for further study. A map in Appendix V shows the sites and the locations of the bores.

IT Environmental (Australia) Pty Ltd were contracted to undertake the sampling of the eight bores, on 12 July 2001, under the supervision of Council staff.

On 11 July Ken Orchard of ITE, with Bruce Colgan of the Council as observer, checked and purged a number of bores using a manual bailer, to confirm their suitability for sampling the next day. The bores originally selected in the vicinity of Site Zg were found to have insufficient water for sampling; two alternatives in the same area were found.

Some bores already had positive displacement pumps in place. These were left until 12 July and purged just prior to sampling. A dedicated polyethylene bailer was left in each of the others.

Key personnel present during sampling on 12 July included Ken Orchard (ITE), John Williams (Council), Marie Gibbs (Dow AgroSciences), and Paddy Burt (DIAG).

Bores 21 (Site F), 43 (Site U), and 49A (Site Zg) were sampled using a bailer. On each successive filling, the sample was split between containers to be analysed on behalf of the Council, and retained by DIAG and the Company, respectively. These were samples 4062, 4063, and 4064. Bores 1 (Site F), 3 and 4 (Site Zf), 6 (Site U), and 46A were sampled using their dedicated air-operated pumps. They were assigned the numbers 4065, 4066, 4067, 4068, and 4069 respectively.

Blanks and duplicates

A duplicate sample (4012) and four rinsate blank samples (4011, 4025, 4048 and 4061) were collected to allow quality control checks of the decontamination procedures and the laboratory analyses if required.

The rinsate blanks were collected by decontaminating the sampling equipment as per the procedures specified in the sampling protocols. De-ionised water was then poured over the particular sampling equipment and into a glass bottle with a teflon lined lid.

Sites not sampled

A residential section at Site Za 60 Marama Crescent, owned by Mr Don Sarten, was not sampled, as the geophysical survey had found no evidence of disturbed soils.

The Omata site (Site E) was not sampled, as the geophysical survey had found no evidence of disturbed soils. This site is on the opposite bank of the Herekawe Stream to the residential property on Rangitake Drive. The sample collected from the Herekawe Stream downstream of these sites (4046) is also a downstream sample for the Omata site.

Site	Sample		Sample date	GPS	Hold	Analyses requested		
	Type	Location				ID number	2378 TCDD	Acid herbicides
G. Marfell Park	Water	Leachate from pipe at discharge point into Mangaotuku Stream.	6/6/01	2600373E 6236491N			*	*
	Water	Mangaotuku Stream downstream of leachate pipe.	6/6/01	2600374E 6236561N	*			
	Sediment	Sediment from immediately below leachate pipe discharge point.	6/6/01	2600373E 6236491N	*			
	Soil	Corner of Endeavour and Grenville streets.	26/6/01				*	*
H. Ngamotu Domain	Water	Collected from immediately below culverted crossing upstream of Ngamotu site and downstream of the Squire Place site.	6/6/01	2600006E 6237173N	*			
	Sediment	Collected from immediately below culverted crossing upstream of Ngamotu site and downstream of the Squire Place site.	6/6/01	2600006E 6237173N		*		
	Water	Collected from channel in swamp/wetland immediately above lower culverted crossing and downstream of Ngamotu site.	11/6/01	2599901E 6237279N			*	*
	Sediment	Collected from swamp/wetland immediately above lower culverted crossing and downstream of Ngamotu site.	11/6/01	2599911E 6237278N	*			
	Sediment	Collected from true left of swamp/wetland approximately 10 m downstream of pipe near archery lawn.	11/6/01	2599933E 6237238N	*			

Site	Sample		Sample date	GPS	Analyses requested			
	Type	Location			ID number	Hold	2378 TCDD	Acid herbicides
A, B. Lawry Street/ Seaview Road	Soil	Lawry Street. Composite sample of 6 soil plugs.	6/6/01	2600713E 6237173N	*			
	Sediment	Sediment from Mangatuku Stream immediately downstream of the Lawry Street site	6/6/01	2600710E 6237211N		*		
	Water	Mangatuku Stream immediately downstream of the Lawry Street site.	6/6/01	2600710E 6237211N	*			
	Soil	Seaview Road. Composite sample of 4 soil plugs.	6/6/01	2600651E 6237111N	*			
J. Belt Road	Soil	Composite sample of 6 soil plugs from on top of alleged contaminated sewage disposal trench.	11/6/01	2601470E 6238026N	*			
	Soil	Composite sample of 6 soil plugs adjacent to alleged disposal area.	13/6/01			*		
M. Beach Road-1	Soil	Composite sample of 6 soil plugs.	7/6/01	2597595E 6235351N	*			
	Sediment	Sediment from swampy area immediately down gradient of site. Sample collected from 0.2 m below ground level.	7/6/01	2597595E 6235351N		*		
Z. Ngahoro	Soil	Composite sample of 6 soil plugs.	7/6/01	2597635E 6235508N	*			
	Sediment	Sediment from swampy area in gully to north of Ngahoro site. Sample collected from 0.2 m below ground level.	7/6/01			*		
	Sediment	Sediment from swampy area in gully to south of Ngahoro site. Sample collected from 0.2 m below ground level.	7/6/01		*			

Site	Sample			Sample date	GPS	Analyses requested			
	Type	Location	ID number			Hold	2378 TCDD	Acid herbicides	Organo chlorines
X. Roto Street	Soil	Soil sample from the north-east end of the site. Composite sample of 6 soil plugs.	4016	7/6/01		*			
	Soil	Soil sample from the south-west end of the site. Composite sample of 6 soil plugs.	4021	7/6/01	-	*			
	Water	Water sample collected from small stream downstream of the seepage zone.	4017	7/6/01		*			
	Sediment	Sediment collected from bed of small stream downstream of the seepage zone.	4019	7/6/01		*			
	Water	Water collected from seepage zone in bank adjacent to small stream.	4018	7/6/01			*		*
	Sediment	Sediment collected from below seepage zone adjacent to small stream. Composite sample of 6 points along seepage zone.	4020	7/6/01		*			
Q. Waiwhakaiho River/Bewley Road	Water	True right of the Waiwhakaiho River approximately 25 m upstream of the Mangaone Stream confluence	4035	13/6/01	2606845E 6239729N	*			
	Sediment	Immediately below stormwater pipe upstream of pipe trestle over Waiwhakaiho River.	4039	13/6/01			*		*
	Sediment	Composite sample from seepage zone with iron oxide staining on true right bank of Waiwhakaiho River. Approximately 10 m upstream of stormwater pipe upstream of pipe trestle over Waiwhakaiho River.	4038	13/6/01			*		

Site	Sample		Sample date	GPS	Analyses requested			
	Type	Location			ID number	Hold	2378 TCDD	Acid herbicides
	Ground-water	Monitoring bore GND0548 (former Bewley Road landfill).	13/6/01				*	*
	Water	Discharge from stormwater pipe with flap on true right bank of Waiwhakaiho River and 50 m upstream of Struthers Place	13/6/01	2606334E 6239069N	*			
	Sediment	Sediment immediately below stormwater pipe with flap on true right bank of Waiwhakaiho River and 50 m upstream of Struthers Place	13/6/01	2606334E 6239069N			*	*
	Sediment	Composite sample from seepage zone with iron oxide staining on true right bank of Waiwhakaiho River near Constance Street.	13/6/01	2606068E 6239038N			*	*
V. Centennial/2 Paritutu Gully	Water	Concrete sump at base of old stormwater pipe.	12/6/01				*	*
	Sediment	Composite sample from seepage zone with iron oxide staining north-east of old stormwater pipe.	12/6/01				*	*
C. Pylon 3	Sediment	Sediment from below a small seep adjacent to the Back beach access track approximately 50 m from where track reaches beach.	12/6/01				*	*
	Sediment	Sediment from below a small seep on coastal cliff face below Pylon 3	12/6/01	2598362E 6237493N			*	*
	Sediment	Sediment from the invert of a pipe that discharges near the top of the beach access track below Pylon 3.	12/6/01	2598396E 6237563N	*			
	Soil	Surface soils from beneath and adjacent to Pylon 3. Composite sample of 6 soil plugs.	28/6/01	2598521E 6237539N		*		

Site	Sample			Sample date	GPS	Analyses requested			
	Type	Location	ID number			Hold	2378 TCDD	Acid herbicides	Organo chlorines
Zi. Pylon 4	Water	Collected from small grassy pool above waterfall approximately 30 m from cliff edge.	4028	12/6/01			*	*	
	Sediment	Composite sediment sample collected from seepage zone 2 to 3 m from edge at top of waterfall.	4029	12/6/01	2598331E 6237135N	*			
	Sediment	Collected from face of small waterfall approximately 2 m above shore line.	4027	12/6/01		*			
Zh. Beach access west of Herekawe Stream (below tank farm)	Soil	Surface soils from beneath and adjacent to Pylon 4. Composite sample of 6 soil plugs.	4059	28/6/01	2598475E 6237228N		*		
	Sediment	Composite sample collected from immediately below seepage zone at beach end of access track.	4056	26/6/01			*	*	
P. 26A Rangitake Drive	Sediment	Sediment from Herekawe Stream. Approximately 30 m downstream of 26A Rangitake Drive.	4046	21/6/01			*	*	
	Soil	Surface soils from rear of section, 26A Rangitake Drive. Composite sample of 6 soil plugs.	4045	21/6/01	2598489E 6236729N	*			
	Sediment	Sediment from 3 seeps at the rear of section, 26A Rangitake Drive.	4044	21/6/01	2598489E 6236729N		*	*	
	Sediment	Sediment from a seepage zone at the north-western corner of 26A Rangitake Drive.	4047	21/6/01			*	*	

Site	Sample			Sample date	GPS	Analyses requested			
	Type	Location	ID number			Hold	2378 TCDD	Acid herbicides	Organo chlorines
D. 32 and 34 Rangitake Drive	Sediment	Soil/sediment sample from rear of section (32 Rangitake Drive) and close to Herekawe Stream. Composite of 5 samples.	4050	21/6/01			*		*
	Soil	Surface soils from rear of section, 34 Rangitake Drive. Composite sample of 6 soil plugs.	4049	21/6/01	2598521E 6236980N	*			
	Sediment	Soil/sediment sample from possible seepage zone at rear of section, below 34 Rangitake Drive and approximately 1 m from Herekawe Stream.	4051	21/6/01			*		*
Da. 42 and 44 Rangitake Drive	Sediment	Sediment from Herekawe Stream approximately 15 m downstream of the stormwater outfall and below 36 Rangitake Drive.	4052	21/6/01			*		*
	Soil	Surface soils from vacant section, 42 Rangitake Drive. Composite sample of 6 soil plugs.	4060	28/6/01	2598570E 6236617N			*	
L. 23C Tahurangi Place	Soil	Surface soils from rear boundary of section, 23C Tahurangi Place. Composite sample of 6 soil plugs.	4053	26/6/01				*	*
	Soil	Surface soils from beneath house, 23C Tahurangi Place. Composite sample of 6 soil plugs.	4054	26/6/01				*	*

Site	Sample		Sample date	GPS	Analyses requested							
	Type	Location			ID number	Hold	2378 TCDD	Acid herbicides	Organo chlorines			
W. Dow AgroSciences stormwater discharge	Water	Water sample from Dow AgroSciences stormwater outfall at the mouth of the Herekawe Stream.	26/6/01									
F. Dow AgroSciences stormwater discharge	Water	Bore 1, east of area	12/7/01			4065		*	*			
U. Dow AgroSciences stormwater discharge	Water	Bore 21, west of area	12/7/01			4062			*	*		
Zf. Dow AgroSciences stormwater discharge	Water	Bore 6, west of area	12/7/01			4068			*	*		
Zg. Dow AgroSciences stormwater discharge	Water	Bore 43, east of area	12/7/01			4063			*	*		
	Water	Bore 3, east of area	12/7/01			4066			*	*		
	Water	Bore 4, west of area	12/7/01			4067			*	*		
	Water	Bore 46A, north-west of area	12/7/01			4069			*	*		
	Water	Bore 49A, north of area	12/7/01			4064			*	*		
Blanks and duplicates	Water	Rinsate blank.	7/6/01			4011			*	*		
	Sediment	Duplicate of sample 4014 (Nghahoro site)	7/6/01			4012		*	*	*		
	Water	Rinsate blank - soil corer and scissors.	11/6/01			4025		*	*	*		
	Water	Rinsate blank - Stainless steel trowel.	21/6/01			4048		*	*	*		
	Water	Rinsate blank.	28/6/01			4061		*	*	*		

Appendix VI
Record of marine sampling

Filenote

Date 17 August 2001
File UIR400

Marine ecological investigation of alleged agrichemical disposal at New Plymouth

1. Introduction

A marine ecological investigation was undertaken as part of a larger Taranaki Regional Council investigation in relation to the former Ivan Watkins Dow agrichemical plant at New Plymouth and its alleged disposal of dioxin-containing by-products during the 1960's and 1970's at areas within New Plymouth.

The marine ecological investigation was undertaken to determine if any adverse effects to marine ecology around the New Plymouth coastline is evident and if any agrichemical contamination of shellfish tissue remains as a result of this alleged dumping over 30 years ago.

2. Methodology

The marine ecological investigation comprised of an inspection of intertidal reef and sandy shore biological communities, observations of individual biota, and collection of reef biota for analysis of agrichemical contamination in shellfish tissue.

A number of sites along the New Plymouth coastline and at the part of the coastline in front of the Waireka Research Station were chosen in consultation with interested parties.

The marine ecological investigation was conducted between 7 and 9 May 2001 and on 5 June 2001 during low tide periods when much of the shoreline was exposed. Most sites were able to be investigated during the 3 day period of low tides between 7 and 9 May, except the East End Beach and Ngamotu Beach sites which were able to be visited during low tide the following month on 5 June 2001.

2.1 Sites

The investigation was conducted at nine sites. Table 1 provides a description of each of the sites. The locations of the sites are depicted in Figure 1.

The five sites considered to be potential impact sites include the old Eliot Street outfall, Belt Road, Paritutu Rock, Herekawe Stream Mouth and the 'cavern' at Waireka. The Herekawe Stream Mouth site was a sandy shore site, while all others were rocky reefs. The Taranaki Regional Council has undertaken previous work at the Waireka cavern site and it is an established site recorded on the Taranaki Regional Council sites' database.

Four control sites were chosen: two sandy shore sites, East End Beach and Ngamotu Beach, and two rocky reef sites, Kawaroa Reef and Waireka South. These control sites

have similar physical characteristics to the potential impact sites but had not been exposed to any alleged discharge. The Waireka South site is an established Taranaki Regional Council site used as a control site for the Waireka cavern potential impact site.

Table 1 Description, type, purpose and location of sites

Site	Site Description	Shore type	Purpose	Grid Reference
East End Beach	Opposite East End Beach Surf Club	Sandy shore	Control	P19:046 390
Old Eliot St Outfall	At outfall	Rocky reef	Impact	P19:036 387
Kawaroa Reef	Opposite carpark & children's playground	Rocky reef	Control	P19:017 384
Belt Road	Beneath car park at end of Belt Road	Rocky reef	Impact	P19:014 381
Ngamotu Beach	Opposite public toilets	Sandy shore	Control	P19:001 377
Paritutu Rock	At base of Paritutu Rock below gully	Rocky reef	Impact	P19:985 373
Herekawe Stream Mouth	In vicinity of stream as crosses beach	Sandy shore	Impact	P19:981 369
Waireka Cavern	At cavern	Rocky reef	Impact	P19:971 353
Waireka South	Approximately 250 metres SE of cavern	Rocky reef	Control	P19:969 351

2.2 Community health

A qualitative ecological inspection at each site was undertaken to describe the number of different types of algae and macro (>3mm) animal species present (the 'diversity') and the relative numbers of individuals of each species (the 'relative abundance'). Under boulder biota was assessed where rocks and cobbles were easily overturned. This provides an overall impression of the ecological health of the intertidal community occurring at each of the potential impact sites compared to the control sites.

Each inspection involved recording the species present and their relative abundance within, approximately, 50 metres of the map grid reference given in Table 1 of each site. The inspection was undertaken prior to any disturbance to the site, such as by sample collection, and photos were taken to demonstrate marine communities occurring at each of the sites. Additional comments were recorded during each inspection with regard to substrate type, weather, odours and other matters of interest.

2.3 Individual health

To address allegations of deformed and undersized biota, individuals of all species were observed to assess the health and quality of individuals at the potential impact sites compared to the control sites. The health of individuals was assessed according to shape and size and shell strength. Particular attention was given to any indications of abnormal morphology.

Photos were taken of species present at both potential impact and control sites.

2.4 Marine biota sample collection

During the inspections samples of marine biota were collected in order to be analysed for dioxin and acid herbicides contamination.

The preferred marine biota for any shellfish tissue analysis is the group of filter feeders. These are bivalve molluscs such as mussels and cockles, which filter very large volumes of water and act as biological filters accumulating and concentrating persistent chemicals in tissue. On this occasion, no filter feeders occurred naturally, or of sufficient abundance, at each of the sites. Other studies have obtained results from the use of gastropod molluscs for tissue analysis and as these animals were common to all sites and relatively abundant, the whelk, *Lepsiella scobina*, was chosen to indicate the presence of residual agrichemical contamination in shellfish for this investigation.

Whelks were collected at all sites for dioxin analysis. As low trace levels of acid herbicides have been recorded at the known discharge site at Waireka, whelks were also collected at the Waireka cavern and the two control sites, Waireka South and Kawaroa Reef, for acid herbicides analysis.

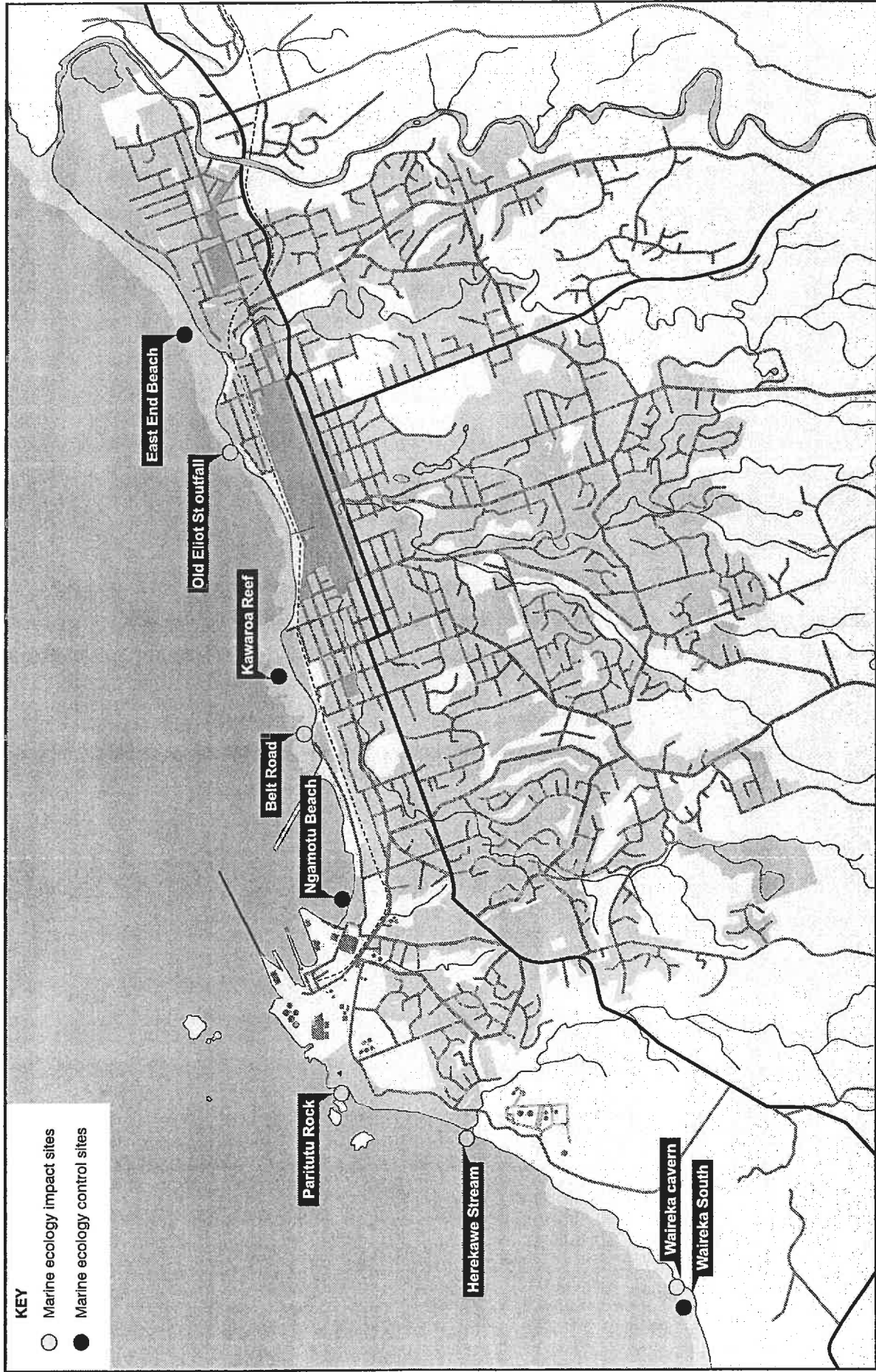


Figure 1 Location of marine ecological investigation sites

3. Results

3.1 Community health

The marine ecological inspections conducted at each site are described below. A copy of the field sheet for each site is attached as Attachment I. A copy of all photos taken at each site is attached as Attachment II.

3.1.1 East End Beach

East End Beach was inspected on 5 June 2001 at approximately 1445 hours. Low tide on this day was at 1521 hours at a height of 0.4 metres. The weather was cloudy and breezy.

East End Beach is an extensive sandy beach as depicted by photos in Attachment II. A search of marine biota within the sandy sediment was undertaken by making hand excavations at approximately 30 random locations from the mid shore to low shore height opposite the surf club. No biota was found.

3.1.2 Old Eliot Street Outfall

The old Eliot Street outfall site was inspected on 7 May 2001 at 1610 hours. Low tide on this day was at 1542 hours at a height of 0.2 metres. The weather was cloudy and breezy and there had been recent showers.

The rocky reef in the vicinity of the old outfall was one of the smaller reefs of those included in the investigation. The intertidal reef area was approximately 15 metres from high to low shore, therefore the area able to be covered during the inspection was generally less than for the other reefs. It was described as a lahar platform outcrop with some large boulders. See Attachment II.

Nine algae and 25 animal species were recorded across the reef during the inspection. Each of the species recorded were common reef species found at virtually all sites along the Taranaki coastline. The dominant species included the encrusting algae, *Corrallina officinalis* paint and *Ralfsia* sp., and the barnacle, *Chaemosipho columna*, whelk, *Lepsiella scobina*, and the small topshell, *Cantharidella tessellata*. A number of species were found to be common across the outcrop. Few paua (*Haliotis iris*) and no kina (*Evechinus chloroticus*) were observed during the inspection.

3.1.3 Kawaroa Reef

Kawaroa Reef was inspected on 7 May 2001 at 1510 hours. Low tide on this day was at 1542 hours at a height of 0.2 metres. The weather was cloudy and breezy with occasional showers.

Kawaroa Reef is the largest intertidal reef along the New Plymouth coastline. The site chosen was directly opposite the carpark and playground on Tisch Avenue next to the FCE Aquatic Centre. It was described as a lahar platform boulder reef. See Attachment II.

Nine algae and 31 animal species were recorded across the reef during the inspection. Most species were common Taranaki reef species, although some species such as the algae, *Splachnidium rugosum*, and the chiton, *Notoplax violacea*, are recorded less frequently. The barnacle, *C. columna*, and the whelk, *L. scobina*, were recorded as the most abundant species across the reef. Both the paua and kina were recorded as present and common, respectively, at this reef.

3.1.4 Belt Road

The reef opposite the carpark at the end of Belt Road was inspected on 9 May 2001 at 1705 hours. Low tide on this day was at 1701 hours at a height of 0.3 metres. The weather was partly cloudy, warm and with a slight breeze.

This reef, at the western end (toward the Lee Breakwater) of the large Kawaroa Reef, was described as lahar platform boulder/cobble reef. In comparison to the site on 'Kawaroa Reef', this section of reef comprised fewer large boulders throughout the mid shore zone. See Attachment II.

Nine algae and 23 animal species were recorded across the reef during the inspection. The algae, *Hormosira banksii* (Neptune's necklace) and the two encrusting algae, *Corralina officinalis* turf and paint and *Ralfsia* sp., dominated the reef. The barnacles, whelks, limpets and topshells were the dominant animal species. The large orange cushion star (*Stegnaster inflatus*) was recorded at this site although not commonly found during routine inspections around Taranaki. Kina was commonly found across the reef and paua were noted as present.

3.1.5 Ngamotu Beach

Ngamotu Beach, opposite the public toilets, was inspected on 5 June 2001 at 1510 hours. Low tide on this day was at 1521 hours at a height of 0.4 metres. The weather was cloudy and breezy.

Approximately 30 hand excavations of the sand at the low shore height found 3 tuatua (*Paphies subtriangulata*). See Attachment II. No other animals, or algae, were present across the beach.

3.1.6 Paritutu Gully

The small reef at the base of Paritutu Rock was inspected on 9 May 2001 at 1540 hours. Low tide on this day was at 1701 hours at a height of 0.3 metres. The weather was partly cloudy, warm and with a slight breeze. Both Taranaki Regional Council officers noted a strong 'landfill' odour at the time of the inspection.

This reef was described as a broken lahar boulder/cobble reef. See Attachment II.

Eight algae and 23 animal species were recorded across the reef during the inspection. The most conspicuous feature of this reef was the large number of anemones (*Isocradactis magna*) present. Other species that were noted as particularly abundant were the barnacles, whelks, limpets, topshells and the little black mussel (*Xenostrobus pulex*). The encrusting algae, *Corralina officinalis* paint was recorded as abundant. The topshell, *Diloma nigerrima*, was recorded as abundant which is typical of a reef receiving a freshwater flow as occurs here. Neither paua nor kina were found during an inspection of the low shore.

3.1.7 Herekawe Stream Mouth

This site was inspected on 9 June 2001 at approximately 1640 hours. Low tide on this day was at 1701 hours at a height of 0.3 metres. The weather was partly cloudy, warm and with a slight breeze.

Herekawe Stream flows across Back Beach, which is an extensive sandy beach as depicted in photos of Attachment II. A search of marine biota within the sandy sediment was undertaken by making approximately 30 hand excavations at random locations from the mid shore to low shore height in the vicinity of where the stream crosses the beach. No biota was found.

3.1.8 Waireka 'cavern'

The area of Waireka Reef about the cavern was inspected on 8 May 2001 at 1520 hours. Low tide on this day was at 1622 hours at a height of 0.2 metres. The weather was partly cloudy, mild and with a SW breeze. Both Taranaki Regional Council officers noted a mild phenoxy odour at the time of the inspection.

The cavern has been inspected by Taranaki Regional Council as part of routine monitoring for a number of years. The cavern area, including a rock pool, was inspected and the area toward low shore. The reef was described as a lahar boulder/cobble reef. See Attachment II.

Ten algae and 24 animal species were recorded across the reef during the inspection. The barnacles, limpets, topshells, whelks and the tubeworm, *Pomatoceros caruleus*, were particularly abundant at this site. Other animal species, common to Taranaki reefs, were also recorded as either common or present. The algae, paint, *Gelidium* sp., Neptune's necklace and *Halopteris* sp., were abundant. Both paua and kina were present.

Previous marine ecological inspections undertaken as routine monitoring by the Taranaki Regional Council found a similar range and abundance of species as identified in this current inspection. This previous monitoring also noted that little or no change in diversity and abundance of intertidal reef biota had occurred at this site.

3.1.9 Waireka South

The area of Waireka Reef approximately 250 metres south of the Waireka cavern site was inspected on 8 May 2001 at 1600 hours. Low tide on this day was at 1622 hours at a height of 0.2 metres. The weather was partly cloudy, mild and with a SW breeze.

This control site has been inspected by Taranaki Regional Council as part of routine monitoring for a number of years. The reef was described as a lahar boulder/cobble reef. See Attachment II.

Nine algae and 24 animal species were recorded across the reef during the inspection. The most notable feature of this site was the presence of 400-500 kina occupying a single rockpool about mid shore. Beyond the rockpool kina were recorded as common. Other abundant species included the barnacles, limpets, whelks, topshells and porcelain crab (*Petrolisthes elongatus*). The dominant algae were Neptune's necklace and *Gelidium* sp. and paint. Paua were also recorded at the site.

3.1.10 Site comparison

As a means of comparing the diversity and relative abundance of communities between each rocky reef site the field data for each site is presented in Table 2 below. This table provides information regarding the distribution of biota across all sites, the comparative abundance of biota at the sites and the comparative diversity of biota at the sites.

The abundance of species are ranked according to the description: 'Present' = 1, 'Common' = 2 and 'Abundant' = 3. Accordingly, the table presents this ranked abundance for each species at each site. It is noted that this manner of comparing between sites is not as meaningful as results collected from a full quantitative survey, and therefore these results warrant only a broad interpretation.

This qualitative assessment found that five of the 16 algae species and 10 of the 44 animal species were found at all sites. This is a total of 15 species that were widespread across all sites. Of those species found at all sites the algae *Corralina officinalis* paint, and the barnacle (*C. columna*) and whelk (*L. scobina*) were the dominant biota. A number of algae and animal species were of low abundance and confined to a few of the sites.

With regard to the ranked abundance of species at sites, the highest total abundance was recorded at the Waireka cavern site (total abundance = 68). This site was followed by the Waireka South site (total abundance = 67), Kawaroa Reef (total abundance = 66), Belt Road (total abundance = 60), Paritutu Rock (total abundance = 59) and old Eliot Street outfall (total abundance = 58).

In terms of diversity, the control site Kawaroa Reef recorded the highest number of species (40 species), followed by the old Eliot Street outfall and Waireka cavern sites (equally 34 species), control site Waireka South (33 species), Belt Road (32 species) and Paritutu Rock (31 species).

Table 2 Diversity and ranked abundance (1 = Present, 2 = Common and 3 = Abundant) of marine communities at each site

Species	Rocky Reef Sites						% of sites that species found in
	Waireka cavern	Waireka South	Paritutu	Belt Rd	Old Eliot St. Outfall	Kawaroa	
Algae							
<i>Carpophyllum</i> sp.	2	2	1	1	2	2	100
<i>Ceramium</i> sp.	2	2	2	0	1	0	67
<i>Chaetomorpha aerea</i>	0	0	0	0	1	0	17
<i>Cladophorosis herpestica</i>	0	0	1	0	0	0	17
<i>Codium fragile</i>	1	0	0	0	0	0	17
<i>Corralina officinalis</i> paint	3	3	3	3	3	3	100
<i>Corralina officinalis</i> turf	2	2	2	3	2	3	100
<i>Cystophora toruica</i>	0	0	0	1	0	2	33
<i>Gelidium caulfacanthum</i>	3	3	2	2	2	1	100
<i>Gigartina</i> sp.	0	0	0	2	1	0	33
<i>Halopteris</i> sp.	3	2	0	0	0	0	33
<i>Hormosira banksii</i>	3	3	0	3	0	3	67
<i>Ralfsia</i> sp.	2	2	2	3	3	2	100
<i>Scytothamnus australis</i>	2	2	2	0	0	2	67
<i>Splachnidium rugosum</i>	0	0	0	2	0	2	33
<i>Ulva</i> sp.	0	0	0	0	1	0	17
Animals							
<i>Alope spinifrons</i>	0	1	0	1	1	1	67
<i>Amaurochiton glaucus</i>	2	2	1	1	2	2	100
<i>Cantharidella tessellata</i>	0	0	0	0	3	2	33
<i>Cellana ornata</i>	3	3	3	3	2	1	100
<i>Cellana radians</i>	3	3	3	3	2	2	100
<i>Chamaesiphon columna</i>	3	3	3	3	3	3	100
<i>Clingfish</i>	0	1	0	1	0	0	33
<i>Cominella maculosa</i>	1	1	0	0	0	1	50
<i>Cookia sulcata</i>	0	0	0	0	1	1	33
<i>Coscinasteria calamaria</i>	0	1	1	1	0	1	67
<i>Diloma nigerrima</i>	0	0	3	0	1	0	33
<i>Eliminus modestus</i>	0	0	0	0	0	1	17
<i>Epopella plicata</i>	2	2	1	1	0	0	67
<i>Evechinus chloroticus</i>	1	2	0	2	0	2	67
<i>Halictis iris</i>	1	1	0	1	1	1	83
<i>Haustrum haustrorum</i>	2	2	0	1	1	1	83
<i>Isactinia olivacea</i>	1	0	1	0	0	1	50
<i>Ischnochiton maorianus</i>	0	0	0	2	0	0	17
<i>Isocradactis magna</i>	0	0	2	0	2	0	33
<i>Lepsiella scobina</i>	3	3	3	3	3	3	100
<i>Littorina</i> sp.	1	0	0	0	0	0	17
<i>Melagraphia aethiops</i>	3	3	2	3	2	2	100
<i>Notoacmea daedala</i>	1	0	0	0	0	0	17
<i>Notoplax violacea</i>	0	0	0	0	0	1	17
<i>Onchidella nigricans</i>	1	1	2	0	2	1	83
<i>Pagurus</i> sp.	2	0	1	1	1	1	83
<i>Patelloidea corticata</i>	0	0	0	0	1	0	17
<i>Patiriella regularis</i>	0	1	0	1	0	1	50
<i>Perna canaliculus</i>	0	1	0	0	0	1	33
<i>Petrolisthes elongatus</i>	2	3	0	2	2	2	83
<i>Pomatoceros caeruleus</i>	3	2	1	2	2	2	100
<i>Plagusia capensis</i>	0	0	2	0	0	0	17
<i>Rainbow chiton</i>	0	2	0	0	2	2	50
<i>Sabellaria kaiparaensis</i>	2	1	1	1	2	1	100
<i>Scutus breviculus</i>	0	0	2	0	0	0	17
<i>Siphonaria zelandica</i>	0	0	2	0	0	0	17
<i>Spirorbis</i> sp.	0	0	0	0	2	1	33
<i>Stegnaster inflatus</i>	0	0	0	1	0	0	17
<i>Stichaster australis</i>	1	1	1	1	0	1	83
<i>Sypharochiton peliiserpentis</i>	2	3	2	2	2	2	100
<i>Thais orbita</i>	1	0	3	0	1	1	67
<i>Turbo smaragdus</i>	2	3	1	3	1	2	100
<i>Xenostrobus puix</i>	2	0	3	0	0	2	50
<i>Xymene</i> sp.	0	0	0	0	1	0	17
Total number of species (diversity)	34	33	31	32	34	40	
Total abundance (sum of ranks)	68	67	59	60	58	65	

3.2 Individual Health

The individual health of algae and animals, and in particular paua and kina, were assessed during each inspection of the reefs. The health of individuals was assessed according to shape and size and shell strength. Particular attention was given to any indications of abnormal morphology.

On no occasion during these inspections were any concerns noted regarding the health of individuals. All individuals at the potential impact sites exhibited similar health compared to those observed at control sites. Indeed, all individuals were no different from that observed at other reefs around the Taranaki coastline.

The Paritutu Rock site was noted as recording whelks of larger size than typically seen at the other reef sites. This site also recorded high numbers of the topshell, *Diloma nigerrima*. It is found from other monitoring around Taranaki that sites receiving a freshwater input record higher numbers of this topshell and it is expected to be the reason for high numbers at this site which receives a freshwater input from an unnamed drainage. It is not certain why whelks were found at a larger size at this site.

Examples of the many individuals observed during the inspections are attached as photos in Attachment II.

3.3 Dioxin and herbicide residues in shellfish tissue samples

3.3.1 Dioxins

Shellfish were able to be collected at each of the rocky shore sites for dioxin analysis, although no shellfish were present at the sandy shore sites (East End Beach, Ngamotu Beach and Herekawe Stream Mouth) except for three individuals of the shellfish, Tuatua, at Ngamotu Beach. Dioxin concentration was determined for shellfish collected at the rocky reef sites.

Dioxin concentrations can be expressed in total i.e., polychlorinated dibenzofurans (PCDD), and as specific congeners i.e., 2,3,7,8-tetrachlorodibenzo-*p* dioxin (TCDD). TCDD was the congener measured in the tissue of whelks, *Lepsiella scobina*, during this investigation using the method based on wet weight. This is the most toxic dioxin and the one with which other dioxins are compared to in terms of relative toxicity, referred to as the toxicity equivalent (TEQ). In this sense, TCDD can be compared to some extent to TEQ corrected PCDD concentrations.

TCDD concentrations in whelk tissue collected at New Plymouth were low at the two Waireka sites and highest at the Paritutu Rock site (Table 3). The records of analysis are presented as Attachment III.

Table 3 Results of tissue analysis for TCDD in whelks collected between 7 and 9 May 2001

Site	TCDD ng kg ⁻¹ (wet weight)
Control sites	
Kawaroa Reef	0.15
Waireka South	0.096
Potential impact sites	
Old Eliot Street outfall	0.34
Waireka cavern	0.094
Paritutu Rock	1.2
Belt Road	0.13

3.3.2 Herbicides

Table 4 summarises the results of tissue analysis for acid herbicides at three sites: control site Kawaroa reef, Waireka 'cavern' and control site Waireka South. No acid herbicides were detected in shellfish at any of these sites, at the detection limit of 0.1 mg kg⁻¹. Analytical results sheets are attached as Attachment III.

Table 4 Results of acid herbicide analyses of whelk tissue collected between 7 and 9 May 2001

Acid Herbicide	Kawaroa Reef (control)	Waireka cavern	Waireka South (control)
Micoprop	ND	ND	ND
MCPA	ND	ND	ND
Dichlorprop	ND	ND	ND
2,4-D	ND	ND	ND
Triclopyr	ND	ND	ND
MCPB	ND	ND	ND
2,4,5-T	ND	ND	ND
2,4-DB	ND	ND	ND
Bentazone	ND	ND	ND
Fenoprop	ND	ND	ND
Picloram	ND	ND	ND

ND = 'not detected' above the detection limit of 0.1 mg kg⁻¹.

4. Discussion

A marine ecological investigation was conducted to determine if any adverse effects to marine ecology exist in the vicinity of alleged former agricultural dumpsites around New Plymouth. The investigation included descriptions of marine community health, individual biota health and residual dioxin contamination of whelk tissue at a number of sites along the New Plymouth coastline and south at Waireka. The investigation was undertaken between 7 and 9 May 2001 and 5 June 2001.

The assessment of community health found that the control site Kawaroa Reef recorded the greatest diversity of all the sites investigated. The diversity of the remaining sites, old Eliot Street outfall, Belt Road, Paritutu Rock, Waireka cavern and Waireka South, were

generally similar. The two Waireka sites and Kawaroa Reef site recorded equally high relative abundance. The abundance of the sites, old Eliot Street outfall, Belt Road and Paritutu Rock recorded similar but slightly lower levels of abundance.

In terms of being a *qualitative* assessment of ecological health it is considered that the differences between each site and between potentially impacted and control sites, are not notably large. As these inspections were single one-off inspections it is not possible to ascertain the natural variability in diversity and abundance at the sites and provide an indication of the significance of the observed differences. It is concluded that there is no discernible difference in the ecological health between each of the sites studied.

The marine biota of the Taranaki coastline have not been well documented. In relation to the New Plymouth coastline Kawaroa Reef had been previously monitored as part of another Taranaki Regional Council study (TRC, 1999) and results found this site to be the most ecologically rich compared to other New Plymouth coastal reefs studied. The most comprehensive and recent study of the intertidal marine biota of North Taranaki was undertaken by Haywood *et. al.* (1999). This study found the diversity of reefs progressively increased from North Taranaki towards New Plymouth. It was noted that the shoreline becomes more sheltered and the reefs consist of a greater variety of microhabitats moving south toward New Plymouth. A second study by Haywood and Morley (unpublished) found that the intertidal biota of reefs around New Plymouth were comparable to that at Kawaroa Reef. In addition they refer to the rocky shores around New Plymouth as containing the richest and most diverse intertidal biota of the Taranaki coast. This is thought to be due to the sheltering effects of the Sugar Loaf Islands.

On no occasion during these inspections were any individuals from potential impact sites unlike those observed at the control sites. This comparison also extends to include observations at other reefs around the Taranaki coastline. All individuals were considered healthy. Other work comparing the shell strength and allometry (length-height relationship) of shellfish was undertaken by the Taranaki Regional Council in 1982. Mussels from the Eliot Street outfall site were included in this study. This study found no conclusive evidence suggesting domestic and industrial wastes from marine outfalls were impacting on mussel shell allometry and strength at the sites studied, including the site at the Eliot Street outfall (TCC, 1983). The study also found that the shell allometry of North Taranaki mussels was similar to that in other literature.

In relation to whelk tissue analysis of dioxins, the two control sites have similar TCDD concentrations to the Belt Road and Waireka cavern sites. The Old Eliot Street outfall and Paritutu Rock sites had higher TCDD levels. The most comprehensive guidelines regulating dioxins in sediments and biota for the purposes of protecting both aquatic life and human health were developed by Canada. TCDD concentrations in whelks at all control and potential impact sites were below the guideline specified in Table 5 for the human consumption of fish for PCDDs. Note that the first two guidelines (a and b) refer to the lipid weight, not the wet weight (the method used in this survey).

Table 5 Summary of available guidelines for PCDDs in estuarine and marine biota (MFE, 1999)

Guideline	Application	Country derived
a. 50 ng I-TEQ kg-1 lipid	Tissue quality objective to protect aquatic life	Canada
b. 0.66 ng I-TEQ kg-1 lipid	Tissue quality objective to protect piscivorous wildlife	Canada
c. 20 ng I-TEQ kg-1 wet weight	Limit concentration for consumption of fish by humans	Canada

A comparison of the New Plymouth dioxin concentrations with other studies in New Zealand and overseas is presented in Table 6. This comparative data must be assessed carefully. Dioxin detection methods are variable and are based on wet weight, dry weight, fat weight or lipid weight, which cannot easily be compared. In addition, most studies conducted throughout the world have been on filter-feeding bivalves. In this survey, small whelks were collected. The only data available on whelks is from a Canadian study of background levels, however, this is expressed in dry weight. As the moisture content of these whelks is not available, the wet weight cannot be accurately calculated. The dry weight dioxin concentration can be 10 times higher than the wet weight concentration, which would make the background dioxin levels in the Canadian whelks range from approximately 0.023 to 0.219 TEQ ng kg⁻¹ WW. The TCDD concentrations at the New Plymouth sites were below the ranges recorded in the Canadian whelks, except at the old Eliot Street outfall and at Paritutu Rock.

Table 6 Comparison of New Plymouth results with dioxins recorded in other New Zealand shellfish and internationally (MfE, 1999)

		Shellfish	TCDD (ng kg ⁻¹ WW)	PCDD (total I-TEQ ng kg ⁻¹ WW)
New Plymouth survey				
Control site range		Whelk	0.096 – 0.15	
Potential impact site range		Whelk	0.094 – 1.2	
New Zealand		Oysters & mussels	< 0.005	0.021 (incl. ½ LOD values) 0.016 (excl. LOD values)
Hellyers Creek (upper reaches)		Oysters		0.26 (incl. ½ LOD values)
Tawarewa River mouth		Tuatuas		0.042-0.29
International IMW & NOAA*				(total TEQ ng kg⁻¹ WW)
Australia	industrial	Mussels		ND - 3
Japan	urban	Cockle <i>Fulvia mutica</i>		0.23-0.71 3.6
Norway	background	Mussels <i>Mytilus edulis</i>		0.1-9.6
	industrial	Mussels <i>Mytilus edulis</i>		60
USA: New York	general	Clams <i>Mya arenaria</i>		0.3-25
USA: East, Gulf and West coasts	background	Bivalves		ND - 3
Canada: St Lawrence Estuary	background	Whelks, <i>Buccinum undatum</i>		DW 0.23-2.19
	urban	Whelks, <i>Buccinum undatum</i>		0.85-2.54

WW = wet weight; DW = dry weight; ND = non detectable; LOD = lower detection limit

* data set of bivalves by International Mussel Watch (IMW) and National Oceanographic and Atmospheric Administration (NOAA) Status and Trends Programmes.

In general, dioxin concentrations in shellfish tissue of the New Plymouth control and potential impact sites were within a similar range to the few other New Zealand studies, however the old Eliot Street outfall and Paritutu Rock site were higher. Both of these sites are still well below the Canadian guideline of 20 ng kg⁻¹ I-TEQ WW. Dioxin levels in New Zealand shellfish, including the New Plymouth shellfish, are generally lower than levels recorded overseas.

Tissue analysis for acid herbicides at three sites: control site Kawaroa reef, Waireka cavern and control site Waireka South was also undertaken. No acid herbicides were detected in whelk tissue at these sites.

Since 1986 the Taranaki Regional Council has monitored the discharge from the Waireka landfill site under its annual monitoring programme. These findings have been reported annually and are publicly available. As part of this programme, the Taranaki Regional Council has conducted ongoing herbicide analyses at the Waireka Reef including in the vicinity of the cavern. Since 1990, kina on the Waireka Reef have been collected and analysed for the acid herbicides which were measured in the tissue of whelks in the current survey. On most occasions, herbicides have been very low or below the detection limits. Herbicides have not been recorded much above the detection limits since 1994.

Water samples collected on the Waireka Reef in June 2000 showed that herbicides were just above the detection limits, for the southern Waireka (control) site and below detection limits (<0.02 mg kg⁻¹) at all other sites on the Waireka Reef.

There are no guidelines or standards regulating acid herbicides, and particularly 2,4-D and 2,4,5-T, in fish or shellfish. The chlorophenoxy compounds, 2,4-D and 2,4,5-T, do not appear to significantly bioaccumulate in the tissue of animals in the aquatic environment and biomagnification along the food web is also not considered to be significant (CCREM, 1987).

These monitoring programmes have clearly established that there is no adverse impact on marine ecology in the vicinity of the Waireka landfill.

Taranaki beaches can be described as open, clean and actively moulded by waves. In addition, the high black ironsand content can cause extreme temperature shifts making conditions unfavourable for shellfish. As a result, the low abundance of shellfish at both control sites and the potential impact site on sandy beaches was not unexpected. Other observations have similarly found no or very few bivalves inhabiting sandy shores of Taranaki.

5. Conclusions

The results of this marine ecological investigation conclude that no residual effects to marine biota and communities as a result of alleged dumping of agrichemicals at New Plymouth were present at the sites investigated.

There was no discernible difference between the ecological health of marine communities at control sites and potentially impacted sites. Other marine ecological studies have found intertidal marine communities to be rich and diverse around the New Plymouth coastline.

In contrary to allegations of deformed and undersized biota at some of the alleged discharge sites, all individual biota at all of the sites investigated was found to be healthy and normal.

The whelk tissue analysis results found residual dioxin levels at the New Plymouth sites were similar to or marginally above other New Zealand studies. It should be noted that these other studies were at background sites isolated from known dioxin discharge points. Of the New Plymouth sites, the old Eliot Street outfall and Paritutu Rock recorded slightly higher levels. As noted above, the biota at both these sites showed no evidence of being in anyway affected. These sites remain well below the Canadian guideline concentration for consumption of fish by humans. Dioxin levels in various overseas shellfish can be considerably higher than recorded during this survey. The dioxin levels recorded in the New Plymouth whelks were well below results reported from the USA for both reference (background) samples and for samples from urban regions (MfE, 1999; Figure 6.1).

No acid herbicides were detected in whelk tissue at the Waireka cavern and two control sites.

This study has found no evidence of risk to either the environment or to human health in relation to the sites investigated.

Fiona Putt
Scientific Officer (Marine Ecology)

References

- CCREM, 1987. Canadian Water Quality Guidelines. Canadian Council of Resource and Environment Ministers. Inland Waters Directorate, Environment Canada, Ontario.
- Haywood, B.W., Morley, M.S. Unpublished. Intertidal biota of the proposed Nga Motu marine reserve, New Plymouth. University of Auckland and Auckland War Memorial Museum.
- Haywood, B.W., Morley, M.S., Stephenson, A.B., Blom, W., Grenfell, H.R., and Prasad, R. 1999. Marine Biota of the North Taranaki Coast. New Zealand. *Tane* 37: 171-199.
- Ministry for the Environment, 1999. Organochlorines in New Zealand: Ambient concentrations of selected organochlorines in estuaries. Ministry for the Environment, Wellington. June 1999.
- Taranaki Catchment Commission, 1983. The influence of coastal municipal outfalls on the condition, allometry and shell strength of North Taranaki mussels. Technical Report 83-4. Taranaki Catchment Commission, Stratford. December 1983.
- Taranaki Regional Council, 1999. Westgate Transport Limited TRK985186 sand Deposition Trial Monitoring Programme Report. Technical report 99-21. Taranaki Regional Council, Stratford. July 1999.

Attachment I

Field Sheets

Dioxin Shellfish Investigation, NP

Site: East End Beach

GPS: 2604672 E, 6237048 N

Date: 5 June 2001 ms. Shie

Low Tide: 3:21 pm 04/m

Site Description (locality, substrate, etc):

Sandy beach. Photos

Comments: Cloudy, breezy.

Population composition, diversity and abundance

Algae

Animals

NO biota present

P = present

C = common

A = abundant

Individual quality and health:

Other Comments:

NO COMMENTS

Dioxin Shellfish Investigation, NP

Site: Old Mill Street outfall GPS: E2603601 N1638730

Date: 7/5/05 1610 - 1640 hrs Low Tide: 3:42pm. 0.2

Site Description (locality, substrate, etc): Platform, some boulders. Site covered approx. 15m area from high to low shore (very small reef/outcrop)

Comments: Small reef/lahar platform outcrop.

1/8 cloud, SW moderate wind, no showers at time of sampling.

Kathryn, Wendy, Fiona

Population composition, diversity and abundance

Algae	Animals
<p> <i>Carpophyllum</i> : C <i>Paint</i> : A <i>Gelidium</i> : C <i>Ralfsia</i> : A <i>Gelidium</i> c <i>Chaetomorpha</i> P <i>Gigartina</i> - P <i>Turf</i> c <i>Ceramium</i> P <i>Ulva</i> P </p>	<p> <i>Chaetomorpha</i> : A <i>Flustra</i> P <i>Lepsiella</i> : A <i>Crobia</i> P <i>Patelloidea</i> : P <i>Pagurus</i> P <i>Carthandella</i> : A <i>C. radians</i> c <i>Xymene</i> : P <i>C. omata</i> c <i>Isocladactis</i> c <i>Onchidella</i> c <i>Turbo</i> P <i>Melagraphia</i> c <i>Anaerodonta</i> c <i>Diloma</i> P <i>Petrolistes</i> c <i>Alope</i> P <i>Pomatoceros</i> c <i>Rainbow chiton</i> c <i>Sibellaria</i> c <i>Sypharochiton</i> c <i>Paua</i> P <i>Thais</i> P <i>Spirorbis</i> C <i>Ulva</i> </p>
<p>Algae</p>	<p>Animals</p>

P = present C = common A = abundant

Individual quality and health:

Nothing unusual or conspicuous to note

Paua morphology normal as for all other biota across reef. Very few paua. No lava

Other Comments:

fewer boulders and small cobbles compared to Kowaina Reef

Dioxin Shellfish Investigation, NP

Site: KAWAROA Reef
 Date/Time: 7/5/01 1510 hrs - 1600 hrs Low Tide: 3:42 pm 0.3M
 Site Description (locality, substrate, etc): Platform/boulder reef. "Site" covered approx. 40M circular area including low tidal zone.
 Comments: (Weather: cloud cover; wind dir./strength), Sampling team: 7/8 cloud, showing SW moderate wind.
 Kathryn, Wendy, Fiona

Population composition, diversity and abundance

Algae	Animals
<i>Homosira banksii</i> A	<i>Kina</i> C
Turf A	<i>Perna</i> P
Paint A	<i>Pauc</i> P
<i>Gelidium</i> P	<i>Petrolisthesis</i> C
<i>Ralfsia</i> C	<i>Elminius</i> mod
<i>Carpophyllum</i> C	<i>Amurochiton</i> C
<i>Splachnidium</i> C	<i>Turbo</i> C
<i>Cystophora</i> C	<i>Notoplax violacea</i> P
<i>Scythamnus</i> C	<i>Nelographa</i> C
	<i>C. radialis</i> C
	<i>Alope</i> P
	<i>Bufoxeros</i> C
	<i>Cantharidella</i> C
	<i>Onchidella</i> P
	<i>Rambow chiton</i> C
	<i>Sypharochiton</i> C
	<i>Coleia sulcata</i> P
	<i>Cocanostrius</i> P
	<i>Thais</i> P
	<i>Palmiella</i> P
	<i>Isachno stracea</i> P
	<i>Xenostrobus</i> C
	<i>Austium</i> P
	<i>Stichaster</i> P
	<i>Cominella maculosa</i> P
	<i>Sabellaria</i> P
	<i>Pagurus</i> P
	<i>Spirorbis</i> P

9 Algae

31 Animals

P = present C = common A = abundant

Individual quality and health:

Nothing unusual or conspicuous to note
 Pauc present appeared normal and strong.
 All other biota appeared morphologically normal/healthy.

Other Comments:

Wright 4 kina = 7g. = 40 grams
 => 20 kina = 200 gm.

Dioxin Shellfish Investigation, NP

Site: Bell Road GPS: (2601447 N 16738152)
 Date: 9/5/01 1105 - 1135 hrs Low Tide: 5:01 pm @ 3m
 Site Description (locality, substrate, etc):
 Lahar Platform / boulder/cobble reef.
 Weather: 4/5 cloud, warm, slight breeze.
 Comments:

Sampling team: Kathryn + Fiona

Population composition, diversity and abundance

Algae	Animals
<p><i>Carpophyllum</i>^P <i>Turf</i>^A <i>Hormosira</i>^A <i>Paint</i>^A <i>Ralfsia</i>^A <i>Gelidium</i>^C <i>Cystophora</i>^P <i>Splachnidium</i>^C <i>Gelidium Gigartina</i>^C</p>	<p><i>Lepsiella</i>^A <i>Kina</i>^C <i>Chaetosiphon</i>^A <i>Melagrapton</i>^A <i>Pomatoceras</i>^C <i>Topopella</i>^P <i>Pagurus</i>^P <i>Aulacroditon</i>^P <i>Ischnoditon</i>^C <i>Stichaster</i>^P <i>C. radicans</i>^A <i>Turbo</i>^{C/A} <i>C. ornata</i>^A <i>Patiriella</i>^P</p>
9 Algae	23 Animals

P = present C = common A = abundant

Individual quality and health:

Photos taken of pauo + kina. All appeared normal.

Other Comments:

11-0010

Dioxin Shellfish Investigation, NP

Site: Ngamotu Beach GPS: 2620062 E, 6237747 N
 Date: Tues 5 June 2001, 1510hrs Low Tide: 3:21pm O.H.M.
 Site Description (locality, substrate, etc):
 Sandy beach. Photos. Cloudy + breezy

Comments: Ngamotu beach used as a control site for the
 Herokawe Stream mouth beach site.

Population composition, diversity and abundance

Algae	Animals
No algae	Tuatua (3 only)

P = present C = common A = abundant

Individual quality and health:

Photos taken of tuatua. Appear normal
 & healthy.

Other Comments:

Dug in 30 mins to find 3 tuatua
 Photos

Dioxin Shellfish Investigation, NP

Site: Paritutu Rock

GPS: E2598467 N6237321

Date: 9/5/01 1540-1630 hrs

Low Tide: 5:01 pm 0.3m

Site Description (locality, substrate, etc): Boulder / broken labras / cobble reef

Weather: 3/8 cloud, warm, slight breeze.

Comments:

Sampling Team: Kathryn + Fiona

Population composition, diversity and abundance

Algae	Animals
Scytothamnus c	Xenostrobus A
Parit A	Isocradactis magna c
Coranidium c	Chaenosiphon A
Gelidium c	Melograptus C
Ralfsia c	Sphaerodictyon c
Carpophyllum P	Cirratians A
Cladophoropsis P	Thais A
Turf c	Dilomaea A
	Ondridella c
	Lepsiella A
	Siphonaria c
	Gropella P
	C. ornata A
	Sabellaria P
	Pomatoceras P
	Pagurus P
	Turbo P
	Stichaster P
	Isachnia P
	Anaeroditon P
	Coscinasterias P
	Plagusia c
	Sartus c
8 Algae	23 Animals

P = present

C = common

A = abundant

Individual quality and health:

A large number of large Lepsiella scrobina present.
 Heaps anemones
 No Pava found. No kina

Other Comments:

Small reef
 large sand lenses present
 Strong 'landfill' odor

NO SAMPLE

Dioxin Shellfish Investigation, NP

Site: Hono Kaimi State Park
Date: 9/5/01 1648 hrs
GPS: E2592072 N167310701
Low Tide: 5:01pm 0.3m
Site Description (locality, substrate, etc):
Sandy beach at river mouth.
Weather: 3/8 cloud, warm, slight breeze.
Comments: No biota present in sand
Sampling team: Kathryn + Fiona

Population composition, diversity and abundance

Algae	Animals
no biota present	

P = present

C = common

A = abundant

Individual quality and health:

Other Comments:

NO COMMENTS

Dioxin Shellfish Investigation, NP

Site: WAIREKA Cavern site GPS: 02591035 N6235255 (adjacent rock pool)
 Date: 8/5/01 1520hrs - 1600hrs Low Tide: 4:22 pm 0.7m
 Site Description (locality, substrate, etc): Lahnar/boulder/cobble reef. Site at rockpool at top of cliff at the cavern. Site covered ~ 40m area from rockpool to low shore level.
 Comments: Mild phenoxo odour at time of sampling/inspection. Large sand lenses present.
 Kimberley, friend

Population composition, diversity and abundance

Algae	Animals
Turf C	Kina P N. daudala P
Gelidium W/A	Coninella P Haustum W/A
Hormosira A	Turbo C Xenostrobus C
Ralfsia C	Pagurus C Sabellaria W/A
Paint A	Chaenosipho A Pterolites C
Ceramium C	Epopella C Anacardium C
Carpophyllum C	C. ornata A Kactinia P
Sargothamnus C	C. radicans A Stichaster P
Halopteris W/A	Pomatoceros A Onchidella P
Codium P	Melagraphra A Paua P
	Sypharochiton C
	Lepsiella A
	Littorina P
	Thais P

10 Algae

24 Animals

P = present C = common A = abundant

Individual quality and health:

No apparent abnormalities. All individuals appear healthy and normal.

Paua had normal morphology.

Fewer paua/harder to find at this site compared to the control site. few kina present.

Other Comments:

Panoramic photos showing landscape of cavern along to control site.

A soft army supply DSC printed photo can be seen at base of cliff. Mussels and other shells present. It appeared to have been washed down from the cavern above with the tide.

NOT

Dioxin Shellfish Investigation, NP

Site: WAIREKA 'Control' GPS: E 2596932 N 6235135
 Date: 25/01 1600hrs - 1630hrs Low Tide: 11:29pm 0.2m
 Site Description (locality, substrate, etc): ~ 200-250m W 'control' @ next headland (photo)
 Lahar/boulder/cobble reef
 Comments: 4/8 cloud, SW breeze, mild

Kimberly, Linn

Population composition, diversity and abundance

Algae	Animals
<p>Turf C Hormosira A Gelidium #A Paint A Ceramium c Dalfsia c Halopteris #c Carpophyllum c Scytothamnus c</p>	<p>Chaetosiphonia A C. ornata c/A C. radicans A Sypharodictyon c Lepsiella A Melograthia A Rainbow dictyon c Pomatoceros c Turbo A Kina c Epoptella c Alope P Anacardictyon c</p>
<p>9 Algae</p>	<p>24 Animals</p>

P = present C = common A = abundant

Individual quality and health:

All individuals appearing normal and healthy
 Photos.
 Paua appeared normal, strong shell.

Other Comments:

Main rockpool is approx. ~ 400m long and slope down
 Panoramic photos showing landscape from 'control' to
 control site

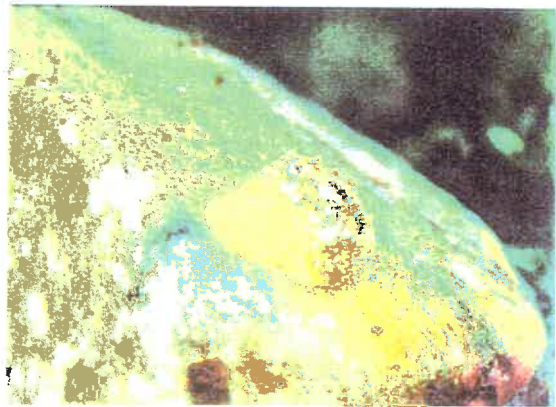
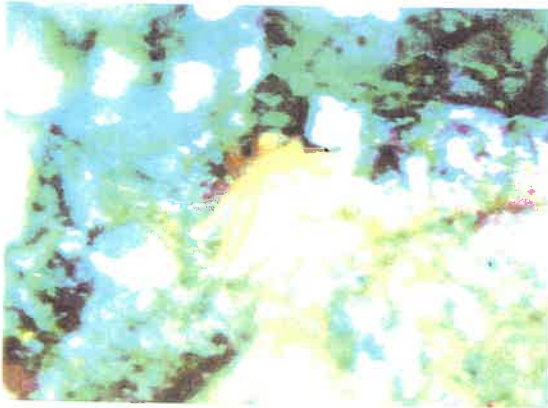
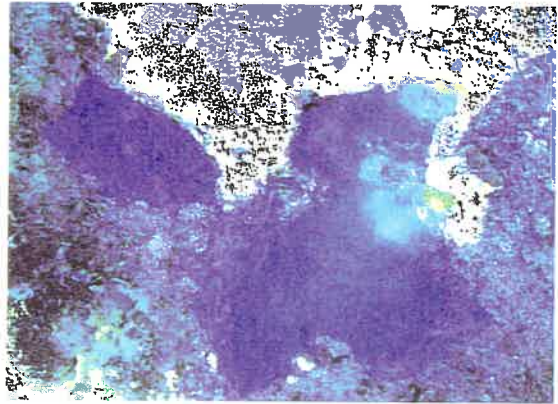
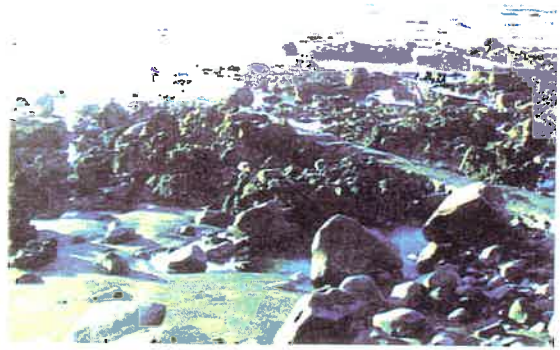
Attachment II

Site Photos

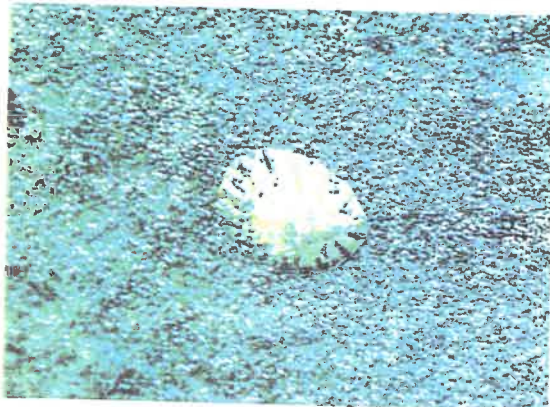
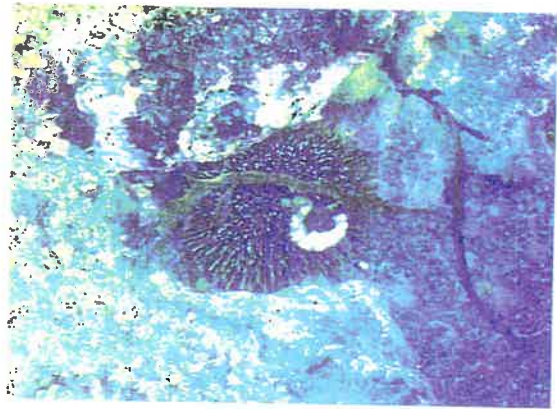
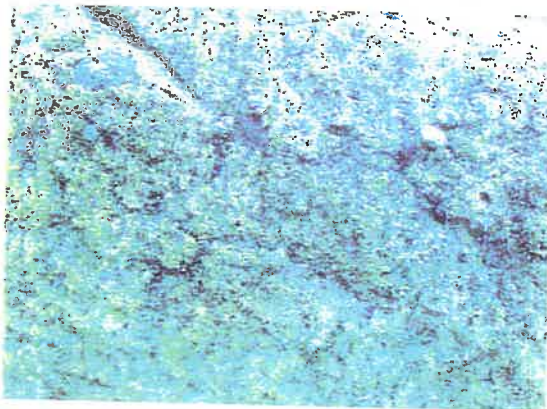
East End Beach

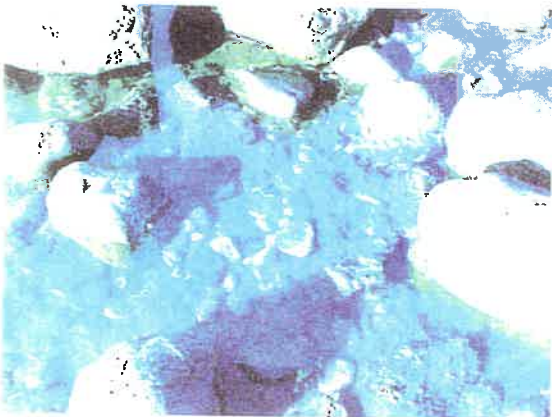
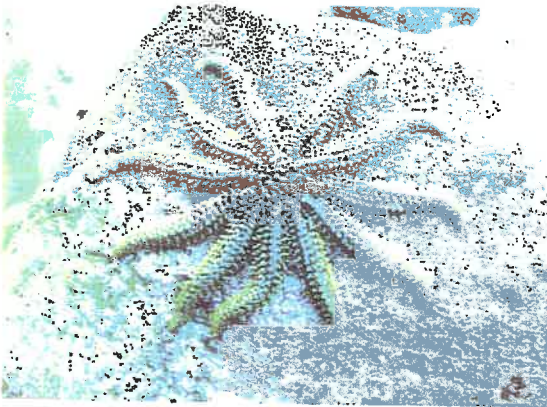
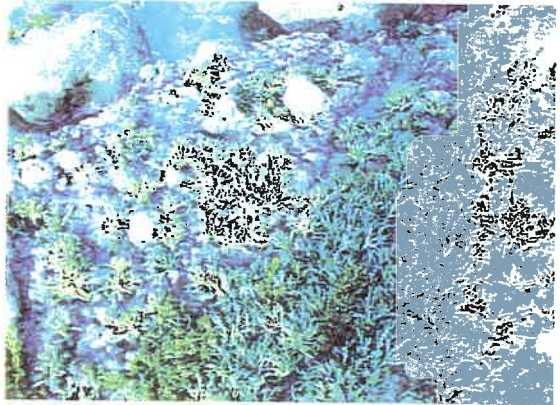
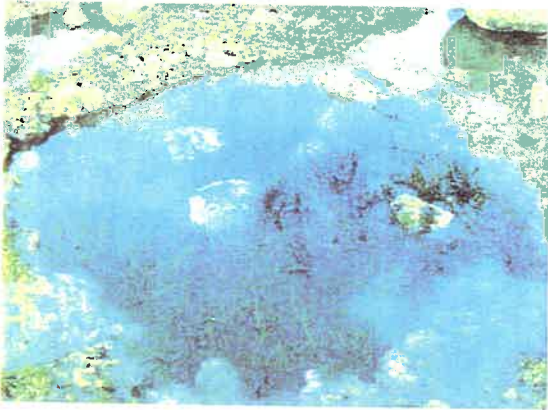


Old Eliot Street Outfall

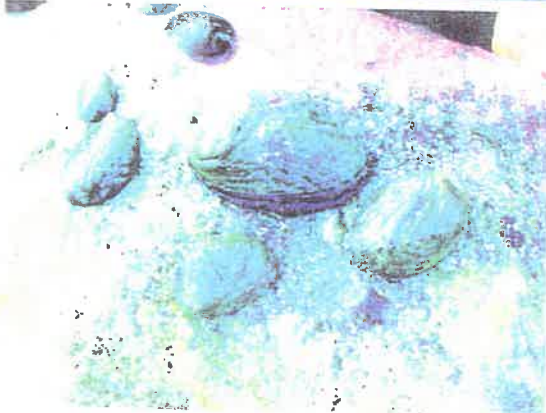
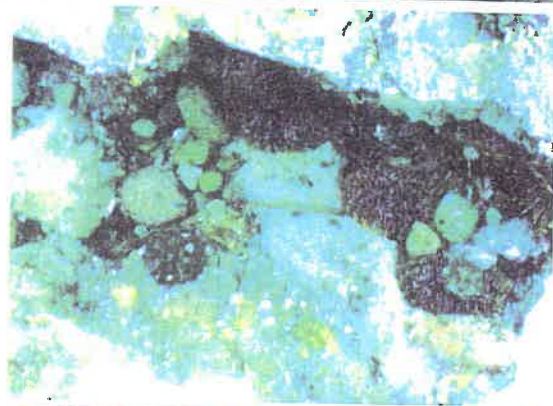
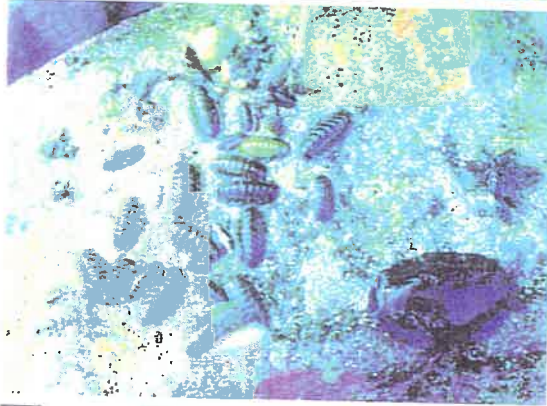
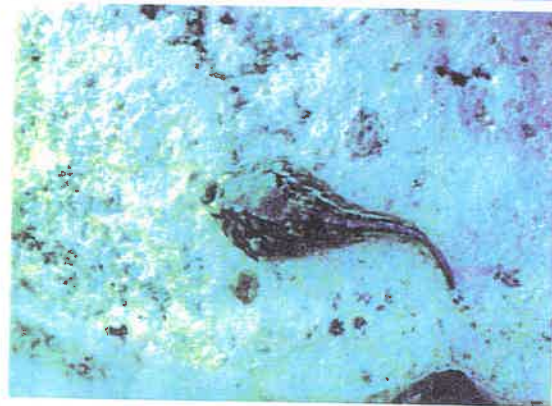


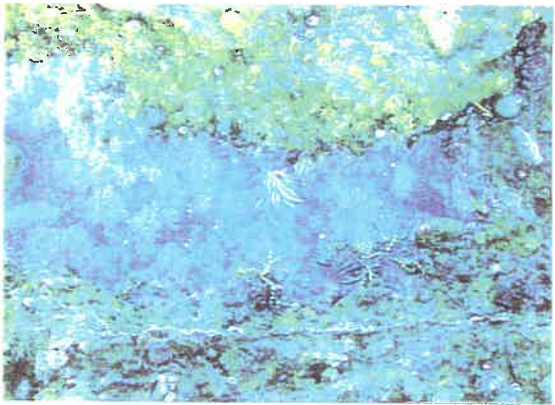
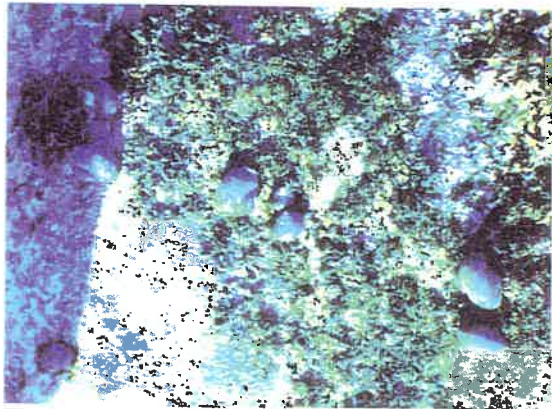
Kawaroa Reef





Belt Road

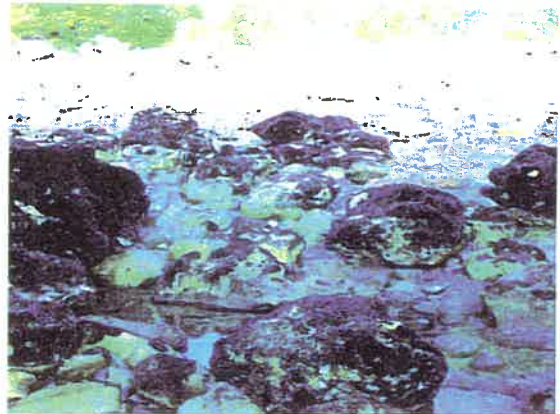


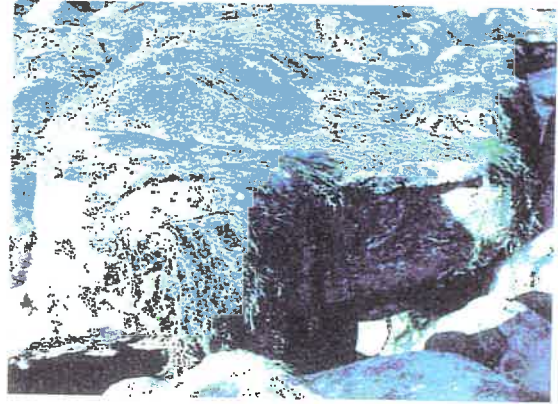
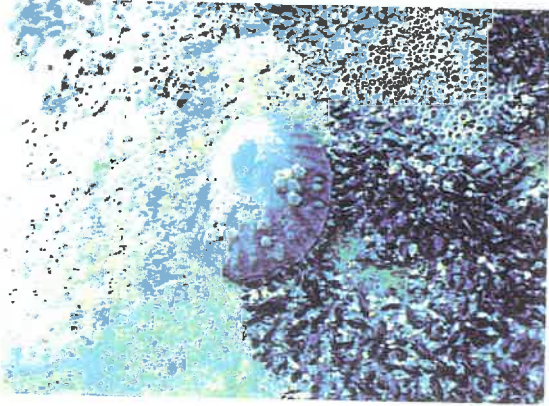
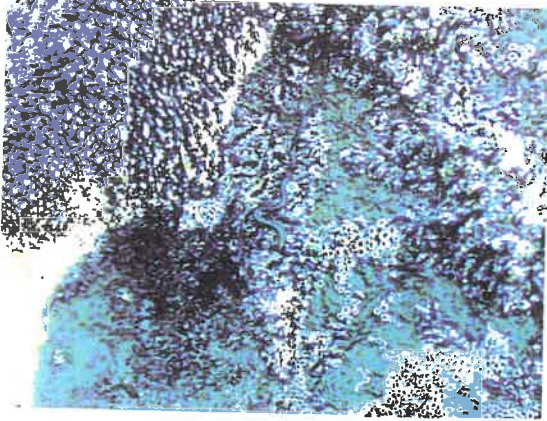


Ngamotu Beach



Paritutu Rock

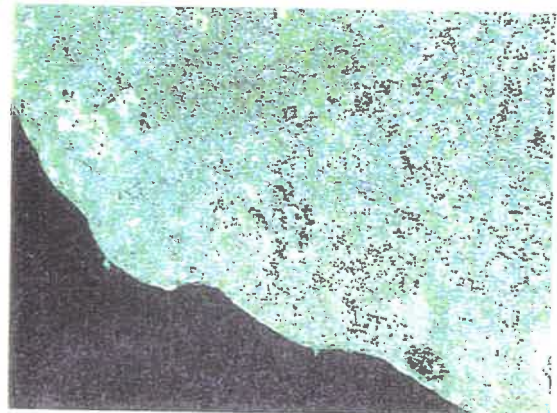
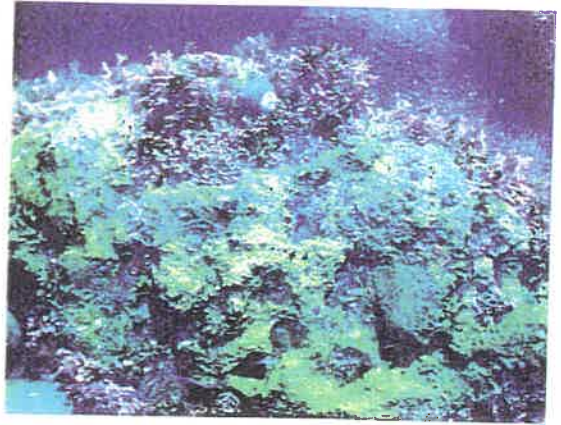
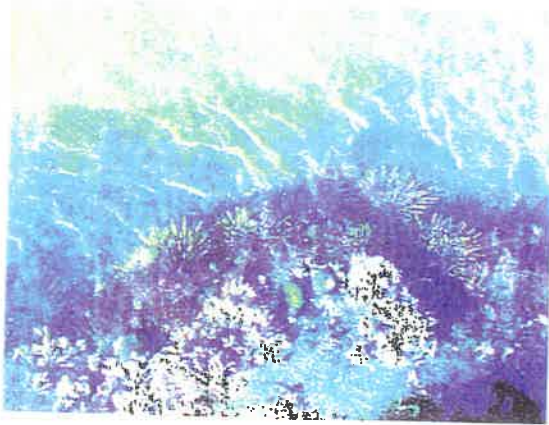


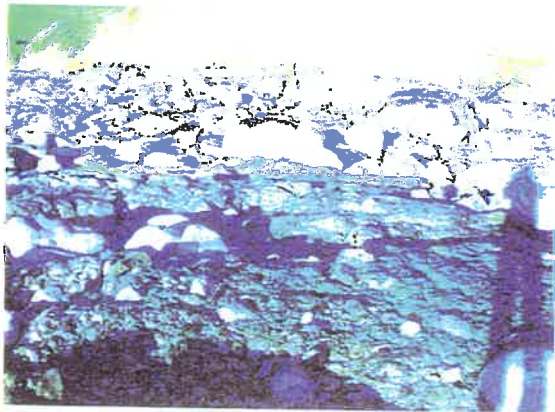


Herekawe Stream Mouth

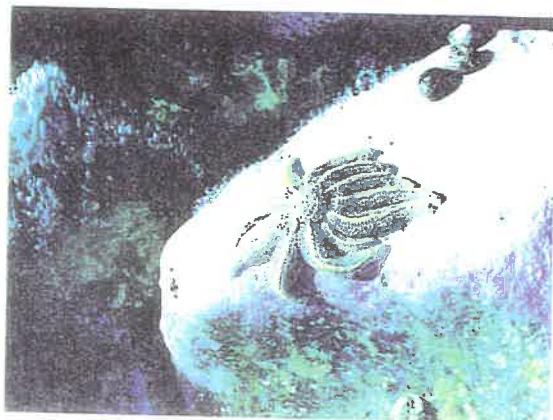
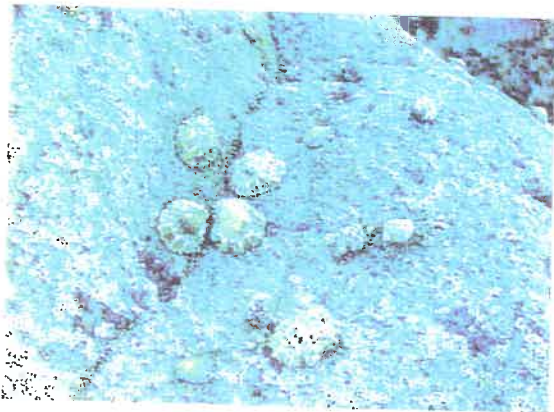
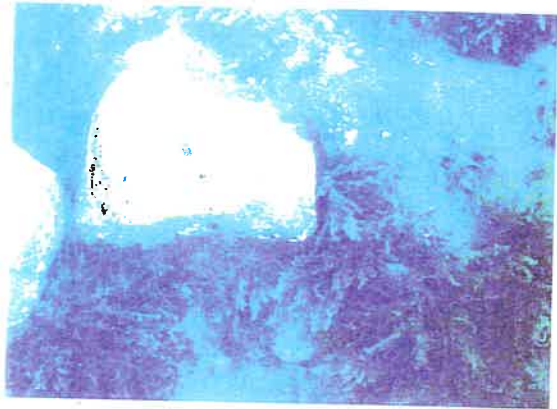
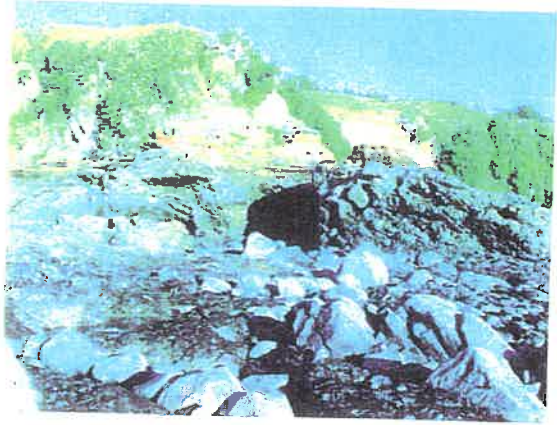
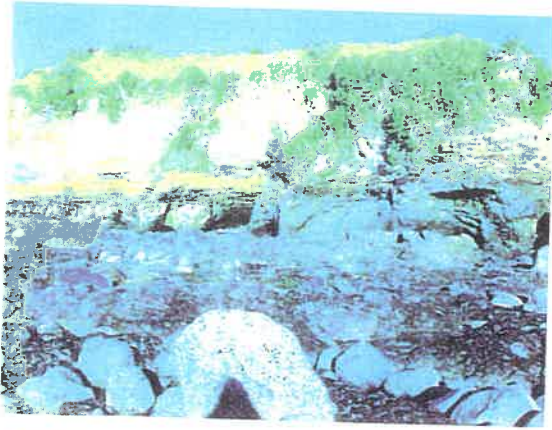


Waireka Cavern





Waireka South



Attachment III
Shellfish Analytical Results

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Fiona Putt

Date Received: 11 May 2001

Client Reference: 011011, 011013, 011014

AgriQuality Lab. Reference: 01-1932/1,3,4

Sample Type: Shellfish

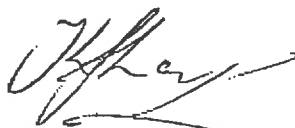
Analysis: Acid Herbicide


Method:

The sample was isolated by solid phase extraction and the extract derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology are available on request.

Results are reported in milligrams per kilogram (ppm).

Analytical results are for samples as received.


K. J. Lange
UltraTrace™ Laboratory
AgriQuality Environmental


M. D. Valentine
UltraTrace™ Laboratory
AgriQuality Environmental

02 August 2001

SAMPLE DETAILS	
Client Reference	011011, Kawaroa Reef, 08/05/01
AgriQuality Lab. Reference	01-1932/1

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

02 August 2001

SAMPLE DETAILS	
Client Reference	011013, Waireka 'cavern', 08/05/01
AgriQuality Lab Reference	01-1932/3

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY
 CLNZ94 01-1932 ah shellfish

02 August 2001

SAMPLE DETAILS	
Client Reference	011014, Waireka 'control', 08/05/01
AgraQuality Lab Reference	01-1932/4

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

AgriQuality New Zealand Limited
Huarangi Aotearoa

Gracefield Research Centre
Gracefield Road
PO Box 30 547
Lower Hutt
New Zealand

AgriQuality Environmental
Phone: 64 4 570 8822
Fax: 64 4 569 4500

Email: <allwoodj@agriquality.co.nz>

Facsimile



To: Fiona Putt

Fax: 06 765 5097

Company: Taranaki Regional Council

Date: July 10, 2001

From: Jacinda Allwood

Pages (including this page): 3

Re: TCDD Results for Marine Biota samples

This message is intended for the person or organisation named above. It contains confidential and perhaps legally privileged information. If you have received it in error, please notify the sender and destroy this document. If you are not the intended recipient, you are notified that any use, distribution or reproduction is prohibited.

Dear Fiona

Please find following the analytical certificate for the TCDD analysis of for your six Marine Biota samples received at AgriQuality Environmental on 11 May 2001. The results are reported in picograms per gram (pg/g), equivalent to ppt, on an as received basis to two significant figures.

The samples are also being analysed for organochlorine (OC) pesticides and polycyclic aromatic hydrocarbons (PAHs). The results for the OCs and the PAHs will be forwarded to you as soon as they become available.

If you have any queries or require any additional information please do not hesitate to contact us.

Kind regards

Jacinda Allwood
Team Leader
UltraTrace™ Laboratory
AgriQuality Environmental

Barry Van Inkarovich

04 570 8805

11/7/01
Fiona
11 7 01

Key

AgriQuality New Zealand Limited
Huarangi Botearoa

Gracefield Road
P.O. Box 31 242
Lower Hutt, New Zealand

Phone: +64 4 570 8800
Facsimile: +64 4 569 4500

10 July 2001

Certificate of Analysis

Client: Taranaki Regional Council
Private Bag 713
Stratford
New Zealand



Attention: Fiona Putt
Date Received: 11 May 2001
Laboratory Reference: 01-1932
Sample Type: Marine Biota
Analysis: 2378 Tetrachlorodibenzo-*p*-dioxin (TCDD)
Method: Based on USEPA Method 8290 (Isotope Dilution)

The samples were spiked with isotopically labelled surrogate standards and extracted with organic solvent. The extracts were purified by chemical treatment and solid phase chromatographic techniques. Measurement was performed using high resolution gas chromatography and high resolution electron impact mass spectrometry.

Results are reported in picograms per gram (pg/g), equivalent to ppt, on an as received basis to two significant figures. Results have been corrected for recoveries.

S V Leathem
UltraTrace™ Laboratory
AgriQuality Environmental

M L Mackey
UltraTrace™ Laboratory
AgriQuality Environmental



All tests reported
herein have been
performed in accordance
with the laboratory's
scope of accreditation

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY

10 July 2001

Results

Laboratory Reference	Sample Identification	Sample Type	TCDD [†] pg/g	¹³ C ₁₂ RE %	
01-1932/1	011011 - Kawaroa Reef	Marine Biota	0.15	84	CONTROL
01-1932/2	011012 - Old Elliot Street outfall	Marine Biota	0.34	101	
01-1932/3	011013 - Waireka 'cavern'	Marine Biota	0.094	112	CONTROL
01-1932/4	011014 - Waireka 'control'	Marine Biota	0.096	112	
01-1932/5	011033 - Paritutu Rock	Marine Biota	1.2	108	
01-1932/6	011034 - Belt Road	Marine Biota	0.13	112	

† = Results are reported on an as received basis.

Abbreviations:

CDD = chlorodibenzo-*p*-dioxin

T = tetra

¹³C₁₂ RE = recovery of ¹³C₁₂ surrogate standard

pg/g = picograms per gram (equivalent to ppt)

ppt = parts per trillion

Sm
01-1932 tcdd

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY

Appendix VII
Record of detailed site inspections

Memorandum

To Brian Calkin: Inspectorate Manager
From Bruce Pope: Investigating Officer
File F02/2 UIR400
Date 31 May 2001

Detailed inspection of alleged Dioxin dump sites

On Monday the 28 May 2001 and Wednesday the 30 of May 2001 detailed inspections of 22 alleged Dioxin dump sites was carried out by seven staff from the inspectorate section of the Taranaki Regional Council. The inspections involved walking all the sites on a shoulder to shoulder basis.

Site A – Lawry St Site

This site is situated on the corner of Devon Street West and Lawry Street and is adjacent to the Mangaotukutuku Stream. A full inspection from west to east parallel with Devon St West was undertaken, including a detailed inspection of the steep slope to the Mangaotukutuku Stream. Possible leachate points were found on the steep banks of the Mangaotukutuku Stream. The slope comprises unconsolidated soils covered in weedy vegetation.

Site B – Seaview Rd Site

This site is situated on the corner of Devon Street West and Seaview road and is adjacent to the Mangaotukutuku Stream. The site is bounded by a garage/service station and a car painting business to the south. A full inspection of the site and adjacent stream banks was undertaken. No evidence of contamination was found.

Sites C – Pylon 3 Site and V – Centennial-2 Site

The Pylon 3 site comprises an area of land between the IWD north-west boundary and Back Beach extending to Mt Moturoa, below a pylon outside the north-west corner boundary of the IWD plant, and extending to the beach. It is a relatively large area and includes a significant area of public reserve. There is a gully at the south-western end of the site that extends from the plant to the coast line. At the head of this gully there is a constructed stormwater pond located on, and for, the IWD site.

A beach walk was undertaken of Pylon 3, Centennial Drive and Centennial-2 sites and two leachate sites were found and marked with spray dye, they were:

- On back beach access track
- North of back beach access track

A full sweep of the Pylon 3 site between Centennial Drive and IWD fence from west to east was undertaken. Some plastic material was found on the surface north of Pylon 3 on the 4 wheel drive track, no other evidence of contamination was found.

Ca – Centennial Drive Site

This is a reserve area above the former stormwater discharge from the office block of IWD.

Inspection of site Ca showed that the area, a slight gully, has been planted in trees and is a reserve. Planting and tree release spraying has been undertaken in the last three months that would negate further investigation.

Site D – 34 Rangitake Drive Site

This is a residential property extending from Rangitake Drive to the Herekawe Stream. A pole house is located at the top of the section near the road. The remainder of the section is a grass terrace and steep vegetated bank down to the Herekawe Stream.

A full inspection was undertaken of the back of this section and there was no evidence of leachate and no foreign objects were found.

Site Da – 44 Rangitake Drive Site

This site is at the southern turnaround of Rangitake Drive and includes the house site. The house is adjacent to a vacant section, which is also included as part of this site, the street number for this section is 42 Rangitake Drive. The road frontage is tarsealed and concreted and a layer of lawn is on 44 Rangitake Drive. The bottom of the sections are relatively overgrown and is adjacent the Herekawe Stream. A full inspection of the area was undertaken and no evidence of dumping was found.

Site E – Omata Reserve Site

This site is directly on the western side of the Herekawe stream. East of the Methanex tank farm. The site is situated on New Plymouth District Council reserve land and has been planted with trees in previous years. A full inspection of the western (true left) bank was undertaken, the area is covered with thick undergrowth and no leachate or unusual problems were found.

Inspections were also done across the remainder of the property on the western side of the site, nothing obvious was found in this area.

A further full sweep of the eastern side (true right) of the Herekawe stream was also undertaken this showed a substantial lump of concrete 20m downstream from the sewerage pipe or start point, this was situated at the back of No 34 Rangitake Drive.

Also found on right hand bank:

- Novaflow at top near mesh on empty back section adjacent to 26A Rangitake Drive.
- Large cutting behind 26A Rangitake Drive on downstream side of house, midway between the cabbage trees and house
- 20metres downstream of 26A Rangitake Drive section boundary, ground water flow less than 1metre up from stream level

As part of the inspection weed eaters were used to cut away substantial excess woody growth. This also enabled access for GPR activities.

Site G – Marfell Park Site

The Marfell Park site is a former municipal landfill. The allegation received by the Council was that herbicide contaminated waste were disposed in an area near the 'top' (south-eastern) end of the former landfill site. According to the New Plymouth District Council, leachate from the former landfill is intercepted and discharged via a pipe to the Mangaotukutuku Stream. The discharge point is approximately 600m north-west of the alleged disposal site.

There is iron oxide staining present at the leachate discharge pipe and in the accumulated sediment immediately below the pipe.

The former landfill site has been developed as sports playing fields. Down gradient of the landfill site is a BMX track and a children's play area.

Two inspections of the site were undertaken, the first sweep from the eastern side of the park from the Cook Street end through the BMX track to Grenville Street. The second sweep from Grenville Street to Cook Street on the western side of the park. Several wet areas were found on the park during these sweeps. However, no other signs of leachate or surface contamination were discovered. Possible sampling sites could be from stormwater pipes in manholes on site or at the discharge point to the Mangaotukutuku Stream.

Further inspection of the known leachate discharge point from the old dump to the Mangatuku Stream was also undertaken, this site is off Endeavour street. A full inspection of the area was undertaken no signs or odours found.

Site H – Ngamotu Domain Site

The Ngamotu Domain site is a former municipal landfill. The site has been grassed and is now used as playing fields. The landfill site is on the western side of a gully formed by the Mangahererangi Stream. Several full inspections of the eastern side of the park, from south to north, showed signs of some odours which appeared to be leachate odour from the old dump site. The remainder of the site was inspected methodically with no other signs of leachate being found. Possible sampling sites were found on the eastern side of the park.

Site I – 7A Squire Place Site

The Squire place site is in a gully immediately beside the Ngamotu Domain. This site contains a stormwater pipe that allegedly contained leachate, which was discharged from the Ngamotu Domain landfill. A full inspection of the western side of the Squire Place was undertaken, this area is between the Ngamotu dump site and the Mangahererangi Stream which flows to Ngamotu beach. This stream would take leachate from the old dump site. Although no odours or strange materials were found during this inspection it was noted that some debris and discoloured water was evident on the opposite stream bank (true right). Samples recommended to be taken at the end of the discharge pipe and at the bottom boundary of the property.

Site J – Belt Road Site

This site is situated at the end of Belt road, over the railway line and on the coast. The area is grassed and is regularly mowed. It is immediately on the cliff face sloping to the foreshore of the Tasman Sea. Inspection did not indicate any leachate discharge points.

Site K – Victoria Road, Oakura Site

This site is on the first farm on the right up Victoria Road off State Highway 45 at Oakura. No leachate discharges were found.

Site M – Beach Road-1 Site

The Beach Road site is located at the base of a gully and incised into a flat terrace area. There is a wetland area at the base of the gully and adjacent to the alleged disposal site. A full inspection from the sea fence to Centennial Drive was undertaken, including an inspection of the wetlands area. No evidence of any discharges or dumping was found.

Site P – 26A Rangitake Drive Site

This site is at the rear of a residential property and backs on to the Herekawe Stream. The rear of the section comprises two grass terraces before steeply sloping to the Herekawe Stream. The steep bank is predominantly covered in kikuyu grass. A full inspection was undertaken along the back of 26A Rangitake Drive. This showed the following:

- Wet area at the lowest level down from the house
- 6 metres further east a wet area with an iron oxide sheen
- A rusted, crushed drum was located at stream level below the site, adjacent to the end of boundary fence. There was no evidence that this drum had contained agrichemicals. The drum has been removed.
- Leachate evident

Site Q – Rifle Range Rd/Bewley Rd

This site is located on Rifle Range road next to the true right bank of the Waiwhakaiho River and was used as a landfill site. It is now an industrial area.

A full inspection from west to east of the true right bank of the Waiwhakaiho River from the waters edge to Bewley Road was undertaken. Start point was GPS2605942E-6238969N. The following was found:

- Between start point and smart Road, various drums, a stormwater discharge pipe and some leachate.
- Between Smart road and Struthers Place, three stormwater pipes, small amount of rubbish and one leachate point.
- Between Struthers Place and Vickers Road, one 30 metre long leachate discharge, stormwater pipe and various pieces of metal.
- Between Vickers Road and the finish point, GPS2606845E-6239729N, Mangaone Stream, six stormwater discharge pipes.

Site R – Beach Road-2 Site

A flat paddock situated on the old IWD farm. No surface water discharge points are possible and there is no sign of any substance relating to drums.

Site X – Roto Street Site

This site consists of a gully adjacent to a recent housing subdivision, however no houses have been built at this stage. Fill material had been previously disposed of in the gully, particularly on the true left side near the head of the gully. Some concrete and asphalt rubble is present at the surface over part of the site. A small stream has been re-directed across and down the true left side of the gully. At the base of an exposed bank adjacent to the stream a seepage zone exists with numerous seeps. There is significant iron oxide staining around these seeps and in the streambed in the immediate vicinity.

A full inspection from the recent housing subdivision to the bush area was undertaken. It was noted that the drain that runs parallel to the site was discoloured with iron oxide.

Site Z – Ngahoro Site

The Ngahoro site is a known IWD disposal area where drums containing herbicide manufacturing wastes had previously been disposed. The drums, contents, and surrounding soil were removed for disposal at the Waireka landfill facility, and site clean-up undertaken, between 1981 and 1985.

The Ngahoro site is located on the seaward side of Centennial Drive approximately 2 km west of the IWD plant and 200 m east of the Beach Road-1 site (Site M). The site is located on the edge of an eroded terrace with steep gullies on the coastal side and flat terrace extending inland. At the base of the gullies, swampy/wetland areas feed small streams flowing towards the coast. There is likely to be a groundwater divide at the site with most groundwater flowing towards the northern gully and a lesser amount flowing to the southern gully.

A full inspection from Centennial Drive to a fence by sea was undertaken. A wet gully to the north of the site was also inspected. No visible signs of pollution were found.

Site Ze – Tank 3500

This is a flat area of farm land on the old Ivon Watkins Dow dairy farm. A full sweep from Centennial Drive fence line, past the Tank 3500 to a wetland/lake, then through wetlands area between lake and Centennial drive. There was no evidence of contamination in the wetland/lake and the surrounding area.

Site Zh – Car Park Site

This site is near the car park west of the Herekawe Stream on a walking track to the beach. No allegations of the presence of herbicide manufacturing residues have been made at this site. The reason this site was investigated and samples collected is to provide assurance to the public that the discharge is natural.

A full inspection showed no signs of any dumped material, however, at the beach end of the track there is a seepage zone with significant iron oxide staining and in the past the Council has received a number of enquiries regarding the rust coloured staining at the seepage zone.

Site Zi – Herekawe Cliff Site (Pylon 4)

The Pylon 4 site comprises the area below a pylon on the west boundary of the IWD property, extending to the beach. A gully extends from Pylon 4 and the south-western corner of the IWD site to the coast. A small stream flows down this gully and over the coastal cliff.

A beach walk was undertaken. Two leachate sites were found and marked with spray dye, they were:

- Near water fall and Hurricanes sign on cliff face
- North of the water fall area

Site Zk – Jury Site

This site is at the end of Norwich Avenue on the former Jury farm. Inspection showed some signs of broken concrete. No potential leachate discharge points were possible.

The following sites were not the subject of the detailed inspections reported above, for various reasons:

F – IWD-1 Site – on site at IWD and investigated later .

L – 23C Tahurangi Place Site – residential section, investigated later.

N – Waireka site – this is the subject of regular monitoring.

O – Pioneer Road Site– entrance way to Ngamotu Domain only.

T – Colson Road Landfill – subject of regular monitoring.

U – IWD-2 Site - on site at IWD and investigated later.

W – Herekawe Stream – current stormwater discharge subject to regular monitoring.

Za – 60 Marama Crescent - residential section, investigated later.

Zb - Buller Street Site – original IWD site. Investigated previously, sealed and covered with concrete.

Zc – Tarahua Road Site– Investigated previously, sealed and metalled.

Zd – Tasman Sea (Elliot St Outfall) – marine sites.

Zf – IWD-3 Site - on site at IWD and investigated later.

Zg – IWD-4 Site - on site at IWD and investigated later.

B E Pope
Investigating Officer

Appendix VIII
Record of site excavations

Memorandum

To Brian Calkin: Inspectorate Manager
From Bruce Pope: Investigating Officer
File FO2/2 UIR400
Date 15 August 2001

Further investigation into 2 sites- Alleged Historical Dioxin Disposal- Stage Two

1. On Tuesday the 14 August 2001 further investigation of two suspected dump sites was undertaken.
2. The purpose of this excavation was to ascertain what was the cause of diffractions detected on sites C, Pylon 3 and Ze, Tank 3500 in the report on Ground Penetrating Radar investigations undertaken by GPR Geotechnical Services.
3. The following are the results of the exploratory digging.
4. The works involved using a back-hoe type digger to excavate several exploratory holes.
5. **Site C, Pylon 3** - One exploratory hole was excavated at GPS 2598459E-6237492N in the western corner of this site. The hole was approximately 1m wide x 4m long x 3m deep. The soils excavated consisted of 300mm of sandy clay top soil, 1 metre of soft sand, 300mm of hard impermeable iron pan followed by insitu sand that was reasonably soft, permeable and easy to excavate.
No sign of any foreign objects, which would cause the unusual radar readings, were found during this work.

Conclusion – The unusual readings found by GPR at this site were due to hard iron pan and were apparently natural

6. **Site Ze, Tank 3500** - Three exploratory holes were excavated on this site. They were as follows:

Hole 1

This hole was excavated at GPS 2597893E-6235964N approximately 100 metres back from the Centennial Drive and 5 metres from the fence next to the Methanex tank farm (Omata 1). The hole was 1.5 metres wide x 4.0 long and 3.0 metres deep.

The soils excavated consisted of 100mm of sandy clay top soil, 1 metre of hard clay, followed by sand which was reasonably soft, permeable and easy to excavate. At the bottom of the hole at 3 metres deep a bed of old native logs were found.

Hole 2

This hole was excavated at GPS 2597898E-6235945N 10 metres south west of the first hole and showed the same results as hole 1.

The soils excavated consisted of 100mm of sandy clay top soil, 1 metre of hard clay, followed by sand which was reasonably soft, permeable and easy to excavate. At the bottom of the hole at 3 metres deep a bed of old native logs were found.

Hole 3.

This hole was excavated at GPS 2597881E-6235976N 30 metres north of the original exploratory hole and although the consistency of the soil was different to the first two holes the results of the investigation was the same as the previous two dug.

7. Conclusion

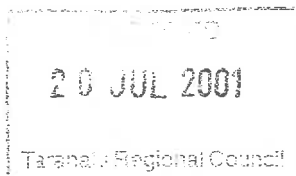
This site showed that the irregular readings were due to a significant quantity of old logs being buried, probably in a pit or depression, then covered some years ago.

8. Both sites were reinstated at the conclusion of the works.

B E Pope
Investigating Officer

Appendix IX
Analytical results

12 July 2001



Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 22 June 2001

Client Reference: 4044, 4046, 4047, 4050, 4051, 4052

AgriQuality Lab. Reference: 01-2575/1,3,4,7,8,9

Sample Type: Sediment

Analysis: **Organochlorine Pesticides**

Method:

The samples were extracted with organic solvent and the extracts analysed by gas chromatography - mass spectrometry. Detection limits are given for target compounds used to validate the analysis. Full details of the methodology are available on request.

Results are reported in milligrams per kilogram (ppm).

Analytical results are calculated on a dry weight basis.

K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental

M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4044, 26A Lawn seeps
AgriQuality Lab. Reference	01-2575/1
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.2
delta-BHC	< 0.2
lindane	< 0.2
aldrin	< 0.1
heptachlor	< 0.2
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.3
endrin	< 0.2
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.2
methoxychlor	< 0.3
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

SAMPLE DETAILS	
Client Reference	4046, Herekawe Street D/S of 26A
AgriQuality Lab. Reference	01-2575/3
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.2
delta-BHC	< 0.2
lindane	< 0.2
aldrin	< 0.1
heptachlor	< 0.2
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.3
endrin	< 0.2
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.2
methoxychlor	< 0.3
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

SAMPLE DETAILS	
Client Reference	4047, Seep D/S 26A
AgriQuality Lab. Reference	01-2575/4
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.2
delta-BHC	< 0.2
lindane	< 0.2
aldrin	< 0.1
heptachlor	< 0.2
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.3
endrin	< 0.2
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.2
methoxychlor	< 0.3
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

SAMPLE DETAILS	
Client Reference	4050, 32 Seeps/Damp area
AgriQuality Lab. Reference	01-2575/7
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.2
delta-BHC	< 0.2
lindane	< 0.2
aldrin	< 0.1
heptachlor	< 0.2
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.3
endrin	< 0.2
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.2
methoxychlor	< 0.3
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

✓ THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY
 CLNZ94\01-2575-1,3,4,7,8,9 OC sed

SAMPLE DETAILS	
Client Reference	4051, 34 Damp point near bank
AgriQuality Lab. Reference	01-2575/8
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.2
beta-BHC	< 0.3
delta-BHC	< 0.2
lindane	< 0.3
aldrin	< 0.1
heptachlor	< 0.3
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 1
endrin	< 0.3
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.5
methoxychlor	< 0.4
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY

CLNZ94\ 01-2575-1,3,4,7,8,9 OC sed

SAMPLE DETAILS	
Client Reference	4052, Herekawe Street D/S of SW outfall
AgriQuality Lab. Reference	01-2575/9
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.2
beta-BHC	< 0.3
delta-BHC	< 0.2
lindane	< 0.3
aldrin	< 0.1
heptachlor	< 0.3
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 1
endrin	< 0.3
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.5
methoxychlor	< 0.4
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

18 July 2001

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 22 June 2001

Client Reference: 4044, 4046, 4047, 4050, 4051, 4052

AgriQuality Lab. Reference: 01-2575/1,3,4,7,8,9

Sample Type: Sediment

Analysis: **Acid Herbicide**

Method:

The samples were isolated by solid phase extraction and the extracts derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology are available on request.

Results are reported in milligrams per kilogram (ppm).

Analytical results are calculated on a dry weight basis.

A handwritten signature in black ink, appearing to read 'K. Lange', with a long horizontal flourish extending to the right.

K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental

A handwritten signature in black ink, appearing to read 'M. D. Valentine', with a long horizontal flourish extending to the right.

M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4044, 26A Lawn seeps
AgriQuality Lab. Reference	01-2575/1
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4046, Herekawe Street D/S of 26A
AgriQuality Lab. Reference	01-2575/3
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4047, Seep D/S 26A
AgriQuality Lab. Reference	01-2575/4
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4050, 32 Seeps/Damp area
AgriQuality Lab. Reference	01-2575/7
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4051, 34 Damp point near bank
AgriQuality Lab. Reference	01-2575/8
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

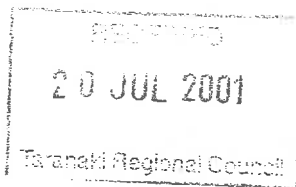
ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4052, Herekawe Street D/S of SW outfall
AgriQuality Lab. Reference	01-2575/9
Date Sampled	21/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

06 July 2001



Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 27 June 2001

Client Reference: 4053 A, 4054 A, 4056 A, 4057 A

AgriQuality Lab. Reference: 01-2634/1,2,4,5

Sample Type: Sediment


Analysis: **Acid Herbicide**

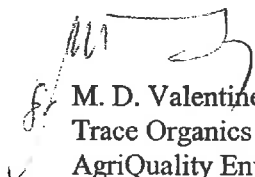
Method:

The samples were isolated by solid phase extraction and the extracts derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology are available on request.

Results are reported in milligrams per kilogram (ppm).

Analytical results are calculated on a dry weight basis.


K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental


M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4053 A, 23C Tahurangi Pl along fence
AgriQuality Lab. Reference	01-2634/1
Date Sampled	26/06/01
Date Extracted	02/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4054 A, 23C Tahurangi Pl under house
AgriQuality Lab. Reference	01-2634/2
Date Sampled	26/06/01
Date Extracted	02/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4056 A, Beach access track west of Herekawe Stream
AgriQuality Lab. Reference	01-2634/4
Date Sampled	26/06/01
Date Extracted	02/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4057 A, Corner Granville and Endeavour Streets
AgriQuality Lab. Reference	01-2634/5
Date Sampled	26/06/01
Date Extracted	02/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

06 July 2001

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 27 June 2001

Client Reference: 4055 A

AgriQuality Lab. Reference: 01-2634/3

Sample Type: Aqueous

Analysis: **Acid Herbicide**

Method:

The sample was isolated by solid phase extraction and the extract derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology and precision are available on request.

Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

A handwritten signature in black ink, appearing to read 'K. J. Lange'.

K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental

A handwritten signature in black ink, appearing to read 'M. D. Valentine'.

M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4055 A, Dow stormwater outlet, Herekawe Stream mouth
AgriQuality Lab Reference	01-2634/3
Date Sampled	26/06/01
Date Extracted	02/07/01
USEPA Recommended Holding Time	7 days

RESULTS	
Acid Herbicide	Level ($\mu\text{g/L}$)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 $\mu\text{g/L}$

12 July 2001

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 27 June 2001

Client Reference: 4056 A, 4057 A

AgriQuality Lab. Reference: 01-2634/4,5

Sample Type: Sediment


Analysis: **Organochlorine Pesticides**

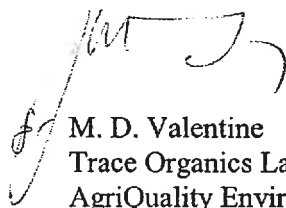
Method:

The samples were extracted with organic solvent and the extracts analysed by gas chromatography - mass spectrometry. Detection limits are given for target compounds used to validate the analysis. Full details of the methodology are available on request.

Results are reported in milligrams per kilogram (ppm).

Analytical results are calculated on a dry weight basis.


K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental


M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4056 A, Beach access track west of Herekawe Stream
AgriQuality Lab. Reference	01-2634/4
Date Sampled	26/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.2
delta-BHC	< 0.2
lindane	< 0.2
aldrin	< 0.1
heptachlor	< 0.2
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.3
endrin	< 0.2
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.2
methoxychlor	< 0.3
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

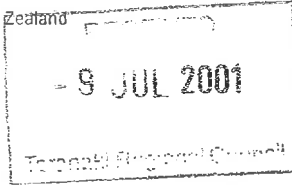
THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY
 CLNZ94\ 01-2634-4,5 OC sed

SAMPLE DETAILS	
Client Reference	4057 A, Corner Granville and Endeavour Streets
AgriQuality Lab. Reference	01-2634/5
Date Sampled	26/06/01
Date Extracted	03/07/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.2
delta-BHC	< 0.2
lindane	< 0.2
aldrin	< 0.1
heptachlor	< 0.2
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.3
endrin	< 0.2
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.2
methoxychlor	< 0.3
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

03 July 2001



Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 12 June 2001

Client Reference: 4022 A

AgriQuality Lab. Reference: 01-2422/1

Sample Type: Aqueous

Analysis: **Acid Herbicide**

Method:

The sample was isolated by solid phase extraction and the extract derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology and precision are available on request.

Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

J. Fry
Trace Organics Laboratory
AgriQuality Environmental

M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4022 A, D/S Ngamotu Domain
AgriQuality Lab Reference	01-2422/1
Date Sampled	11/06/01
Date Extracted	18/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Acid Herbicide	Level (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

04 July 2001

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 12 June 2001

Client Reference: 4022 A

AgriQuality Lab. Reference: 01-2422/1

Sample Type: Aqueous

Analysis: **Organochlorine Pesticides**

Method:

The sample was extracted with organic solvent and the extract analysed by gas chromatography - mass spectrometry. Detection limits are given for target compounds used to validate the analysis. Full details of the methodology and precision are available on request.

Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported
herein have been
performed in accordance
with the laboratory's
scope of accreditation


J. Fry
Trace Organics Laboratory
AgriQuality Environmental


M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4022 A, D/S Ngamotu Domain
AgriQuality Lab. Reference	01-2422/1
Date Sampled	11/06/01
Date Extracted	18/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Organochlorine pesticides	Level (µg/L)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.1
delta-BHC	< 0.1
lindane	< 0.01
aldrin	< 0.01
heptachlor	< 0.01
heptachlor epoxide	< 0.01
procymidone	< 0.2
alpha-chlordane	< 0.01
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.01
pp-DDD	< 0.1
pp-DDT	< 0.2
endrin	< 0.1
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.1
methoxychlor	< 0.2
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

28 June 2001

2 JUL 2001

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 7 June 2001

Client Reference: 4000 A

AgriQuality Lab. Reference: 01-2338/2

Sample Type: Aqueous

Analysis: **Organochlorine Pesticides**

Method:

The samples were extracted with organic solvent and the extracts analysed by gas chromatography - mass spectrometry. Detection limits are given for target compounds used to validate the analysis. Full details of the methodology and precision are available on request.

Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation


J. Fry
Trace Organics Laboratory
AgriQuality Environmental


M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4000 A, Leachate from drain from Marfell Park
AgriQuality Lab. Reference	01-2338/2
Date Sampled	06/06/01
Date Extracted	11/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Organochlorine pesticides	Level (µg/L)
hexachlorobenzene	< 1
alpha-BHC	< 1
beta-BHC	< 1
delta-BHC	< 1
lindane	< 1
aldrin	< 1
heptachlor	< 1
heptachlor epoxide	< 1
procymidone	< 2
alpha-chlordane	< 1
gamma-chlordane	< 1
endosulfan I	< 1
pp-DDE	< 1
dieldrin	< 1
pp-DDD	< 1
pp-DDT	< 2
endrin	< 1
endosulfan II	< 1
endrin aldehyde	< 1
endosulfan sulphate	< 1
endrin ketone	< 1
methoxychlor	< 2
cis permethrin	< 2
trans permethrin	< 2

< = Less than limit of detection

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 7 June 2001

Client Reference: 4000 A

AgriQuality Lab. Reference: 01-2338/2

Sample Type: Aqueous

Analysis: **Acid Herbicide**

Method:

The sample was isolated by solid phase extraction and the extract derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology and precision are available on request.

Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation


J. Fry
Trace Organics Laboratory
AgriQuality Environmental

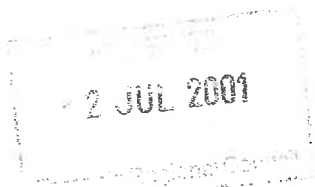

M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4000 A, Leachate from drain from Marfell Park
AgriQuality Lab. Reference	01-2338/2
Date Sampled	06/06/01
Date Extracted	12/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Acid Herbicide	Level ($\mu\text{g/L}$)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	3
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 1 $\mu\text{g/L}$

28 June 2001



Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 8 June 2001

Client Reference: 4018 A

AgriQuality Lab. Reference: 01-2392/9

Sample Type: Aqueous

Analysis: **Organochlorine Pesticides**

Method:

The samples were extracted with organic solvent and the extracts analysed by gas chromatography - mass spectrometry. Detection limits are given for target compounds used to validate the analysis. Full details of the methodology and precision are available on request.

Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported
herein have been
performed in accordance
with the laboratory's
scope of accreditation

J. Fry
Trace Organics Laboratory
AgriQuality Environmental

M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4018 A, Water Seep Roto Street
AgriQuality Lab. Reference	01-2392/9
Date Sampled	07/06/01
Date Extracted	11/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Organochlorine pesticides	Level (µg/L)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.1
delta-BHC	< 0.1
lindane	< 0.01
aldrin	< 0.01
heptachlor	< 0.01
heptachlor epoxide	< 0.01
procymidone	< 0.2
alpha-chlordane	< 0.01
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.01
pp-DDD	< 0.1
pp-DDT	< 0.2
endrin	< 0.1
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.1
methoxychlor	< 0.2
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 8 June 2001

Client Reference: 4018 A

AgriQuality Lab. Reference: 01-2392/9

Sample Type: Aqueous

Analysis: **Acid Herbicide**

Method:

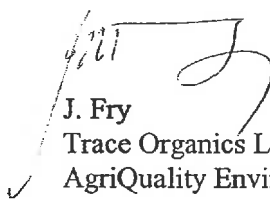
The sample was isolated by solid phase extraction and the extract derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology and precision are available on request.

Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported
herein have been
performed in accordance
with the laboratory's
scope of accreditation


J. Fry
Trace Organics Laboratory
AgriQuality Environmental

M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4018 A, Water Seep Roto Street
AgriQuality Lab. Reference	01-2392/9
Date Sampled	07/06/01
Date Extracted	12/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Acid Herbicide	Level (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

03 July 2001

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 13 June 2001

Client Reference: 4028 A, 4033 A

AgriQuality Lab. Reference: 01-2434/2,7

Sample Type: Aqueous

Analysis: **Acid Herbicide**

Method:


The sample was isolated by solid phase extraction and the extract derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology and precision are available on request.


Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported
herein have been
performed in accordance
with the laboratory's
scope of accreditation


K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental


M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4028 A, Pylon 4 above waterfall
AgriQuality Lab. Reference	01-2434/2
Date Sampled	12/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Acid Herbicide	Level (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	0.2

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

SAMPLE DETAILS	
Client Reference	4033 A, Paritutu Gully old sump
AgriQuality Lab. Reference	01-2434/7
Date Sampled	12/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Acid Herbicide	Level (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	0.4
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 13 June 2001

Client Reference: 4031 A, 4032 A, 4034 A

AgriQuality Lab. Reference: 01-2434/5,6,8

Sample Type: Sediment


Analysis: **Organochlorine Pesticides**

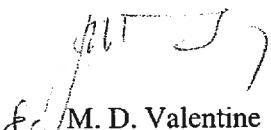
Method:

The samples were extracted with organic solvent and the extracts analysed by gas chromatography - mass spectrometry. Detection limits are given for target compounds used to validate the analysis. Full details of the methodology are available on request.

Results are reported in milligrams per kilogram (ppm).

Analytical results are calculated on a dry weight basis.


K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental


M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4031 A, Pylon 3 trackside sediment
AgriQuality Lab. Reference	01-2434/5
Date Sampled	12/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.1
delta-BHC	< 0.1
lindane	< 0.1
aldrin	< 0.1
heptachlor	< 0.1
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.5
endrin	< 0.1
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.1
methoxychlor	< 0.2
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

SAMPLE DETAILS	
Client Reference	4032 A, Pylon 3 sediment below seep
AgriQuality Lab. Reference	01-2434/6
Date Sampled	12/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.1
delta-BHC	< 0.1
lindane	< 0.1
aldrin	< 0.1
heptachlor	< 0.1
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.5
endrin	< 0.1
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.1
methoxychlor	< 0.2
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

SAMPLE DETAILS	
Client Reference	4034 A, Paritutu Gully sediment below seep
AgriQuality Lab. Reference	01-2434/8
Date Sampled	12/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.1
delta-BHC	< 0.1
lindane	< 0.1
aldrin	< 0.1
heptachlor	< 0.1
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.5
endrin	< 0.1
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.1
methoxychlor	< 0.2
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY

CLNZ94\01-2434-5,6,8 OC sed

Page 4 of 4

04 July 2001

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 13 June 2001

Client Reference: 4028 A, 4033 A

AgriQuality Lab. Reference: 01-2434/2,7

Sample Type: Aqueous

Analysis: **Organochlorine Pesticides**

Method:


The samples were extracted with organic solvent and the extracts analysed by gas chromatography - mass spectrometry. Detection limits are given for target compounds used to validate the analysis. Full details of the methodology and precision are available on request.


Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported
herein have been
performed in accordance
with the laboratory's
scope of accreditation


K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental


M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4028 A, Pylon 4 above waterfall
AgriQuality Lab. Reference	01-2434/2
Date Sampled	12/06/01
Date Extracted	18/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Organochlorine pesticides	Level (µg/L)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.1
delta-BHC	< 0.1
lindane	< 0.01
aldrin	< 0.01
heptachlor	< 0.01
heptachlor epoxide	< 0.01
procymidone	< 0.2
alpha-chlordane	< 0.01
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.01
pp-DDD	< 0.1
pp-DDT	< 0.2
endrin	< 0.1
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.1
methoxychlor	< 0.2
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

SAMPLE DETAILS	
Client Reference	4033 A, Paritutu Gully old sump
AgriQuality Lab Reference	01-2434/7
Date Sampled	12/06/01
Date Extracted	18/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Organochlorine pesticides	Level (µg/L)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.1
delta-BHC	< 0.1
lindane	< 0.01
aldrin	< 0.01
heptachlor	< 0.01
heptachlor epoxide	< 0.01
procymidone	< 0.2
alpha-chlordane	< 0.01
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.01
pp-DDD	< 0.1
pp-DDT	< 0.2
endrin	< 0.1
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.1
methoxychlor	< 0.2
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 13 June 2001

Client Reference: 4031 A, 4032 A, 4034 A

AgriQuality Lab. Reference: 01-2434/5,6,8

Sample Type: Sediment

Analysis: Acid Herbicide

Method:

The sample was isolated by solid phase extraction and the extract derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology are available on request.

Results are reported in milligrams per kilogram (ppm).

Analytical results are calculated on a dry weight basis.

A handwritten signature in black ink, appearing to read 'K. J. Lange'.

K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental

A handwritten signature in black ink, appearing to read 'M. D. Valentine'.

M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4031 A, Pylon 3 trackside sediment
AgriQuality Lab. Reference	01-2434/5
Date Sampled	12/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4032 A, Pylon 3 sediment below seep
AgriQuality Lab. Reference	01-2434/6
Date Sampled	12/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4034 A, Paritutu Gully sediment below seep
AgriQuality Lab. Reference	01-2434/8
Date Sampled	12/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

03 July 2001

12 JUL 2001
Taranaki Regional Council

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 14 June 2001

Client Reference: 4039 A, 4041 A, 4042 A

AgriQuality Lab. Reference: 01-2454/4,6,7

Sample Type: Sediment

Analysis: **Acid Herbicide**

Method:

The samples were isolated by solid phase extraction and the extracts derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology are available on request.

Results are reported in milligrams per kilogram (ppm).

Analytical results are calculated on a dry weight basis.


K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental


M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4039 A, Sediment at pipe discharge, 9m v/s pipe crossing
AgriQuality Lab. Reference	01-2454/4
Date Sampled	13/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4041 A, Sediment at stormwater pipe with flap, discharge point
AgriQuality Lab. Reference	01-2454/6
Date Sampled	13/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

SAMPLE DETAILS	
Client Reference	4042 A, Waiwhakaiho River v/s seep zone
AgriQuality Lab. Reference	01-2454/7
Date Sampled	13/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

05 July 2001

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 14 June 2001

Client Reference: 4039 A, 4041 A, 4042 A

AgriQuality Lab. Reference: 01-2454/4,6,7

Sample Type: Sediment

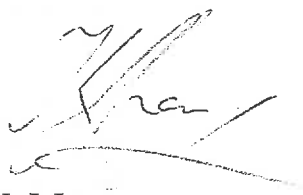
Analysis: **Organochlorine Pesticides**

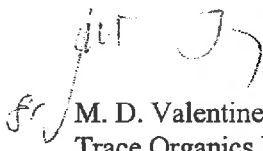
Method:

The samples were extracted with organic solvent and the extracts analysed by gas chromatography - mass spectrometry. Detection limits are given for target compounds used to validate the analysis. Full details of the methodology are available on request.

Results are reported in milligrams per kilogram (ppm).

Analytical results are calculated on a dry weight basis.


K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental


M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4039 A, Sediment at pipe discharge, 9m v/s pipe crossing
AgriQuality Lab. Reference	01-2454/4
Date Sampled	13/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.1
delta-BHC	< 0.1
lindane	< 0.1
aldrin	< 0.1
heptachlor	< 0.1
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.5
endrin	< 0.1
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.1
methoxychlor	< 0.2
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY

CLNZ94\01-2454-4,6,7 OC sed

Page 2 of 4

SAMPLE DETAILS	
Client Reference	4041 A, Sediment at stormwater pipe with flap, discharge point
AgriQuality Lab. Reference	01-2454/6
Date Sampled	13/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.1
delta-BHC	< 0.1
lindane	< 0.1
aldrin	< 0.1
heptachlor	< 0.1
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.5
endrin	< 0.1
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.1
methoxychlor	< 0.2
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY

CLNZ94\ 01-2454-4,6,7 OC sed

SAMPLE DETAILS	
Client Reference	4042 A, Waiwhakaiho River v/s seep zone
AgriQuality Lab. Reference	01-2454/7
Date Sampled	13/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	14 days

RESULTS	
Organochlorine pesticides	Level (mg/kg)
hexachlorobenzene	< 0.1
alpha-BHC	< 0.1
beta-BHC	< 0.1
delta-BHC	< 0.1
lindane	< 0.1
aldrin	< 0.1
heptachlor	< 0.1
heptachlor epoxide	< 0.1
procymidone	< 0.2
alpha-chlordane	< 0.1
gamma-chlordane	< 0.1
endosulfan I	< 0.1
pp-DDE	< 0.1
dieldrin	< 0.1
pp-DDD	< 0.1
pp-DDT	< 0.5
endrin	< 0.1
endosulfan II	< 0.1
endrin aldehyde	< 0.1
endosulfan sulphate	< 0.1
endrin ketone	< 0.1
methoxychlor	< 0.2
cis permethrin	< 0.2
trans permethrin	< 0.2

< = Less than limit of detection

03 July 2001

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 14 June 2001

Client Reference: 4037 A

AgriQuality Lab. Reference: 01-2454/2

Sample Type: Aqueous

Analysis: **Acid Herbicide**

Method:


The sample was isolated by solid phase extraction and the extract derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology and precision are available on request.

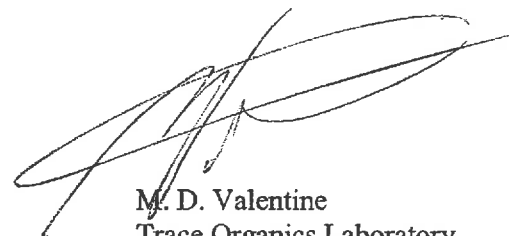
Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported
herein have been
performed in accordance
with the laboratory's
scope of accreditation


K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental


M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4037 A, Groundwater Bewly Rd, GND0548
AgriQuality Lab. Reference	01-2454/2
Date Sampled	13/06/01
Date Extracted	19/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Acid Herbicide	Level ($\mu\text{g/L}$)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 $\mu\text{g/L}$

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 14 June 2001

Client Reference: 4037 A

AgriQuality Lab. Reference: 01-2454/2

Sample Type: Aqueous

Analysis: **Organochlorine Pesticides**

Method:

The sample was extracted with organic solvent and the extract analysed by gas chromatography - mass spectrometry. Detection limits are given for target compounds used to validate the analysis. Full details of the methodology and precision are available on request.

Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

A handwritten signature in black ink, appearing to read 'K. J. Lange'.

K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental

A handwritten signature in black ink, appearing to read 'M. D. Valentine'.

M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

SAMPLE DETAILS	
Client Reference	4037 A, Groundwater Bewly Rd, GND0548
AgriQuality Lab. Reference	01-2454/2
Date Sampled	13/06/01
Date Extracted	18/06/01
USEPA Recommended Holding Time	7 days

RESULTS	
Organochlorine pesticides	Level (µg/L)
hexachlorobenzene	< 1
alpha-BHC	< 1
beta-BHC	< 1
delta-BHC	< 1
lindane	< 1
aldrin	< 1
heptachlor	< 1
heptachlor epoxide	< 1
procymidone	< 2
alpha-chlordane	< 1
gamma-chlordane	< 1
endosulfan I	< 1
pp-DDE	< 1
dieldrin	< 1
pp-DDD	< 1
pp-DDT	< 2
endrin	< 1
endosulfan II	< 1
endrin aldehyde	< 1
endosulfan sulphate	< 1
endrin ketone	< 1
methoxychlor	< 2
cis permethrin	< 2
trans permethrin	< 2

< = Less than limit of detection

AgriQuality New Zealand Limited
Haurangi Aotearoa

Gracefield Road
P.O. Box 31 242
Lower Hutt, New Zealand

Phone: +64 4 570 8800
Facsimile: +64 4 569 4500

02 August 2001

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Fiona Putt

Date Received: 11 May 2001

Client Reference: 011011, 011013, 011014

AgriQuality Lab. Reference: 01-1932/1,3,4

Sample Type: Shellfish


Analysis: Acid Herbicide

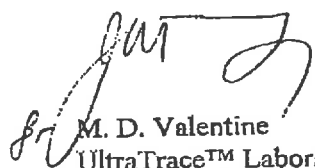
Method:

The sample was isolated by solid phase extraction and the extract derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology are available on request.

Results are reported in milligrams per kilogram (ppm).

Analytical results are for samples as received.


K. J. Lange
UltraTrace™ Laboratory
AgriQuality Environmental


M. D. Valentine
UltraTrace™ Laboratory
AgriQuality Environmental

02 August 2001

SAMPLE DETAILS	
Client Reference	011011, Kawaroa Reef, 08/05/01
AgriQuality Lab. Reference	01-1932/1

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

02 August 2001

SAMPLE DETAILS	
Client Reference	011013, Waireka 'cavern', 08/05/01
AgriQuality Lab Reference	01-1932/3

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

02 August 2001

SAMPLE DETAILS	
Client Reference	011014, Waireka 'control', 08/05/01
AgrQuality Lab Reference	01-1932/4

RESULTS	
Acid Herbicide	Level (mg/kg)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 mg/kg

Log

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 13 July 2001

Client Reference: 4062-4069

AgriQuality Lab. Reference: 01-2885/1-8

Sample Type: Aqueous

Analysis: Acid Herbicide

Method:

The sample was isolated by solid phase extraction and the extract derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology and precision are available on request.

Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.

HAND DELIVERED

27/7/01

ORIGINAL GIVEN TO

Gary

COPY IN MAIL DATED

30/7/01

Key

(Signed)



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

K. J. Lange
Trace Organics Laboratory
AgriQuality Environmental

M. D. Valentine
Trace Organics Laboratory
AgriQuality Environmental

23 July 2001

SAMPLE DETAILS	
Location	4062, DAS Bore 21
Sample ID	01-2885/1
Date Sampled	12/07/01
Date of Analysis	19/07/01
Recommended Holding Time	7 days

RESULTS	
Anti-Herbicide	Concn (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

SAMPLE DETAILS	
ANALYST	4063, DAS Bore 43
APPROVAL/ANALYST REFERENCE	01-2885/2
DATE SAMPLED	12/07/01
DATE RECEIVED	19/07/01
USE PAH Recommended Holding Time	7 days

RESULTS	
Acid Herbicide	µg/L (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	0.1

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

23 July 2001

SAMPLE DETAILS	
Client Reference	4064, DAS Bore 49A
Application/Tag Reference	01-2885/3
Date Sampled	12/07/01
Date Expired	19/07/01
STPS Recommended Holding Time	7 days

RESULTS	
Field Herbicide	Level (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	0.1
bentazone	ND
fenoprop	0.2
picloram	0.6

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L.

23 July 2001

SAMPLE DETAILS	
Client Reference	4065, DAS Bore 1
Well Quality Label Reference	01-2885/4
Date Sampled	12/07/01
Date of Analysis	19/07/01
ECMBS Recommended Holding Time	7 days

RESULTS	
Acid Herbicide	Result (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

N

23 July 2001

SAMPLE DETAILS	
Client Reference	4066, DAS Bore 3
AgriQuality Lab Reference	01-2885/5
Date Sampled	12/07/01
Batch Number	19/07/01
US EPA Recommended Holding Time	7 days

RESULTS	
Weeds Herbicide	Level (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

SAMPLE DETAILS	
Client Reference	4067, DAS Bore 4
Client Identification Number	01-2885/6
Date Sampled	12/07/01
Date Received	19/07/01
US EPA Recommended Holding Time	7 days

RESULTS	
Compound	Level (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	ND

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

23 July 2001

SAMPLE DETAILS	
Client Reference	4068, DAS Bore 6
AgriQuality Reference	01-2885/7
Date Sampled	12/07/01
Date Reported	19/07/01
USEPA Recommended Holding Time	7 days

RESULTS	
Acid Herbicide	Level (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
bentazone	ND
fenoprop	ND
picloram	16

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

23 July 2001

SAMPLE DETAILS	
Client Reference	4069, DAS Bore 46A
Lab Reference	01-2885/8
Sample	12/07/01
Date of Analysis	19/07/01
US EPA Recommended Holding Time	7 days

RESULTS	
As Herbicide	Concentration
mecoprop	0.4
MCPA	1.2
dichlorprop	ND
2,4-D	1.3
triclopyr	ND
MCPB	0.1
2,4,5-T	0.6
2,4-DB	0.6
bentazone	ND
fenoprop	0.4
picloram	11

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY

CLNZ94\ 01-2885 ah aq

Page 2 of 2

AgriQuality New Zealand Limited
Huarangi Aotearoa

Gracefield Road
P.O. Box 31 242
Lower Hutt, New Zealand

Phone: +64 4 570 8800
Facsimile: +64 4 569 4500

08 August 2001

Certificate of Analysis



Client: Taranaki Regional Council
Private Bag 713
Stratford

Attention: Gary Bedford

Date Received: 13 July 2001

Client Reference: 4068

AgriQuality Lab. Reference: 01-2885/7

Sample Type: Aqueous

Analysis: Acid Herbicide

NO DELIVERED
10/8/01
Gary
13/8/01
Key (Signature)

Method:

The sample was isolated by solid phase extraction and the extract derivatised with diazomethane. Measurement was performed using gas chromatography - mass spectrometry. Full details of the methodology and precision are available on request.

Results are reported in micrograms per litre (ppb).

Analytical results are for samples as received.



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

[Signature]
K. J. Lange
UltraTrace™ Laboratory
AgriQuality Environmental

[Signature]
M. D. Valentine
UltraTrace™ Laboratory
AgriQuality Environmental

08 August 2001

SAMPLE DETAILS	
Client Reference	4068, DAS Bore 6
AgriQuality Lab Reference	01-2885/7, repeat extraction
Date Sampled	12/07/01
Date Extracted	01/08/01
USEPA Recommended Holding Time	7 days

RESULTS	
Acid Herbicide	Conc (µg/L)
mecoprop	ND
MCPA	ND
dichlorprop	ND
2,4-D	ND
triclopyr	ND
MCPB	ND
2,4,5-T	ND
2,4-DB	ND
benflazone	ND
fenoprop	ND
picloram	9.1

ND The letters ND mean "not detected" above the detection limit of 0.1 µg/L

AgriQuality New Zealand Limited
Huarangi Aotearoa

Gracefield Research Centre
Gracefield Road
PO Box 30 547
Lower Hutt
New Zealand

AgriQuality Environmental
Phone: 64 4 670 8822
Fax: 64 4 569 4500

Email <allwoodj@agriquality.co.nz>

Facsimile



To: Gary Bedford

Fax: 06 765 5097

Company: Taranaki Regional Council

Date: June 15, 2001

From: Jacinda Allwood

Pages (including this page): 3

Re: Sample for Acid Herbicide analysis and 2378-TCDD analysis (01-1545).

This message is intended for the person or organisation named above. It contains confidential and perhaps legally privileged information. If you have received it in error, please notify the sender and destroy this document. If you are not the intended recipient, you are notified that any use, distribution or reproduction is prohibited.

Dear Gary,

Please find following the analytical report for the 2378-TCDD analysis your aqueous sample received by AgriQuality Environmental on the 18th April 2001. The sample was analysed for 2378-TCDD and Acid Herbicides (AHs), which you were faxed the results on the 30th May.

The top copies of the two certificates and the invoice relating to this work will follow shortly by post.

If you have any queries please do not hesitate to contact me.

Kind regards

Jacinda Allwood
Team Leader
UltraTrace™ Laboratory
AgriQuality Environmental

HAND DELIVERED	15, 6, 01
ORIGINAL GIVEN TO	Gary
COPIES IN MAIL DATED	18, 6, 01
	<i>Kay</i> (Signed)

15 Jun 2001

Certificate of Analysis

Client: Taranaki Regional Council
Private Bag 713
Stratford
New Zealand



Attention: Gary Bedford
Date Received: 18 April 2001
Laboratory Reference: 01-1545
Sample Type: Aqueous
Analysis: 2378 Tetrachlorodibenzo-*p*-dioxin (TCDD)
Method: Based on USEPA Method 1613 (Isotope Dilution)

The sample was spiked with isotopically labelled surrogate standards and extracted with organic solvent. The extract was purified by chemical treatment and solid phase chromatographic techniques. Measurement was performed using high resolution gas chromatography and high resolution electron impact mass spectrometry.

Results are reported in picograms per litre (pg/L), equivalent to ppq, on an as received basis to two significant figures. Results have been corrected for recoveries.

A handwritten signature in black ink, appearing to read 'S V Leathem'.

S V Leathem
UltraTrace™ Laboratory
AgriQuality Environmental

A handwritten signature in black ink, appearing to read 'M L Mackey'.

M L Mackey
UltraTrace™ Laboratory
AgriQuality Environmental



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY

15 June 2001

Results

Laboratory Reference	Sample Identification	Sample Type	TCDD pg/L	¹³ C ₁₂ RE %
01-1545/1	010904, Wairaka Point Rock Pool	Aqueous	< 8	75

† = Results are reported on an as received basis.

Abbreviations:

CDD = chlorodibenzo-*p*-dioxin

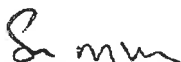
T = tetra

¹³C₁₂ RE = recovery of ¹³C₁₂ surrogate standard

pg/L = picograms per litre (equivalent to ppq)

ppq = parts per quadrillion

< = less than limit of detection (LOD)


01-1545 tcdd

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Page 2 of 2

AgriQuality New Zealand Limited
Huarangi Aotearoa

Gracefield Research Centre
Gracefield Road
PO Box 30 647
Lower Hutt
New Zealand

AgriQuality Environmental
Phone: 64 4 570 8810
Fax: 64 4 569 4500

Email: <mackeym@agriquality.co.nz>

Facsimile



To: Gary Bedford

Fax: 06 765 5097

Company: Taranaki Regional Council

Date: August 15, 2001

From: Moana Mackey

Pages (including this page): 3

This message is intended for the person or organisation named above. It contains confidential and perhaps legally privileged information. If you have received it in error, please notify the sender and destroy this document. If you are not the intended recipient, you are notified that any use, distribution or reproduction is prohibited.

Dear Gary,

Please find following the results for your soil sample, received by AgriQuality on the 14th of June 2001, and analysed for 2378-TCDD.

Results are reported as picograms per gram (pg/g), equivalent to ppt, on an as received basis.

You should receive the top copy of the analytical certificate shortly by post.

If you have any queries please do not hesitate to contact me.

Kind regards

Moana Mackey
UltraTrace™ Laboratory
AgriQuality Environmental

16.8.01
Gary
16.8.01

Kay

Certificate of Analysis

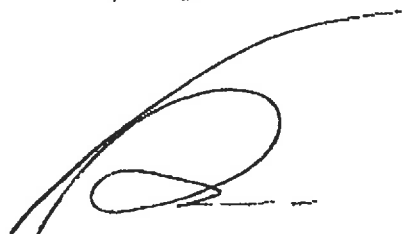
Client: Taranaki Regional Council
Private Bag 713
Stratford
New Zealand

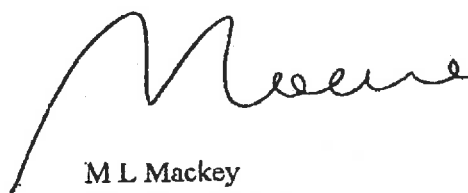


Attention: Gary Bedford
Date Received: 14 June 2001
Laboratory Reference: 01-2454
Sample Type: Soil
Analysis: 2378 Tetrachlorodibenzo-*p*-dioxin (TCDD)
Method: Based on USEPA Method 1613A (Isotope Dilution)

The sample was spiked with isotopically labelled surrogate standards and extracted with organic solvent. The extract was purified by chemical treatment and solid phase chromatographic techniques. Measurement was performed using high resolution gas chromatography and high resolution electron impact mass spectrometry.

Results are reported in picograms per gram (pg/g), equivalent to ppt to two significant figures, on a dry weight basis. Results have been corrected for recoveries.


S V Leathem
UltraTrace™ Laboratory
AgriQuality Environmental


M L Mackey
UltraTrace™ Laboratory
AgriQuality Environmental



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Results

01-2454/8	4043 - Belt Road Soil 2	Soil	< 9	98
-----------	-------------------------	------	-----	----

† = Results are reported on a dry weight basis.

Abbreviations:

CDD = chlorodibenzo-*p*-dioxin

T = tetra

¹³C₁₂ RE = recovery of ¹³C₁₂ surrogate standard

pg/g = picograms per gram (equivalent to ppt)

ppt = parts per trillion

< = less than limit of detection (LOD)

Sumner
01-2454 tedd

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AgriQuality New Zealand Limited
Huarangi Aotearoa

Gracefield Research Centre
Gracefield Road
PO Box 30 547
Lower Hutt
New Zealand

AgriQuality Environmental
Phone: 64 4 870 8810
Fax: 64 4 589 4500

Email: <mackeym@agriquality.co.nz>

Facsimile



To: John Williams

Fax: 06 765 5097

Company: Taranaki Regional Council

Date: August 15, 2001

From: Moana Mackey

Pages (including this page): 3

This message is intended for the person or organisation named above. It contains confidential and perhaps legally privileged information. If you have received it in error, please notify the sender and destroy this document. If you are not the intended recipient, you are notified that any use, distribution or reproduction is prohibited.

Dear Gary,

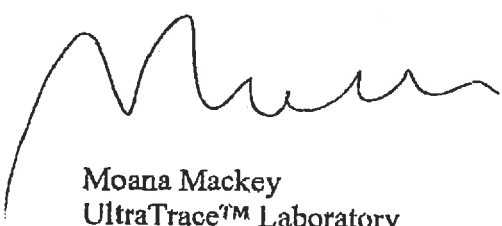
Please find following the results for your eight aqueous samples, received by AgriQuality on the 13th of July 2001, and analysed for 2378-TCDD.

Results are reported as picograms per litre (pg/L), equivalent to ppq, on an as received basis.

You should receive the top copy of the analytical certificate shortly by post.

If you have any queries please do not hesitate to contact me.

Kind regards


Moana Mackey
UltraTrace™ Laboratory
AgriQuality Environmental

HAND DELIVERED

15/8/01
John W
16/8/01



15 August 2001

Certificate of Analysis


Client: Taranaki Regional Council
Private Bag 713
Stratford
New Zealand

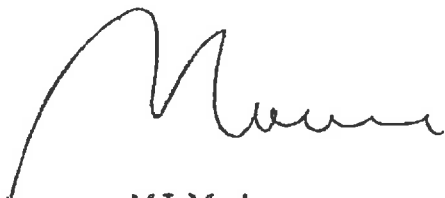


Attention: John Williams
Date Received: 13 July 2001
Laboratory Reference: 01-2885
Sample Type: Aqueous
Analysis: 2378 Tetrachlorodibenzo-*p*-dioxin (TCDD)
Method: Based on USEPA Method 1613 (Isotope Dilution)

The samples were spiked with isotopically labelled surrogate standards and extracted with organic solvent. The extracts were purified by chemical treatment and solid phase chromatographic techniques. Measurement was performed using high resolution gas chromatography and high resolution electron impact mass spectrometry.

Results are reported in picograms per litre (pg/L), equivalent to ppq to two significant figures, on as received basis. Results have been corrected for recoveries.


S V Leathem
UltraTrace™ Laboratory
AgriQuality Environmental


M L Mackey
UltraTrace™ Laboratory
AgriQuality Environmental



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

01-2885 todd

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Page 1 of 2

Results

01-2885/1	4062-DAS Bore 21	Aqueous	< 3	87
01-2885/2	4063-DAS Bore 43	Aqueous	< 3	76
01-2885/3	4064-DAS Bore 49A	Aqueous	< 20	58
01-2885/4	4065-DAS Bore 1	Aqueous	< 9	38
01-2885/5	4066-DAS Bore 3	Aqueous	< 4	89
01-2885/6	4067-DAS Bore 4	Aqueous	< 2	98
01-2885/7	4068-DAS Bore 6	Aqueous	< 2	95
01-2885/8	4069-DAS Bore 46A	Aqueous	< 10	42

† = Results are reported on an as received basis.

Abbreviations:

CDD = chlorodibenzo-*p*-dioxin
 T = tetra
¹³C₁₂ RE = recovery of ¹³C₁₂ surrogate standard

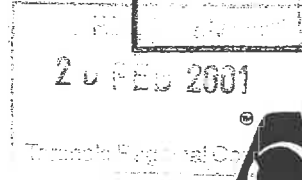
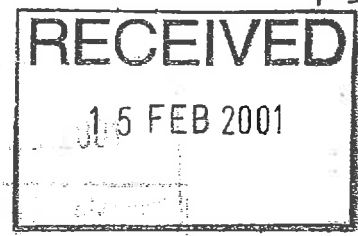
pg/L = picograms per litre (equivalent to ppq)
 ppq = parts per quadrillion
 < = less than limit of detection (LOD)

C. m.
 01-2885 told

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY

Page 2 of 2

Colson RD. Landfill P3/19/3



14 February 2001

Client Ref: 16288B
AgriQuality Ref: 01-0124

New Plymouth District Council
Works and Services Department
Private Bag 2025
New Plymouth

Attention: Graham Morris

Dear Graham

Please find enclosed the top copy of the analytical certificate for your aqueous sample, received by AgriQuality Environmental on the 12th of January 2001, and analysed for polychlorinated dibenzo-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs).

Results are reported as picograms per litre (pg/L), equivalent to ppq, on an as received basis. The total toxic equivalence (I-TEQ) was calculated using international toxic equivalency factors (I-TEFs).

Also enclosed for your attention is the invoice for this work.

If you have any queries or require any additional information, please do not hesitate to contact us.

Kind regards

Moana Mackey
UltraTrace™ Laboratory
AgriQuality Environmental

Certificate of Analysis



Client: New Plymouth District Council
Works and Services Department
Private Bag 2025
NEW PLYMOUTH 4620

Attention: Graham Morris

Date Received: 12 January 2001

Laboratory Reference: 01-0124

Sample Type: Aqueous

Analysis: Polychlorinated dibenzo-*p*-dioxins (PCDDs)
Polychlorinated dibenzofurans (PCDFs)


Method: Based on USEPA Method 1613 (Isotope Dilution)

The samples were spiked with isotopically labelled surrogate standards and extracted with organic solvent. The extracts were purified by chemical treatment and solid phase chromatographic techniques. Measurement was performed using high resolution gas chromatography with high resolution electron impact mass spectrometry.

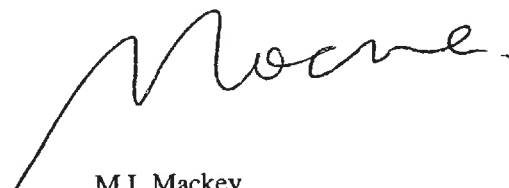
Results are reported in picograms per litre (pg/L), equivalent to ppq, on an as received basis to two significant figures. Results have been corrected for recoveries. The sum of PCDDs and PCDFs is calculated and reported both excluding limit of detection (LOD) values and including half the LOD values to three significant figures.

The total toxic equivalence (I-TEQ) was calculated for each sample using international toxic equivalency factors (I-TEFs). For non-detected congeners, half the value of the level is used in the I-TEQ calculation. The total I-TEQ level is reported both excluding LOD values and including half the LOD values to three significant figures.

IANZ endorsement applies only to the application of an approved analytical method for the determination of PCDDs and PCDFs in these samples.



S V Leathem
UltraTrace™ Laboratory
AgriQuality Environmental



M L Mackey
UltraTrace™ Laboratory
AgriQuality Environmental



All tests reported
herein have been
performed in accordance
with the laboratory's
scope of accreditation

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY

Sample Details:

Sample Identification	Laboratory Reference	Sample Type
1, Colson Road Landfill Leachate	01-0124/1	Aqueous
2, Cook Street Landfill Leachate	01-0124/2	Aqueous

Abbreviations:

CDD = chlorodibenzo-*p*-dioxin
CDF = chlorodibenzofuran
T = tetra
Pe = penta
Hx = hexa
Hp = hepta
O = octa

I-TEF = International toxic equivalency factor
I-TEQ = International toxic equivalence
¹³C₁₂ RE = recovery of ¹³C₁₂ surrogate standard
pg/L = picograms per litre (equivalent to ppq)
ppq = parts per quadrillion
< = less than limit of detection (LOD)

Results

Laboratory Reference:


01-0124/1

Sample Identification:

1, Colson Road Landfill Leachate

PCDD/PCDF Congener	Level [†] pg/L	I-TEF	I-TEQ pg/L	¹³ C ₁₂ RE %
2378 TCDF	< 2	0.1	0.1	75
Non 2378 TCDF	< 6	0	0	
2378 TCDD	< 2	1	1	77
Non 2378 TCDD	< 4	0	0	
12378 PeCDF	< 1	0.05	0.025	75
23478 PeCDF	< 1	0.5	0.25	72
Non 2378 PeCDF	< 2	0	0	
12378 PeCDD	< 3	0.5	0.75	68
Non 2378 PeCDD	< 3	0	0	
123478 HxCDF	< 1	0.1	0.05	69
123678 HxCDF	< 1	0.1	0.05	70
234678 HxCDF	< 1	0.1	0.05	81
123789 HxCDF	< 1	0.1	0.05	78
Non 2378 HxCDF	< 1	0	0	
123478 HxCDD	< 2	0.1	0.1	90
123678 HxCDD	< 2	0.1	0.1	85
123789 HxCDD	< 2	0.1	0.1	
Non 2378 HxCDD	< 2	0	0	
1234678 HpCDF	< 3	0.01	0.015	61
1234789 HpCDF	< 1	0.01	0.005	81
Non 2378 HpCDF	< 4	0	0	
1234678 HpCDD	< 6	0.01	0.03	72
Non 2378 HpCDD	< 10	0	0	
OCDF	< 5	0.001	0.0025	
OCDD	< 7	0.001	0.0035	85
Sum of PCDD and PCDF congeners:				
	Excluding LOD values	0	pg/L	
	Including half LOD values	36.5	pg/L	
Total I-TEQ:				
	Excluding LOD values	0	pg/L	
	Including half LOD values	2.68	pg/L	

† = Results are reported on an as received basis.


01-0124 dx

THIS REPORT MUST ONLY BE REPRODUCED IN ITS ENTIRETY

Results

Laboratory Reference: 01-0124/2

Sample Identification: 2, Cook Street Landfill Leachate

PCDD/PCDF Congener	Level [†] pg/L	I-TEF	I-TEQ pg/L	¹³ C ₁₂ RE %
2378 TCDF	< 0.9	0.1	0.045	76
Non 2378 TCDF	< 4	0	0	
2378 TCDD	< 2	1	1	87
Non 2378 TCDD	9.3	0	0	
12378 PeCDF	< 0.9	0.05	0.0225	88
23478 PeCDF	< 1	0.5	0.25	82
Non 2378 PeCDF	< 1	0	0	
12378 PeCDD	< 2	0.5	0.5	85
Non 2378 PeCDD	< 2	0	0	
123478 HxCDF	< 1	0.1	0.05	89
123678 HxCDF	< 1	0.1	0.05	87
234678 HxCDF	< 1	0.1	0.05	93
123789 HxCDF	< 1	0.1	0.05	91
Non 2378 HxCDF	< 1	0	0	
123478 HxCDD	< 2	0.1	0.1	106
123678 HxCDD	< 2	0.1	0.1	95
123789 HxCDD	< 2	0.1	0.1	
Non 2378 HxCDD	< 2	0	0	
1234678 HpCDF	< 2	0.01	0.01	68
1234789 HpCDF	< 1	0.01	0.005	74
Non 2378 HpCDF	< 2	0	0	
1234678 HpCDD	< 4	0.01	0.02	73
Non 2378 HpCDD	< 4	0	0	
OCDF	< 4	0.001	0.002	
OCDD	< 20	0.001	0.01	73
Sum of PCDD and PCDF congeners:	Excluding LOD values	9.30	pg/L	
	Including half LOD values	41.2	pg/L	
Total I-TEQ:	Excluding LOD values	0	pg/L	
	Including half LOD values	2.36	pg/L	

† = Results are reported on an as received basis.