

**Investigation of alleged
agrchemical waste disposal
sites in New Plymouth**

Technical Report 2001-42

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Executive summary

This report represents the completion of Stage Two of the Council's investigations into allegations of the existence of dump sites arising from the inappropriate disposal of agrichemical waste from the Ivon Watkins Dow (now Dow AgroSciences Limited) plant on Paritutu Road, New Plymouth. The disposal of such wastes, contaminated in particular with dioxin as a byproduct of the manufacture of herbicides 2,4,5-T and 2,4-D was alleged to have occurred between 1960 and 1980.

Stage One of the Council's investigations was the establishment of the possible locations of such sites. The Council conducted some 80 interviews with interested people who believed they had information as to the location of such sites. The co-operation Council received from the public and interested parties, particularly the Dioxin Investigation Network and the Dioxin Investigation Action Group, was excellent. On 2 May 2001, Council considered the Stage One report and resolved on the basis of that report, to 'commence Stage Two investigations and sampling with urgency'. The report identified 36 sites for further investigation and sampling. The process by which the sites were identified was robust and open such that no party since the release of the Stage One report has queried or questioned the list of sites.

The purpose of Council in undertaking this investigation and the aims of Stage Two are most important. The allegations of inappropriate disposal of dioxin contaminated wastes were made most forcefully and publicly with intense media interest and speculation. The allegations were not simply of soil contamination but of substantial dump sites containing drums of toxic waste material. These allegations gave rise to considerable community disquiet and deserved immediate attention. The Council recognised its responsibilities under the Resource Management Act 1991 for the disposal of contaminants to land and water even if historical. The Council had previously in 1993/1994 investigated similar allegations of inappropriate disposal of dieldrin and aldrin pesticides in the 1960s and 1970s.

The purpose of Council's action in Stage Two of this investigation was firstly to ascertain whether there was any environmental risk arising from any of the identified alleged dump sites and secondly to ascertain whether any inappropriate dumping or disposal had occurred. If the investigation identified any such dumps with associated contamination and environmental risk, then appropriate action to clean up and remediate these sites would be considered as Stage Three of the investigation.

The sites identified for further investigation in Stage Two fell readily into four groupings. The first grouping covered eleven sites currently or historically held by IWD. All of these sites were known to and had been previously investigated by the Council. Five of the sites were the known dump sites rehabilitated in the 1980s.

The second grouping was of six sites where alleged historic surface contamination from stormwater from the IWD plant had occurred. The allegations associated with these sites did not involve dumping or burial of contaminated waste.

The third grouping of seven sites were known municipal landfills and sewage discharge outfalls operating during the period 1960 to 1980. With each of these sites there is no direct link to IWD. If disposal of contaminated wastes occurred it was in all probability

in accordance with the standards of the time and undertaken by a range of parties ie, contractors, councils and the Company.

The fourth grouping of twelve sites centres on alleged substantial dump sites and alleged contaminated seepages. This grouping was of sites generally not known or previously investigated by the Council and was identified in the course of the Stage One interviews.

Details of the Stage Two investigations are set out in the report and associated appendices. The sampling and procedural protocols developed prior to the field work commencing were reviewed by DIN/DIAG, Ministry for the Environment and an independent consultant. The range of methods included detailed site inspections, analysis of aerial photographs and other historical records, probing with augers and the use of an excavator on two sites, the use of ground penetrating radar and sampling of soils, sediments, surface and groundwaters, leachate and marine biota. The particular methods used at each site varied as to the nature of the allegation, for example ground penetrating radar was not used on sites where the issue was potential contamination from stormwater runoff. Analysis of the samples was undertaken by AgriQuality NZ Ltd.

The methods to be used and samples taken were discussed with DIN/DIAG representatives before field work commenced and DIN/DIAG representatives accompanied Council staff and contractors in the field. The co-operation of all parties, DIN/DIAG, and particularly the owners and occupiers of the alleged sites was very much appreciated.

While this report contains the detailed results, summarising in terms of the four groupings of sites is valuable.

With respect to the first grouping of eleven sites on land currently or historically held by IWD the Council found no evidence of environmental risk arising from any of the sites. The investigations showed that the five known dump sites cleaned up in the 1980s harboured no further buried material and were effectively rehabilitated. The results for the two sites where IWD previously manufactured and stored herbicides gave no cause for concern. The four sites on the current Dow AgroSciences site on Paritutu Road showed some minor contamination of groundwater (already known) but no evidence of the alleged significant dumpsites or burial of waste. The known contamination presents no environmental risk.

The second grouping of six sites potentially contaminated by stormwater runoff from the IWD site included four residential sections. All were investigated and sampled with particular focus on the soil and sediment. Council is pleased to advise these property owners that the results indicate no contamination of the soil and hence no environmental risk.

The third grouping of seven sites consisted of the known landfills and outfalls operating at the time (1960s-1980s). Extensive sampling of sediment, surface and groundwater emanating from current and closed landfills did not indicate any environmental risk. As noted, if disposal of agricultural wastes did occur at these locations, it was properly authorised in respect of the standards of the time. These sites will continue to be monitored as part of the Council's existing monitoring of closed and current landfills. With respect to the outfall sites, the results of the sampling of the adjacent marine biota indicate dioxin levels in accord with background levels elsewhere in New Zealand as measured by the Ministry for the Environment.

With respect to the results of the investigation of the fourth grouping of twelve sites consisting of alleged dump sites (9) and seepages (3), none of the seepages provided any evidence of inappropriate disposal of agrichemical waste or any environmental risk.

Much attention will naturally focus on the previously unknown alleged dump/drum disposal sites identified through the Stage One process. All these sites were investigated, at several, at DIN/DIAG's request, particular samples and analysis were undertaken. At two of the sites excavation was undertaken to investigate and confirm analysis provided by the ground penetrating radar. In no case was any evidence found of inappropriate disposal of agrichemical wastes contained in drums or otherwise. The sampling undertaken further confirmed no environmental risk arising from any of the sites.

In conclusion the results of the Council's Stage Two investigation indicate:

- At the five sites where disposal of agrichemical wastes is known to have occurred in the 1960s to 1980s the clean up and rehabilitation was found to be effective with no evidence of any additional unknown waste.
- There is no evidence of any disposal of agrichemical wastes at any of the other 31 sites investigated.
- There is no evidence of environmental risk at any site, or in the marine environment in the vicinity of those sites that were on the coast.

The Council at this point has no evidence that any further action is required at any of the sites investigated. Council would like to acknowledge the input and assistance from members of DIN and DIAG and the residents groups. The co-operation of site owners and occupiers was also appreciated.

1. Introduction

This report has been prepared by the Taranaki Regional Council to describe the investigations conducted at a number of sites during the 2001 calendar year, arising from allegations that agrichemical wastes from Ivon Watkins Dow (IWD) were dumped at a number of sites around the New Plymouth area, in particular the Spotswood/ Ngamotu suburb, from the 1960's to the 1980's. The report describes the nature of investigations carried out at each site, and the findings of those investigations.

In the second half of 2000, concerns about a range of historical dioxin contamination issues began to be expressed by and on behalf of some residents in the area surrounding the site currently occupied by Dow AgroSciences.

The concerns culminated in a public meeting being held by New Plymouth District Council on 14 February 2001. At that meeting the Taranaki Regional Council's responsibilities in the matter were identified as:

- investigating alleged disposal of dioxin contaminated wastes; and
- air discharge monitoring since 1991.

The Council has reported the results and findings of its air quality monitoring annually. Summaries of the air quality information were also presented at meetings of the Consents and Regulatory Committee of the Council on 14 February and 21 March, specifically to address the concerns being raised publicly. At the same meetings, the Council confirmed its intention that a full investigation would be undertaken by the Taranaki Regional Council into the alleged historical disposal sites and that the findings would be reported publicly. The investigation was to be completed in three stages as follows:

- Stage One - identification of the alleged historical dump sites and confirmation of inspection and sampling methods;
- Stage Two - undertaking inspection and sampling, reporting of results; and
- Stage Three - recommended response actions.

This report presents the findings of Stage Two of the investigation, in fulfilment of the Council's commitment.

Although the Company is referred to as IWD, it should be noted this was the name of the owner of the agrichemical plant for only part of its life. Originally the Company was known as Ivon Watkins Limited and then Ivon Watkins Dow Limited, and from 1990 to 1998 it was known as DowElanco (NZ) Ltd. It is only since 1998 that the Company has been known as Dow AgroSciences (NZ) Ltd. However, for simplicity the Company is referred to as IWD throughout this report, its name during the period of interest.

2. Background

2.1 Statutory requirements

Following the inception of the Taranaki Regional Council in 1989 and the coming into force of the Resource Management Act in 1991, the Council became responsible for regulating discharges to land, water, and air.

Prior to this time the Council's predecessor, the Taranaki Catchment Commission, was responsible for regulating discharges to water under the Water and Soil Conservation Act, 1967. The Taranaki Catchment Commission had no responsibility for discharges to land or to air. The control of the use of land was essentially a town and country planning matter for the respective city, county, borough or district councils, and discharges to air a matter for the Department of Health.

2.2 IWD Paritutu Road site

IWD have occupied the site on Paritutu Road, in Spotswood/Ngamotu, since 1960. (Both names for the suburb tend to be used interchangeably). This site was used for the manufacture of a variety of agrichemicals. Of particular note is that the manufacture of the herbicide 2,4,5-T was discontinued in 1988 and manufacture of 2,4-D was discontinued in 1997. Manufacture of all agrichemicals at the plant was discontinued in 1998. Currently only blending and packaging of agrichemicals takes place at the site.

In 1993 IWD conducted a comprehensive assessment of their Paritutu site. This investigation found two locations where soil and groundwater had been contaminated through operations on site. The nature of the contamination was determined to be leakage during product storage and not as the result of deliberate disposal of wastes.

A comprehensive site investigation and monitoring programme has been in place since the discovery of these two contaminated areas at the Paritutu Road site. IWD have kept the Council fully informed of the results and methodology used for these site investigations. The status of this work is publicly reported via the Council's annual compliance monitoring reports for the site.

The results of the study have confirmed that no detectable concentrations of any contaminants have or are likely to migrate from these areas. The levels of detection used for the analyses are far below guideline values for environmental concern. Council staff have in addition continued to survey the Back Beach foreshore in the vicinity of the plant as a precaution since 1994, and have found no evidence of any discharge of agrichemical residues.

2.3 IWD Buller Street site

IWD occupied a site at 14 to 24 Buller Street, New Plymouth as their manufacturing plant from about 1941 until 1959/60 when the Company moved to its current site on Paritutu Road.

The Buller Street site was investigated by the Taranaki Regional Council in October 1995 as a potentially contaminated site. Investigations included water and soil samples from

and around the site and from a stormwater discharge from below Woolcombe Terrace. Extremely low concentrations of DDT were found in site soils, far below any soil quality guidelines for environmental concern as a contaminated site.

IWD advised the Council in 1997 that, to the best of their records, there was no disposal of wastes at this site as Company practice at that time was to use municipal landfills. Based on this information, and the results of the Council's previous investigations at this site, the Council did not conduct further work on this property within the context of the study being reported.

2.4 Waireka landfill site

In 1975 and 1976 IWD disposed of various drums and bags of wastes by burial at two locations on their Waireka experimental farm. This disposal operation was undertaken with the approval of the Health Department as the relevant authority at the time. One of the locations identified in Stage One of this investigation by residents are these burial sites.

Discharges from the Waireka burial sites on to the beach near the Waireka Stream mouth were the subject of investigation in late 1982, after discharges of leachate-contaminated groundwater were noticed on the foreshore. IWD sought and were granted a water right regulating the management of the discharge, and subsequently installed a leachate collection and treatment system to intercept, treat and dispose of this discharge.

In 1986 IWD removed the entire contents of the two burial sites, together with associated contaminated soil, into a purpose built secure containment facility also located on the Waireka experimental farm. This secure facility, referred to as the Waireka landfill, still exists at the Waireka site inland from the two original burial sites.

The Waireka burial sites and associated discharges have held consents and been monitored since 1983, originally by the Taranaki Catchment Commission, and currently by the Council. The secure landfill is also licensed as a land use activity, previously by the Taranaki County Council and now by the New Plymouth District Council.

The level of contaminants now present in groundwater at the burial sites is now so low that the collection of leachate has been discontinued with Council approval. The resource consent for this discharge is in the process of being surrendered. Other than occasional odour at a couple of locations on the cliff face, there are no adverse environmental or ecological effects arising from the two burial sites.

Nevertheless, because of renewed concerns about potential contaminated discharges from the site, further investigations were carried out below the Waireka site as part of the present study. The work and results are detailed within this report.

Because there has never been any discharge from the secure Waireka landfill facility, IWD holds no resource consent issued by the Council, nor is it required to. Nevertheless Council staff have monitored for the possibility of either discharges to air or loss of leachate control from the secure Waireka landfill facility. No evidence of any escape has been found.

The environmental performance of the remedial measures undertaken at the two burial sites and the environmental performance of the Waireka landfill is a matter of public

record through the Council's annual compliance monitoring reports. In summary this monitoring has found no evidence of any leakage at the Waireka landfill and there are no adverse environmental or ecological effects arising from the two remediated burial sites.

2.5 Beach Road (“Ngahoro”) site

It is a matter of public record that during 1974 IWD disposed of wastes in an area at the end of Beach Road near where the tank farm is now located. These wastes, together with associated contaminated soils were returned to the IWD main Centennial Drive site on Paritutu Road for disposal in 1981.

Council officers have inspected and monitored this area and the foreshore below it, since 1996 and found no evidence of any agrichemical residues remaining in the area. Nevertheless, because of renewed concerns about potential discharges from the site, further investigations were carried out below the Ngahoro site as part of the present study. The work and results are detailed within this report.

2.6 Monitoring by Taranaki Regional Council

2.6.1 1991-1999

Since 1991 and the implementation of the RMA the Taranaki Regional Council has monitored all discharges to the environment from Dow AgroSciences at both its properties on Paritutu Road (formulations plant) and at Waireka Road (Waireka experimental farm). Dow AgroSciences has an excellent record of compliance since that time. There have been no incidents of unauthorised disposal (“dumping”), nor any allegations of such having occurred since the Council began monitoring in 1991. The concerns raised by members of the public appear to be associated with activities of IWD held to have occurred during the 1960's and 1970's.

In the summer of 1994/95 a Council project sought to identify and investigate every old or informal rubbish disposal site in Taranaki. The investigations included site assessments and surveys and the sampling of any receiving waters. In the New Plymouth district organochlorine scans were also undertaken. Approximately 106 sites were identified throughout Taranaki and investigated.

At least five of those sites investigated in 1994/95 were among those recently identified as possible IWD disposal sites by concerned members of the public. One of these sites (Marfell Park) was the municipal landfill for New Plymouth at the time. Consequently it is highly likely that IWD did dispose of plant wastes at this site, as was common practice for other industries at that time.

The 1994/95 study found no evidence of the disposal of pesticides or agrichemical residues at any of the sites. The study found no evidence of pesticide residues remaining at any site and no indication of any pesticide residues in associated receiving waters. Five of the sites investigated were later identified by concerned members of the public during Stage One of these investigations.

2.6.2 2000-2001

In March 2000 the Council received a collection of comments and documents from Mr Andrew Gibbs referring to a number of sites of actual or alleged historical disposal of IWD plant wastes (1960s-1980s). Four of these sites (Buller Street, Waireka landfill, Beach Road, and Marfell Park) had already been investigated by the Council between 1993 and 1995. Three additional sites where the disposal of IWD plant wastes may allegedly have occurred were also identified by Mr Gibbs, namely: the gully beside and west of Paritutu, the Herekawe/Rangitake Drive area, and the netball courts beside the Waiwhakaiho River. These sites were accordingly investigated in May 2000 by Tonkin and Taylor Ltd, who have considerable experience in contaminated site investigations, on behalf of the Council. Soil and/or water samples were collected from each of these sites. In addition, the Council's marine biologist inspected the foreshore in the vicinity of Paritutu Rock. The Council routinely undertakes freshwater surveys at the other two sites.

At no sites were there any immediate evidence of any pesticides found, nor evidence of dumping or burial of agrichemical wastes (other than at sites already known, as described above in Sections 2.4 and 2.5). No traces of agrichemicals were found in any of the collected samples. Mr Gibbs was advised of these findings in July 2000.

In November 2000 an article in a local newspaper reported further sites where IWD had allegedly disposed of contaminated wastes. This information had been provided to the newspaper by several people including Mr Gibbs.

The Council subsequently contacted Mr Gibbs offering to investigate any new alleged site identified. Accordingly six sites were subsequently visited by Council staff and Mr Gibbs in December 2000. Most of these sites were already known to the Council and had been previously investigated between 1993 and 1995.

Following media publicity and information provided by concerned members of the public during January and February 2001, the Taranaki Regional Council gave a public commitment to undertake a detailed investigation of environmental risks arising from sites where it was alleged that herbicide contaminated wastes were disposed.

3. Structure of investigations

3.1 Stage One investigations

Based on this Council's experience during the 1991 investigation into the alleged historical stockpiling and dumping of dieldrin, it was decided to undertake interviews of all persons who proffered information (Stage One), and to collate the information gathered to identify potential sites for further investigation (Stage Two). Given that this investigation was dealing with events that may have occurred up to forty years ago, recollections of localities and details can become uncertain, more so as the landscape may have changed dramatically.

In order to facilitate the investigation and to make it convenient for the interested parties in New Plymouth to have input, weekly operational meetings of Council staff were held in the Taranaki Emergency Management offices at Robe Street, New Plymouth. The meetings were attended by members of the Dioxin Investigation Network (DIN), the Dioxin Investigation Action Group (DIAG), Greens, Surfriders, Vietnam Veterans, Paritutu Property Rights Group, and the Paritutu Community Residents Group. Without their co-operation the investigation could not have proceeded. They brought to the Council the names of people they believed to be able to provide information relating to alleged dumping or discharging of wastes from IWD.

From late December 2000 onwards approximately 80 interviews were conducted. A list of the interviewees and names provided to the Council is attached to this report as Appendix I. Written records of the interviews are held in the Council files. These will be archived in due course, along with all other material relating to this investigation.

Sites had to be identified by an interviewee with sufficient clarity to avoid confusion. It was preferable that two persons separately identified the site.

Council staff subsequently visited every site, where possible with the interviewee, to confirm details of identification, to demarcate the site, and to log its suspected location by instrumental measurement (global positioning system, or GPS).

In addition to the names presented to Council staff by the various groups and following completion of the interviews, an advertisement was placed in the Daily News on Saturday, 7 April 2001 calling for any further interested parties to contact Council, as a check that all efforts had been made to contact those who potentially held information. The advertisement solicited no further response.

The interviews and preliminary site visits identified 38 sites where it was alleged that inappropriate historical disposal of dioxin contaminated waste had occurred. Thirty six of these were investigated in more detail following the methodologies outlined below. Of the original 38, two sets of two sites were found to be duplicates, referred to by different names.

A map showing all sites investigated is attached to this report as Appendix II.

3.2 Stage Two investigations

The Stage Two programme was developed in consultation with the DIAG/DIN representatives. It was designed as a comprehensive screening of the possible sites. It

was not intended to be an exhaustive investigation of each site. Further study of particular sites would be considered in Stage Three of the investigation of each site in the event that a risk is indicated, based on results being above guideline or known background values. For a Stage Three investigation, the Council would review the need for further, more detailed site-specific investigations e.g. core drilling and sampling, groundwater sampling, more intensive soil sampling, and/or biological surveys.

It should be clearly understood that the primary aim of the programme is to identify and address possible environmental risk from alleged dump sites. It is not intended to conclusively prove or disprove whether dioxin-containing wastes are present within a site, nor to provide data on concentrations of dioxin in surface soils generally throughout the suburb of Spotswood. Council has recommended that that issue is the subject of a separate investigation should the Ministry of Health see fit.

The Council focused on whether there is an actual or plausible environmental risk at any of the sites. It is considered that the primary route of exposure would be by release from any buried reservoir, via leaching into groundwater and thence into the surface environment. Therefore the site inspections and the sampling regime had as its fundamental focus, any seeps, drains, pipes, or other forms of leachate discharge. These were to be analysed for a range of contaminants that would indicate the possible presence of dioxins, as well as being environmental contaminants in their own right (namely acid herbicides and organochlorine pesticides).

Analysis for 2,3,7,8 TCDD was also undertaken in a number of situations. The analysis for 2,3,7,8 TCDD is based in part on the much higher cost of analysis for a full suite of dioxins, in part on the fact that 2,3,7,8 TCDD is the dioxin of most concern from a health perspective, and in part on the fact that 2,3,7,8 TCDD is the primary 'marker' of dioxin contamination in 2,4,5-T.

Once the collation of information and statements from witnesses was completed, on-site investigations, including detailed site inspections, geophysical surveys using ground penetrating radar (GPR) and electromagnetic induction systems, and appropriate sampling of identified site soil cover, discharges, receiving water courses, and sediments, was implemented. Depending on site-specific considerations, Council staff collected surface soil samples, samples of each discharge of leachate or groundwater, samples of soil over which any leachate discharge has flowed, samples from any stream below each site and sediment from receiving water courses. Marine biota were surveyed and sampled where appropriate.

A sampling and analytical protocol was agreed between the Council, the various action groups, Ministry for the Environment, and New Zealand's foremost dioxin scientists, to ensure the protocols were scientifically defensible and rigorous, and met the various needs and concerns of each party as far as practicable. The protocols are attached to this report as Appendix III.

Occupational health and safety issues involved in the investigation were addressed in the sampling protocols.

The archives of Taranaki Regional Council (formerly Taranaki Catchment Commission and Taranaki Catchment Board) and New Plymouth District Council (including the former North Taranaki County Council) were searched as part of the investigation.

No additional sites were identified as a result of the searches. Some information was gained in relation to the extent of the sites under investigation that had been local authority landfills.

Aerial photograph series of the New Plymouth area for 1958-59, 1974-76-77, and 1994 were viewed in detail in order to assist in the identification and determination of possible dump locations.

One location in particular, a large concrete bunker on the former IWD dairy farm at Ngahoro, was identified and investigated. The investigation confirmed that the bunker was constructed by a petroleum exploration company in the 1960s and contained drilling muds for some years. In the 1970s the drilling muds were disposed of and the bunker was used as a silage pit by sharemilkers on the property. The bunker was subsequently broken up and the site is beneath a current methanol storage tank on one of the tank farm sites (see the notes on Site Zk below).

No other additional sites were identified by this method.

While it was held by Council officers that previous monitoring and investigations at some of the sites of interest had been properly conducted, members of DIAG and DIN expressed the desire for repeat testing in some cases. The Council extended an invitation to these groups to have a representative on site during the surveys and sampling to improve understanding, and to provide confirmation that samples were collected from the areas of particular concern. Representatives of DIAG/DIN were present throughout the sampling and survey programme. All samples collected were split so that DIAG/DIN and any owner or occupier could hold sub samples for independent analysis as they wished.

It is not known whether any independent analyses were carried out, and no such results are reported in this document.

Ground penetrating radar/soil conductivity profiling (GPR) enables the rapid location and delineation of buried containers and soil contamination at depths of 5-20 metres. The members of DIAG and DIN consulted with, confirmed that if subsurface surveys indicated no grounds supporting an allegation of material buried on a site, then they would accept that result as evidence that that site was not a dumpsite. Some sites were under investigation as sites of alleged surface discharge of wastes, not of burial of wastes, and these sites were not the subject of GPR survey.

The investigation was designed so that the leachate/ground water and stream samples were analysed for acid herbicides (which would capture any 2,4-D, 2,4,5-T, MCPA, MCPB, mecoprop, dichlorprop, triclopyr, 2,4-DB, bentazone, fenoprop, or picloram) and for organochlorine pesticides (which would capture DDT and its decomposition products, lindane, dieldrin, endrin, and a number of other compounds). Dioxin occurs as a trace contaminant of some of these substances therefore the absence of these substances in a sample indicates there is no justification for testing for dioxins.

The soil and sediment samples of most interest to DIAG/DIN and Council staff were analysed for the 2,3,7,8 TCDD isomer of dioxin, as this is the most significant dioxin associated with 2,4,5-T.

It is important to note that the Council had a broader interest than dioxin alone and wished to confirm or eliminate the presence of a range of agrichemicals and hence associated environmental risks, at each site.

It is recognised that the absence of acid herbicides in a water or leachate sample, or even of dioxin in a surface soil or sediment sample, cannot be taken as absolutely guaranteeing that no dioxin is present within a soil body nearby. Dioxins tend to bind to soil and are therefore relatively immobile, while acid herbicides are more mobile. The only way to achieve that level of certainty would have been to fully excavate every suspect site. This was unrealistic. The investigation methodology adopted was targeted at determining whether there was any plausible environmental risk arising from discharges or pathways into the environment. From the work done at the Waireka site, where the contents of the dump were removed almost twenty years ago, modern analytical methods can still detect traces of acid herbicide residues within the groundwater at levels below parts per billion, it is considered that the collection and analysis of discharge and surface samples is a robust methodology for investigating the concerns raised about relatively large scale buried dumps.

The offer was made to DIAG and DIN that regardless of the outcome of the acid herbicide and organochlorine screens, that at the sites of most concern to the group, analysis for TCDD in soils and sediments would be performed as they specified. The group requested surface soil analysis at Sites C (Pylon 3), P (42 Rangitake Drive), and Zi (Pylon 4).

Those groups also expressed a particular interest in dioxin levels in shellfish at up to five coastal sites where dumping or discharges may have occurred. The usefulness of shellfish as bioaccumulators of persistent toxins is well recognised. In addition, the health and state of the shellfish could serve as an indicator of possible biotoxic effects from a range of possible contaminants. Therefore an intertidal marine survey and sampling was carried out at five specific coastal sites related to known or alleged discharge points.

4. Findings of site investigations

4.1 Introduction

The 36 sites identified for investigation can be considered in four groupings.

The first grouping centres on alleged sites on land currently or historically held by IWD. There are eleven such alleged sites. Four of these involved allegations of inappropriate practice in the past, on the current Dow AgroSciences premises on Paritutu Road. Four other sites may be referred to as the Ngahoro suite, these relate to former dumpsites in the area south of the Omata Tank Farm that were already rehabilitated. They were known or found and cleaned-up by IWD in the late 1970's to mid 1980's. The remaining three sites in this grouping are the Waireka dumpsites and the original Ivon Watkins Buller Street factory and Tarahua Street warehouse. All were well known to Council and have been previously investigated as part of its resource consent monitoring or contaminated sites work.

The second grouping results from alleged impacts of stormwater emanating from the IWD Paritutu Road site in the past. Six sites were identified for further investigation including four residential sections. The allegations did not involve dumping or burial but related more to residential development at locations where contaminated stormwater is alleged to have given rise to contaminated soil.

The third grouping involves seven sites that are essentially associated with municipal waste disposal systems. These are largely known historical and existing municipal landfills and sewerage outfalls. All locations identified were known to Council through its previous work on landfill contaminated sites completed in 1994/95. With each of these sites there is no direct link to IWD, that is, if disposal occurred it was in all probability authorised in accordance with the standards of the time and undertaken by a range of parties i.e.; contractors, councils and perhaps the Company.

The fourth grouping is broader being essentially anything that does not fit in the previous three categories. Nine of these twelve alleged sites involved allegations of disposal by burial of dioxin contaminated waste, the remaining three involved cliff face seepages. In general these sites were of interest because they were identified in the course of the interviews undertaken and Council was not aware of them previously.

4.2 Sites and investigation details

Table 1 presents a summary of each of the 36 sites investigated and the nature of the investigations carried out at each site. Further details on the analyses conducted (acid herbicides, organochlorine pesticides, 2,3,7,8 TCDD) is provided in Appendix V.

Details of the sites and investigations are contained in Appendices to this report as follows:

Appendix I of this report presents a record of interviews conducted in Stage One of this investigation.

Appendix II contains a map of site locations identified in Stage One.

Appendix III contains the sampling protocols followed by staff in conducting the studies.

Appendix IV presents the report prepared by GPR Geotechnical Services Ltd on there findings of the geophysical investigations (Ground penetrating radar and electro-magnetic induction surveys).

Appendix V describes the sampling undertaken at each site.

Appendix VI describes the marine studies and sampling.

Appendix VII describes the findings of the site inspections.

Appendix VIII records the results of further excavations carried out at two sites.

Appendix IX presents the results of the acid herbicide, organochlorine pesticide, and 2,3,7,8 TCDD (dioxin) analyses conducted by AgriQuality for the Council.

Table 1 Sites and investigation details

	Archive inspection and Photographic perusal	GPR	Detailed inspection	Sampling and analysis	Marine biota
A Lawry Street - GPS 2600700E-6237180N. On the corner of Lawry Street and Devon Street West, and west of the garden centre on Devon Street West. The site is on the western bank of the Mangaotukutuku Stream.		*	*	*	
B Seaview Road - GPS 2600656E-6237096N. This alleged site is on the corner of Seaview Road and Devon Street West, behind the Shell service station and across from site-A. The site is on the eastern bank of the Mangaotukutuku Stream.		*	*	*	
C Pylon 3 - GPS2598377E-6237586N. The alleged site is immediately north/west of the IWD premises and is on both sides of Centennial Drive and includes an area approximately 100m x 150m in the Paritutu Centennial Park. The pipeline corridor transverses part of the site. There is an alleged discharge emanating from the cliffs below this site.	*	*	*	*	
Ca Centennial Drive - GPS25985535E-6237713N. This alleged site was addressed as part of the Council's dielidrn investigation in 1991 . Further work was therefore limited to a confirmatory detailed inspection			*		
D 34 Rangitake Drive - GPS2598513E-6236679N. The alleged site is at the rear of the property at 34 Rangitake Drive. Prior to residential development this site was above a small tributary of the Herekawe Stream that allegedly received stormwater from the IWD premises. At least three previous owners identified the site. Alleged burial	*	*	*	*	
Da 44 Rangitake Drive. As above.	*	*	*	*	
E Omata Reserve (east of the Methanex tank farm) - GPS2598382E-6236657N. The alleged site is on New Plymouth District Council reserve land on the eastern side of the Methanex tank farm. The site was identified by DIAG, previous occupiers do not support the allegations.	*	*	*		
F IWD-1 - GPS2598663E-6237173N. An alleged disposal site on the IWD premises.	*	*	*	*	
G Marfell Park - GPS2600682E-6236037N (identified by Andrew Gibbs and Ian McLeod), GPS2600734E-6236179N (identified by Trevor Fleming). This site was a known municipal landfill prior to being closed, grassed and used as playing fields in the late 1970's. Dumping of 200 litre drums was alleged. The Mangaotukutuku Stream is close by. Also wastes from the unblocking of the City sewerage system at the corner of Ngamotu Road and Centennial Drive were allegedly disposed of here. The wastes were identified as being phenol based	*		*	*	
H Ngamotu Domain - GPS2599875E-6237183N. This site is a known past municipal landfill. The site has also been covered, grassed and is used as playing fields. Wastes from the unblocking of the city sewerage system were disposed of at this site.	*		*		
I 7A Squire Place - GPS2600021E-6337111N. A stormwater pipe that allegedly could have contained leachate from the Ngamotu Domain landfill discharges at this location	*		*		
J Belt Road - GPS260143E-6238019N. This site is at the end of Belt Road (over the railway line to the right) on the coast. This is another site where wastes from the unblocking of city sewerage was disposed of. The wastes allegedly flowed over the cliffs and into the sea.			*	*	*
K Victoria Road, Oakura - GPS2593182E-6232055N. This site is the first farmlet up Victoria Road off SH45			*		
L 23C Tahurangi - GPS2598732E-6236974N. This is a residential site on Tahurangi Place. Prior to residential development it is alleged a stormwater pipe used to discharge from the IWD premises onto farm land where this property is situated.	*		*	*	
M Beach Road-1 - GPS2597532E-6235427N. This alleged site is at the end of Beach Road to the west and has been linked with the known and rehabilitated Ngahoro dump. A small spring is nearby.		*	*	*	
N Waireka rehabilitated dumpsite - GPS2596874E6234237N. This records the identification by a number of interviewees of the known rehabilitated dump sites (2) at Waireka. The sites are the subject of ongoing monitoring since 1986.					*
O Pioneer Road - GPS2599214E-6237257N. Further investigation showed this site was the road leading to the Ngamotu Domain (Site H)					

	Archive inspection and Photographic perusal	GPR	Detailed inspection	Sampling and analysis	Marine biota
P 26A Rangitake Drive – GPS2598481E-6236717N. This alleged site is at the rear of a residential property at 26A Rangitake Drive. Prior to residential development this alleged site was adjacent to a small tributary of the Herekawe Stream that may have received stormwater from the IWD premises.	*	*	*	*	*
Q Rifle Range Road/Bewley Road – GPS2606429E-6239250N. This alleged site is located on Rifle Range Road next to the Waiwhakaiho River. Part of the developed area was a Taranaki County Council dump. The old landfill site has resource consents and is monitored.	*		*		
R Beach Road-2 – GPS2598038E-6235117N. This alleged site is on the old IWD dairy farm on Beach Road approximately 750 metres from the sea and was identified arising from the extraction of chemicals from old dumpsites during the early 1980's.	*	*	*	*	
T Colson Road Landfill – GPS2607397E-6237616N. This is a present municipal landfill and has been in use since the early 1970's. It is alleged that IWD waste products have been disposed of in this landfill during past years. This landfill has resource consents and is monitored.				*	
U IWD-2 - Another alleged dumpsite on the IWD premises. The allegation refers to a concrete bunker used as an anisol storage facility.	*	*	*	*	
V Centennial-2 – GPS2598524E-6237853N. This alleged site is the discharge point of the former stormwater line from the office blocks of the IWD premises. The stormwater system was apparently accessed during spills that occurred on site and was seen to be frothing before the mid 1980's.	*		*	*	*
W Herekawe Stream – GPS2598309E-6236771N. This is the current stormwater discharge from the Dow AgroSciences premises. The discharge has resource consents and is monitored.				*	*
X Roto Street – GPS2600775E-6234738N. This alleged site is located on a recent subdivision. The land was previously owned by a plant nursery. The allegation is that drums containing chemical had been dumped. A drain flows from the south-west end of the subdivision.	*	*	*	*	
Z Ngahoro – GPS2597661E-6235515N. This is a known site on the old IWD dairy farm. In February 1981, 230 drums of waste were removed from this site and returned to Ivon Watkins-IWD Ltd for incineration or recycling. About 1000m ² of soil was relocated from this site to the Waireka facility. It has been alleged that between thirty and fifty empty drums and assorted rubbish were left behind and covered with 1.5 to 3 metres of clean soil.	*	*	*	*	
Za 60 Marama Crescent – GPS2598529E-6236990N. This site is located at the rear of a residential property at 60 Marama Crescent. Recently part of a drum was dug up.	*	*	*		
Zb Buller Street – GPS2603497E-6238487N. The site of the original Ivon Watkins Limited.	*		*		
Zc Tarahua Road - GPS2604173E-6235524N. This is a former warehouse of the original Ivon Watkins Ltd. The site is either sealed, metallised or concreted and was referred by the present owners	*		*		
Zd Tasman Sea – Adjacent to old Elliot Street sewer outfall					*
Ze Tank 3500 – GPS2597888E-6235965N. This is a known site on the old IWD dairy farm that has been confused with Ngahoro but is separate. The site was discovered by the then Ministry of Works during the construction of tanks at the tank farm in April/May 1985. IWD were advised and clean-up was undertaken in 1985	*	*	*		
Zf IWD-3 - Another alleged dumpsite on the IWD premises. The allegation refers to dumping of waste in a deep bunker.	*	*	*	*	
Zg IWD-4 - Another alleged dumpsite on the IWD premises. The allegation refers to drums punctured near the current incinerator.	*	*	*	*	
Zh Car Park – GPS2597919E-6236297N. This alleged site is near the car park west of the Herekawe Stream on a walking track to the beach and is often referred to Council as a chemical discharge and was included for completeness in this investigation.	*		*	*	*
Zi Herekawe cliff (Pylon 4) – GPS2598205E-6237049N. This alleged site is to the east of the Herekawe Stream and is a cliff discharge that is seen by surfers. It is also referred to as a chemical discharge.	*		*	*	
Zk Jury site – GPS2598766E-6236388N. This alleged site is at the end of Norwich Avenue and was originally a concrete bunker site on the former Jury farm in close proximity to the old Ngamotu Tavern. Old concrete is still visible. There is no waterbody nearby.	*		*		

4.3 Interpretation of results of chemical analyses

The findings of the investigations at each site are set out in Section 4.4 of this report. Details include the results of chemical analyses. The full results of the chemical analysis are attached to this report in Appendix IX.

The New Zealand soil criteria for dioxin are set out in Table 2 below. They have been prepared by the Ministry for the Environment and Ministry of Health (Health and Environmental Guidelines for Selected Timber Treatment Chemicals, 1997). Whether these soil criteria are appropriate is not a matter for the Council to determine. They are the criteria in use in New Zealand at the moment, and any query over their appropriateness is a matter for the Ministries of Health or Environment or ERMA to determine.

Table 2 NZ soil criteria for dioxin

	Agricultural	Residential	Industrial unpaved	Industrial paved	Industrial maintenance
Dioxins, ng I-TEQ kg ⁻¹	10	1500	18 000	90 000	21 000

In interpreting reported numerical values for the levels of dioxin in the environment, it is critical to note the units used. Generally, trace levels of substances in the environment are measured at levels of parts per million and expressed as milligrammes per kilogramme (mg kg⁻¹ for solids such as soils, or mg L⁻¹ for liquids). For even lower levels, the units are parts per billion- a thousand times lower. These quantities are expressed as microgrammes per kilogramme (ug kg⁻¹). However, for dioxin, environmental levels are so low and the limits of detection with modern instrumentation so good, that even smaller units have to be used. Dioxin concentrations are generally at levels of parts per trillion- a thousand times lower again, and expressed as nanogrammes per kilogramme (ng kg⁻¹, as in Table 2 above), or even parts per quadrillion, a thousand times lower again, and expressed as picogrammes per kilogramme (pg kg⁻¹).

$$1 \text{ pg kg}^{-1} = 0.001 \text{ ng kg}^{-1} = 0.000\ 001 \text{ ug kg}^{-1} = 0.000\ 000\ 001 \text{ mg kg}^{-1}.$$

There are two ways of indicating the significance of levels of dioxins in the environment. There are 75 different individual congeners or forms of dioxin, each differing according to the number and position of chlorine atoms around the basic structure. The most toxic are those with 4 chlorine atoms attached; of these, the most toxic is 2,3,7,8 TCDD. To enable an evaluation of complex mixtures of dioxins, a system of toxic equivalents has been developed (I-TEQ). Each individual dioxin is assigned a factor representing its toxicity in relation to 2,3,7,8 TCDD, which is assigned a value of 1. The dioxin 2,3,7,8 TCDD is the only congener assigned this value; the others have factors ranging from 0.5 down to 0.001. Most data and criteria reported in international literature report concentrations of dioxins in terms of I-TEQ units, rather than actual measured concentrations of individual congeners.

In this study, only 2,3,7,8 TCDD was analysed for. It is the most significant dioxin in terms of its toxicity. It is the primary dioxin of interest when the possible source is 2,4,5-T herbicide. And when present it would tend to dominate the I-TEQ value for a complete analysis, because of its comparatively high I-TEQ factor.

4.4 Findings at each site

Sites were identified and described in Stage One of this investigation. Following is a resume of activity and the findings at the sites, in relation to Stage Two. Detailed site inspections were conducted at each site discussed below, unless otherwise noted.

A Lawry Street

This site is alleged to have been used as an unauthorised dumping area prior to development of the property.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed that the majority of the site consists of fill material typical of a refuse tip. The data showed no evidence of a drum dumpsite. The site was already known to have been filled prior to subdivision.

Samples of soil, streambed sediment, and the stream water were collected at this site (4005, 4006, 4007, 4008). The streambed sample was analysed for 2,3,7,8 TCDD. The results are presented in full in Appendix IX. The results are as follows:- no 2,3,7,8 TCDD was detected in the streambed sediment sample. The limit of detection was at a level of 8 parts per trillion. The limit of detection is far below the current residential guideline for NZ of 1500 ppt. There is no NZ guideline for recreational areas, which would typically be higher than for a residential area.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agricultural wastes at this site. There is no evidence of site contamination, or of an environmental risk.

B Seaview Road

This site is alleged to have been used as an unauthorised dumping area prior to development of the property.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal soil strata across most of the site, with a small amount of fill material in one area. The data showed no evidence of a drum dumpsite. The site was already known to have been filled prior to development.

The streambed result reported above for Site A is below this site also.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agricultural wastes at this site. There is no evidence of site contamination, or of an environmental risk.

C Pylon 3

This site was alleged to have been a casual dumping area prior to construction of Centennial Drive and development of the current industrial area. The site is probably the one where it is alleged a fenced off area containing liquid waste was sited.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed undisturbed soil strata across most of the site (a very large area). Data along and across Centennial Drive showed the presence of underground pipelines

running to the Port. At the southern end of the area, anomalous data gave some evidence of the possibility of disturbed subsurface strata and buried objects.

Following the receipt of this information, staff of the Council carried out an excavation within the area identified by the GPR operator as being the most critical area. This excavation found no evidence of disturbed subsurface layers, but instead found a natural iron pan, a hard impermeable layer of iron-rich minerals. There was no evidence of a drum dumpsite or of the disposal or burial of any wastes. The detailed record of the excavations is presented in Appendix VIII.

Samples of surface soil and sediment from beneath 2 areas of seep patches and from within the mouth of a pipe were collected at this site (4030, 4031, 4032, 4058). They were analysed for acid herbicides and organochlorine pesticides (seeps sediments) and for 2,3,7,8 TCDD (surface soil). The latter sample was collected at the request of DIAG/DIN. The results are presented in full in Appendix IX. The results are as follows:-no organochlorine pesticides were detected in the sediments. The limits of detection were 0.1-0.5 parts per million. No acid herbicides were detected in the sediments. The limit of detection was 0.1 parts per million.

The surface soil sample was collected as requested by DIAG/DIN from an area of undisturbed land. 2,3,7,8 TCDD was detected at a level of 29 parts per trillion in the surface soil sample. This result is consistent with the measurements of dioxin levels in this area made by the Department of Health in 1985, and by the Ministry for the Environment on Mount Moturoa in 1996. The level is far below the current residential guideline for NZ of 1500 ppt. There is no NZ guideline for recreational areas, which would normally be higher than for a residential area.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site.

Ca Centennial Drive

This site was alleged to have been a casual dumping area prior to construction of Centennial Drive and development of the current industrial area.

This site has previously been investigated by the Council in 1991, in regard to the collection and disposal of dieldrin in the 1960s and 1970s. Following a further detailed site inspection, it was considered there was no justification for any additional studies.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.

D 34 Rangitake Drive

This site was alleged to have been a casual dumping area prior to subdivision and was in the path of a tributary alleged to have carried stormwater from the IWD site.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal data across most of the site. Anomalous data in one area indicated the possibility of a few buried objects. The data showed no evidence that the site had been used as a drum dumpsite or for disposal of other buried refuse. The section is known to have been filled prior to subdivision.

Samples of soil and sediment from beneath seep patches and from the bed of the Herekawe Stream were collected at and below this site (4049, 4050, 4051, 4052). They were analysed for acid herbicides and for organochlorine pesticides. The results are presented in full in Appendix IX. The results are as follows:-no organochlorine pesticides were detected in sediments taken on two different parts of the site, nor in sediments from the bed of the Herekawe Stream approximately 15 metres downstream of the property. The limits of detection were 0.1-0.5 parts per million. No acid herbicides were detected in any of the samples, at a detection limit of 0.1 ppm.

These results are at or below background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of the use of this site as a drum dumpsite or for the inappropriate burial or disposal of agrichemical wastes. Council staff will liase with the site owner if any further work to determine the nature of the objects shown in the GPR data is desired. There is no evidence of site contamination, or of an environmental risk.

Da 44 Rangitake Drive/ Rangitake Drive carriageway

This section was an alleged casual dumpsite prior to subdivision.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal data across most of the site. Anomalous data in one area indicated the possibility of a few buried objects. The data showed no evidence of a drum dumpsite or other buried refuse. The section is known to have been filled prior to subdivision.

A GPR survey was also conducted along the length of the carriageway of Rangitake Drive. The detailed record is presented in Appendix IV. The survey showed normal soil strata data along the street, with underground services. The data showed no evidence of a drum dumpsite or other buried refuse.

Samples of surface soil were collected at the request of DIAG/DIN at this site (4060). They were analysed for 2,3,7,8 TCDD. The results are presented in full in Appendix IX. The results are as follows:-2,3,7,8 TCDD was not detected in the surface soil sample. The limit of detection was less than 5 parts per trillion . This limit is far below the current residential guideline for NZ of 1500 ppt.

From the investigations carried out by the Council at this site, there is no evidence of the use of this site as a drum dumpsite or for the inappropriate burial or disposal of agrichemical wastes. Council staff will liase with the site owner if any further work to determine the nature of the objects shown in the GPR data is desired. There is no evidence of site contamination, or of an environmental risk.

E Omata Reserve

This section was an alleged casual dumpsite in the 1970's.

Two GPR surveys were conducted at this site, to cover separate areas. The detailed records are presented in Appendix IV. The surveys showed normal soil strata data across all of the site. The data showed no evidence of previous site excavations, a drum dumpsite, or other buried refuse.

Samples taken in the Rangitake Drive sites relate also to this site.

Following a detailed site inspection, and based on the information provided by site owners that rejected any suggestion that the site had been used in the manner alleged, it was considered there was no justification for any additional studies.

From the investigations carried out by the Council at this site, there is no evidence to support the claims made concerning inappropriate burial or disposal of agricultural wastes at this site. There is no evidence of site contamination, or of an environmental risk.

F IWD-1 South eastern corner of property

A site identified as an alleged disposal site by former staff.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal soil strata data across all of the site, and showed no evidence of previous site excavations, a drum dumpsite, or other buried refuse.

Samples of groundwater were collected from two groundwater monitoring bores within and on opposite sides of the area, maintained on the property (4062, 4065). They were analysed for acid herbicides and for 2,3,7,8 TCDD. The results are presented in full in Appendix IX. The results are as follows:-no acid herbicides were detected in Bore 21, to the west of this area, or in Bore 1, to the east. The limits of detection were 0.1 parts per billion. No 2,3,7,8 TCDD was detected in either bore. The limit of detection was 3-9 parts per quadrillion.

These results are at or below background levels of these chemicals. They show no evidence of burial or disposal of agricultural wastes at this site.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agricultural wastes at this site. There is no evidence of site contamination, or of an environmental risk.

The site is routinely monitored by the Council as part of an ongoing compliance monitoring programme.

G Marfell Park

A former authorised municipal landfill that received IWD liquid wastes during sewerage system maintenance.

A GPR survey was not conducted at this site. The site is a known previous municipal refuse disposal site.

Samples of leachate/stormwater from the park, soil from a point of seepage from the corner of Grenville and Endeavour Streets, sediment from beneath the point of discharge of leachate and stormwater into the Mangatuku Stream, and a sample from the stream were collected at this site (4000, 4001, 4002, 4057). They were analysed for acid herbicides and for organochlorine pesticides. The results are presented in full in Appendix IX. The results are as follows:- no acid herbicides were detected in the seepage, at a limit of

detection of 0.1 parts per million, or organochlorine pesticides, at a detection limit of 0.1-0.3 ppm.

No organochlorine pesticides were detected in the leachate flowing from the drain. The limit of detection was 1-2 parts per billion. No acid herbicides, other than 2,4-D at a level of 3 parts per billion, were detected in the leachate flowing from the drain. The limit of detection was 1 ppb.

The New Plymouth District Council had collected a sample of the discharge from the park just prior to the present study being undertaken, and had had a complete dioxin analysis undertaken. The full results are presented in Appendix IX (referred to as Cook Street). No 2,3,7,8 TCDD was detected. The limit of detection was 2 parts per quadrillion. Other dioxins (non 2,3,7,8 TCDD) were detected, at 9.3 ppq. This indicates a source or sources other than agrichemical wastes.

These results are at or below background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical-contaminated wastes at this site. There is no evidence of contamination of the site by such wastes, or of an environmental risk.

The site is routinely monitored by the Council as part of an ongoing compliance monitoring programme.

H Ngamotu Domain

A former authorised municipal landfill that received IWD liquid wastes during sewerage system maintenance.

A GPR survey was not conducted at this site. It is a known landfill. The issue of concern related to liquid wastes.

Samples of streambed sediment and discharges were collected at this site (4004, 4022, 4023, 4024). They were analysed for acid herbicides and organochlorine pesticides (discharges). The results are presented in full in Appendix IX. The results are as follows:- no acid herbicides were detected in the discharges. The limit of detection was 0.1 parts per billion. No organochlorine pesticides were detected in the discharges, at a limit of detection of 0.1 parts per million.

These results are at or below background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical-contaminated wastes at this site. There is no evidence of contamination of the site by such wastes, or of an environmental risk.

I 7A Squire Place

A site where a stormwater culvert discharges, above Ngamotu Domain (site H). An alleged contaminated soil disposal site.

A GPR survey was not conducted at this site.

A sample of sediment from below the discharge was collected at this site (4003). It was analysed for 2,3,7,8 TCDD. The results are presented in full in Appendix IX. The results are as follows:- no 2,3,7,8 TCDD was detected in the sediment sample. The limit of detection was 10 parts per trillion. This limit is far below the current residential guideline for NZ of 1500 ppt. There is no NZ guideline for recreational areas, which would be higher than for a residential area.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agricultural wastes at this site. There is no evidence of site contamination, or of an environmental risk.

J Belt Road

A former unauthorised discharge area that received liquid wastes from the Paritutu area during sewerage system maintenance.

A GPR survey was not conducted at this site, as the issue was disposal of liquid wastes onto the ground.

Samples of surface soil were collected at this site (4026, 4043). The second sample was collected following clarification of the location of the alleged disposal site by DIAG/DIN. It was analysed for 2,3,7,8 TCDD. The results are presented in full in Appendix IX. The results are as follows:-no 2,3,7,8 TCDD was detected in the surface soil sample. The limit of detection was at a level of less than 9 parts per trillion. The limit of detection is far below the current residential guideline for New Zealand of 1500 ppt. There is no New Zealand guideline for recreational areas, which would be higher than for a residential area.

The marine ecology on the foreshore in the vicinity of the site was surveyed. Samples of biota were collected for analysis for 2,3,7,8 TCDD. The results are presented in Appendix VI.

The marine ecology was found to be in a healthy state, and the levels of 2,3,7,8 TCDD similar to those found by the Ministry for the Environment in its survey of background levels of dioxins in marine biota around New Zealand.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agricultural-contaminated wastes at this site. There is no evidence of site contamination, or of an environmental risk, either on the site or in the adjoining marine environment.

K Victoria Road, Oakura

A farmlet that received 200 litre drums of offspec chemical for weed control.

A GPR survey was not conducted at this site, as the issue was discharge of liquid agriculturals onto land.

A detailed site inspection by Council staff found no reason to conduct further investigations. From the investigations carried out by the Council at this site, while there was unorthodox weed control operations, there is no evidence of inappropriate burial of agricultural wastes at this site.

L 23C Tahurangi Place

An alleged stormwater discharge point off the IWD site prior to subdivision.

A GPR survey was not conducted at this site, as the issue in hand was that of stormwater discharge, not drum disposal.

Samples of surface soil from the rear of the property and from beneath the house were collected and analysed for 2,3,7,8 TCDD and for acid herbicides (4053, 4054). The results are presented in full in Appendix IX. The results are as follows:-no acid herbicides were detected in either of the samples. The limits of detection were 0.1 parts per million. No 2,3,7,8 TCDD was detected in either of the two soil samples. The limit of detection was 4-6 parts per trillion. This detection limit is below the New Zealand agricultural guideline, of 10 ppt, and far below the residential guideline, of 1500 ppt.

These results are at or below background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.

M Beach Road-1

An alleged dumping site of 200 litre drums. This site may have been confused with the Ngahoro Site (site Z), where drums were dumped and have since been removed.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal data across the majority of the site. In one part of the site the GPR data showed anomalies consistent with pipes, at a considerable depth (4 metres). The data showed no evidence of a drum dumpsite or other buried refuse.

A sample of sediment from a swampy area was collected at this site (4009, 4010). The sediment sample was analysed for 2,3,7,8 TCDD. The results are presented in full in Appendix IX. The results are as follows:- 2,3,7,8 TCDD was detected at 2.0 parts per trillion.

This result is well below the NZ agricultural soil standard of 10 ppt..

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.

N Waireka rehabilitated dumpsite

The IWD dumpsite rehabilitated during the mid 1980s..

A GPR survey was not conducted at this site. The site was comprehensively examined and remediated during the early 1980s

Samples of whelks were collected and analysed for the presence of acid herbicides and for 2,3,7,8 TCDD. The results are presented in full in Appendix IX. No acid herbicides were detected, at a detection limit of 0.1 parts per million.

The marine ecology in the vicinity of the outfall was surveyed. Samples of biota were collected for analysis for 2,3,7,8 TCDD. The results are presented in Appendix VI. The marine ecology was found to be in a healthy state, and the levels of 2,3,7,8 TCDD similar to those found by the Ministry for the Environment in its survey of background levels of dioxins in marine biota around New Zealand.

A sample of the leachate collected in a rock pool beneath the seepage discharge area was collected and analysed for 2,3,7,8 TCDD. The results are presented in full in Appendix IX. No 2,3,7,8 TCDD was detected. The limit of detection was 8 parts per quadrillion.

From the investigations carried out by the Council at this site, there is no evidence of an environmental risk arising from the low level continuing discharge of groundwater and leachate at this site.

O Pioneer Road

Another identification of the Ngamotu Domain site (see site H).

P 26A Rangitake Drive

This section was in the path of a small tributary of the Herekawe Stream which carried stormwater from the IWD site prior to subdivision and was also an alleged casual dumpsite.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal data across most of the site. Anomalous data in one area indicated the possibility of a few buried objects, while data from another area indicated buried refuse or similar small objects. The data showed no evidence of a drum dumpsite. The section is known to have been filled prior to subdivision.

Samples of soil and sediment from beneath seep patches were collected at this site (4044, 4045, 4046, 4047). They were analysed for acid herbicides and for organochlorine pesticides. The results are presented in full in Appendix IX. The results are as follows:-no organochlorine pesticides were detected in sediments taken on two different parts of the site, nor in sediments from the bed of the Herekawe Stream approximately 30 metres downstream of the property. The limits of detection were 0.1-0.3 parts per million. No acid herbicides were detected in any sample, at a limit of detection of 0.1 ppm.

These results are at or below background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of the use of this site as a drum dumpsite or for the inappropriate burial or disposal of agrichemical wastes. Council staff will liaise with the site owner if any further work to determine the nature of the objects shown in the GPR data is desired. There is no evidence of site contamination, or of an environmental risk.

Q Rifle Range Road/Bewley Road

A former authorised municipal landfill alleged to have received IWD wastes.

A GPR survey was not conducted at this site, as it is a known past refuse disposal site covering a wide area.

Samples of leachate seepage, groundwater, and sediments were collected at several points across this site (4035, 4037, 4038, 4039, 4040, 4041, 4042). These included sampling all observed seepage points. They were analysed for acid herbicides and for organochlorine pesticides. The results are presented in full in Appendix IX. The results are as follows:-no organochlorine pesticides were detected in the groundwater sample. The limits of detection were 1-2 parts per billion. No acid herbicides were detected in the same sample. The limit of detection was 0.1 ppb. No organochlorine pesticides were detected in the sediment samples (limit of detection 0.1-0.5 parts per million). No acid herbicides were discovered in the sediment samples. The limits of detection were 0.1 parts per million.

These results are at or below background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of the use of this site as a drum dumpsite, or of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of contamination of the site by agrichemicals, or of an environmental risk.

The site is routinely monitored by the Council as part of an ongoing compliance monitoring programme.

R Beach Road-2

A dumping site of 200 litre drums that have since been removed.

A GPR survey was conducted at this site. The area to be studied was pinpointed by the nature of the allegations. The detailed record is presented in Appendix IV. The survey showed normal data across all of the site. The data showed no evidence of buried drums or other buried refuse. The site is flat, and has been recontoured. There was no sign of discharges to the environment from the site.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site since the removal of known wastes and remediation. There is no evidence of site contamination, or of an environmental risk.

S not assigned- combined with Site I

T Colson Road landfill

Current municipal landfill for New Plymouth alleged to have received agrichemical wastes.

The landfill is routinely inspected and sampled by the Council as part of an ongoing compliance monitoring programme.

The New Plymouth District Council had collected a sample of the leachate discharge from the landfill just prior to the present study being undertaken, and had had a complete dioxin analysis undertaken. The full results are presented in Appendix IX. No 2,3,7,8 TCDD was detected. The limit of detection was 2 parts per quadrillion. No other dioxin congeners were detected. The limits of detection were 1-10 ppq.

From the routine ongoing monitoring carried out by the Council at this site, there is no evidence of the use of the site as a drum dumpsite, or of the inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of contamination of the site by agrichemicals, or of an environmental risk.

U IWD-2 South west area of property

A site identified as an alleged storage site for wastes, by former staff.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal soil strata data across the site, together with a significant underlying rock formation. The formation was already known from previous site studies. The data showed no evidence of previous site excavations, a drum dumpsite, or other buried refuse.

Samples of groundwater were collected from two groundwater monitoring bores, one at each end of and within this site (4063, 4068). The results are presented in full in Appendix IX. The results were as follows:-of the eleven acid herbicides analysed for, no acid herbicides were detected in Bore 43, to the east, except for picloram at a level of 0.1 parts per billion. No acid herbicides were detected in Bore 6, to the northwest, except for picloram at a level of 16 parts per billion. A repeat analysis of the sample from Bore 6 gave a result of 9.1 parts per billion.

There is no NZ Drinking Water Standard for picloram. However, the level detected in the groundwater is comparable with the NZ Drinking Water standards for various other acid herbicides (2,4-D 30 ppb, 2,4 DB 100 ppb, MCPA 2 ppb, mecoprop 10 ppb, dichlorprop 100 ppb, 2,4,5-T 10 ppb). The direction of flow is towards the northwest. Sampling of cliff face seeps at Site Zi, downflow of this site, did not detect any acid herbicides except for picloram at a level of 0.2 ppb. Given this result, and the processes of natural attenuation and degradation, it is considered that there are no grounds for environmental concern for picloram at this level.

No 2,3,7,8 TCDD was detected in either bore. The limit of detection was 2-3 parts per quadrillion.

Other than for picloram, these results are at or below normal background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial of agrichemical wastes at this site. There is no evidence of an environmental risk.

The site is routinely monitored by Council staff, as part of an ongoing compliance monitoring programme

V Centennial-2

The former stormwater discharge point to the Tasman Sea from the office block area of IWD.

A GPR survey was not conducted at this site.

Samples of the discharge from the pipe, and sediment beneath the discharge, were collected at this site (4033,4034). They were analysed for acid herbicides and for organochlorine pesticides. The results are presented in full in Appendix IX. The results are as follows:-no organochlorine pesticides were detected in the discharge, nor in the sediments from beneath the flow. The limits of detection were 0.01-0.2 parts per billion for the discharge, and 0.1-0.5 parts per million for the sediment. No acid herbicides were detected in the discharge except for 2,4,5-T at a level of 0.4 parts per billion. The limit of detection was 0.1 ppb. No acid herbicides were detected in the sediments. The limit of detection was 0.1 parts per million.

Except for the 2,4,5-T result (which is well below the NZ drinking water standard of 10 ppt), these results are at or below background levels of these chemicals.

The marine ecology in the vicinity of the outfall was surveyed. Samples of biota were collected for analysis for 2,3,7,8 TCDD. The results are presented in Appendix VI.

The marine ecology was found to be in a healthy state. The levels of 2,3,7,8 TCDD found in the biota were slightly elevated above those found by the Ministry for the Environment in its survey of background levels of dioxins in marine biota around NZ. However, the levels were similar to those found in seafood in the Ministry's study of dioxin intake in New Zealand diets.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate discharge of agrichemical wastes at this site. There is no evidence of an environmental risk.

W Herekawe Stream

The current stormwater discharge point from Dow AgroSciences. It is routinely monitored by the Council. Additional investigations were conducted as part of this study.

A GPR survey was not conducted at this site.

A sample of the discharge from the pipe was collected at this site. It was analysed for acid herbicides. The results are presented in full in Appendix IX. The results are as follows:-no acid herbicides were detected in the sample. The limits of detection were 0.1 parts per million.

These results are at or below background levels of these chemicals, and validate data routinely supplied by the Company to the Council, in addition to the Council's own test results on other occasions.

The marine ecology in the vicinity of the stream mouth was surveyed. The results are presented in Appendix VI. The marine ecology was found to be in a healthy state.

Additional information on this site is reported annually by the Council in its compliance monitoring programme report for the Herekawe catchment.

From the investigations carried out by the Council at this site, there is no evidence of any effects arising from inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of contamination, or of an environmental risk.

X Roto Street

An alleged dumpsite on the former plant nursery site.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed that the majority of the site consists of fill and debris material. The data showed no evidence of a drum dumpsite. The section is known to have been filled prior to subdivision.

Samples of soil (two areas), streambed sediment, seepage, and stream flow were collected at this site (4016, 4017, 4018, 4019, 4020, 4021). They were analysed for acid herbicides and organochlorine pesticides (seeps). The results are presented in full in Appendix IX. The results are as follows:-no organochlorine pesticides were detected in the seep. The limits of detection were 0.01-0.2 parts per billion. No acid herbicides were detected in the seep. The limits of detection were 0.1 ppb.

These results are at or below background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial of drums or disposal of agrichemical wastes at this site. There is no evidence of contamination of the seep, or of an environmental risk.

Y not assigned- combined with Site Q**Z Ngahoro**

A known dumping site of 200 litre drums, that was rehabilitated in the 1980s.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal data across the top part of the site, and an anomalous area that is consistent with a previous excavation. This corresponds to the known use of this site for a drum disposal area in the 1970s and early 1980s, as described in Section 3 of this report. The data showed no evidence of a current drum dumpsite or other buried refuse.

Samples of soil and sediment from two swampy areas, to the northwest and southwest, were collected at this site. They were analysed for 2,3,7,8 TCDD. The results are presented in full in Appendix IX. The results are as follows:-2,3,7,8 TCDD was detected at a concentration of 330 parts per trillion in the northwest sample. This result is consistent with the known previous use of this site for disposal of agrichemical manufacturing wastes in the 1970s and early 1980s. The area of contamination is confined.

From the investigations carried out by the Council at this site, there is no new evidence of inappropriate disposal of agrichemical wastes at this site, other than that already known and remediated. There is no evidence of a significant environmental risk.

Za 60 Marama Crescent

An alleged casual dumpsite.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed in situ soil strata data across all of the site that was surveyed. There is a recent open excavation on the site.

The data showed no evidence of previous site excavations, a drum dumpsite, or other buried refuse.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site.

Zb Buller Street

The site of the original Ivon Watkins Limited.

This site has been previously investigated by the Council, including soil sampling and analysis. DDT at levels from less than 0.01 up to 1.3 parts per million were detected in soil. No 2,4,5-T was detected, and 2,4 D was detected in one soil sample only, at 0.8 ppm. No DDT or acid herbicide was detected in a sample of stormwater.

A GPR survey was not conducted at this site.

Samples of marine biota were collected for analysis for 2,3,7,8 TCDD from the vicinity of the old Elliot Street sewerage outfall, which would have been in use at the time this site was occupied by IWD. The marine ecology in the vicinity of the outfall was surveyed. These results are presented in the report on Site Zd below.

These results are marginally above background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of contamination above recognised guidelines, or of an environmental risk.

Zc Tarahua Road

The site of a former Ivon Watkins Limited warehouse.

Following a detailed site inspection and discussion with the current owner, no further investigations were considered justified or were undertaken. The site is effectively capped by buildings and paved areas, such that there is no risk pathway even if contamination did exist.

Zd Tasman Sea - old Elliot Street outfall

The outfall off Elliot Street that included stormwater discharge from Buller Street.

The marine ecology in the vicinity of the outfall was surveyed. Samples of biota were collected for analysis for 2,3,7,8 TCDD. The results are presented in Appendix VI.

The marine ecology was found to be in a healthy state. The levels of 2,3,7,8 TCDD were slightly elevated above those at the control sites for this study and those found by the Ministry for the Environment in its survey of background levels of dioxins in marine biota around New Zealand. This is to be expected for a municipal sewage discharge, and the level detected is typical of those reported elsewhere.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate disposal of agricultural wastes through the outfall. Dioxin levels in marine biota are in accord with background levels elsewhere. There is no evidence of an environmental risk.

Ze Tank 3500

A known disposal site of 200 litre drums, that was rehabilitated in the 1980s..

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal data across most of the site. Anomalous data in one area indicated the possibility of a large excavation or depression approximately 55 by 20 metres, to a maximum depth of 3 metres, and with strong anomalies indicating foreign objects, possibly metallic in nature. The GPR data was further confirmed by an electromagnetic induction survey to study the conductivity of the soil. The site was in the vicinity of the known Ngahoro dump site.

Following the receipt of this information, staff of the Council carried out three excavations within the area identified by the GPR operator as being the most critical area. This excavation found a bed of logs and stumps at a depth of 3 metres, in all three excavations. There was no evidence of a drum dumpsite or of the disposal or burial of any wastes. The detailed record of the excavations is presented in Appendix VIII.

No discharges from the area into the environment in the vicinity were found.

From the investigations carried out by the Council at this site, there is no evidence of ongoing site contamination, or of an environmental risk, since the site was remediated.

Zf IWD-3 South eastern corner of site, north of Site F

A site identified by former staff as an alleged disposal site.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal soil strata data across the majority of the site. In one area there was evidence of a previous excavation and buried debris or fill material. This corresponds to the alleged placement of wastes in this vicinity. There was no evidence of a drum dumpsite.

Samples of groundwater were collected from two groundwater monitoring bores maintained on the property. They were analysed for acid herbicides and for 2,3,7,8 TCDD. The results are presented in full in Appendix VII. The results are as follows:-no acid herbicides were detected in Bore 4, to the west of this area, or in Bore 3, to the east. The limits of detection were 0.1 parts per billion.

No 2,3,7,8 TCDD was detected in either bore. The limit of detection was 2-4 parts per quadrillion.

These results are at or below background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial of drums at this site. There is no evidence of site contamination, or of an environmental risk.

The site is routinely monitored by the Council as part of an ongoing compliance monitoring programme.

Zg IWD-4 Western area, middle of site

An alleged site where drums were punctured by gun shots, identified by former staff.

No GPR survey was conducted in the area, as the allegations concerned the discharge of liquids onto the ground rather than burial, there are underground services in the area that would dominate GPR data, and iron pans in the vicinity would also interfere with the GPR data.

Site investigations conducted by plant staff since 1994, and reported on an ongoing basis to the Council, have separately identified two areas of ground with low levels of product contamination in this area. The contamination is believed to have come from leakage from stored material, but the source of the discharge (whether deliberate or not) cannot be verified. The area is not a process area.

Samples of groundwater were collected from two groundwater monitoring bores, downflow of this site (4064, 4069). The results are presented in full in Appendix IX. The results were as follows:-of the eleven acid herbicides analysed for, 2,4 DB was detected at 0.1 parts per billion, fenoprop at 0.2 ppb, and picloram at 0.6 ppb, in Bore 49A. In Bore 46A, 8 acid herbicides were detected at concentrations of less than 1.3 ppb, and picloram at 11 ppb. These results confirm the data that has been supplied to the Council since 1994, and reported publicly through the Council's annual compliance reports for the site. They show no evidence of burial or disposal of agrichemical wastes at this site. Monitoring since 1994 has shown the levels to be steadily decreasing. Given this result, and the processes of natural attenuation and degradation, it is considered that there are no grounds for environmental concern..

No 2,3,7,8 TCDD was detected in either bore. The limits of detection were 10-20 parts per quadrillion.

From the investigations carried out by the Council, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. Where there is evidence of groundwater contamination, there is no evidence of an environmental risk.

The site is routinely monitored by the Council as part of an ongoing compliance monitoring programme.

Zh Car park, Herekawe Stream

A site near the carpark near the Herekawe stream where cliff face seeps have been the subject of regular complaints to the Council.

A GPR survey was not conducted at this site.

A sample of sediment from immediately beneath the cliff face seepage was collected at this site. It were analysed for acid herbicides and for organochlorine pesticides. The results are presented in full in Appendix IX. The results are as follows:-no acid herbicides were detected in the sample. The limits of detection were 0.1 parts per million. No

organochlorine pesticides were detected at this site. The limits of detection were 0.1-0.3 ppm.

These results are at or below background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of contamination of the seep, or of an environmental risk.

Zi Herekawe cliff site (Pylon 4)

An alleged casual dumpsite.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal data across most of the site. Anomalous data in one area indicated the possibility of a couple of large objects or rock formations. The data showed no evidence of previous site excavations, a drum dumpsite, or other buried refuse.

Samples of seepage, sediment from 2 areas beneath the seepage zone, and surface soil were collected at this site. The seepage was analysed for acid herbicides and for organochlorine pesticides. The surface soil was analysed for 2,3,7,8 TCDD. This latter sample was collected from undisturbed soil, as requested by DIAG/DIN. The results are presented in full in Appendix IX. The results are as follows:- no organochlorine pesticides were detected in the seepage sample, at a limit of detection of 0.01-0.2 parts per billion. No acid herbicides were detected in the seepage sample, at a limit of detection of 0.1 ppb, except for picloram at a level of 0.2 ppb. 2,3,7,8 TCDD was detected in the surface soil sample at a level of 8.1 parts per trillion. The New Zealand agricultural guideline is 10 ppt, and the residential guideline is 1500 ppt.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of an environmental risk.

Zk Jury site

An alleged site relating to the existence of a large concrete bunker.

A GPR survey was not conducted at this site. Following a detailed site inspection, it was considered that there were no grounds to pursue investigations on this site any further.

Photographic analysis identified where a large bunker on the former IWD farm had been located. The bunker probably relates to this allegation (see page 7).

From the investigations carried out by the Council at this site, it was concluded that the original allegations concerned other sites rather than this one. There is no evidence of inappropriate burial or disposal of agrichemical wastes at this site.

5. Summary

This report represents the completion of Stage Two of the Council's investigations into allegations of the existence of dump sites arising from the inappropriate disposal of agrichemical waste from the Ivon Watkins Dow plant on Paritutu Road, New Plymouth.

The disposal of such wastes, contaminated in particular with dioxin as a byproduct of the manufacture of herbicides 2,4,5-T and 2,4-D was alleged to have occurred between 1960 and 1980.

Stage One of the Council's investigations was the establishment of the 36 possible locations of such sites for further investigation.

The purpose of Council's action in Stage Two of this investigation was firstly to ascertain whether there was any environmental risk arising from any of the identified potential dump sites and secondly to ascertain whether any inappropriate dumping or disposal had occurred.

The sites identified for further investigation in Stage Two fell readily into four groupings. The first grouping covered 11 sites currently or historically held by IWD. All of these sites were known to and had been previously investigated by the Council, indeed five of the sites were the known dump sites rehabilitated in the 1980s.

The second grouping was of six sites where alleged historic surface contamination from stormwater from the IWD plant had occurred. The allegations on these sites did not involve dumping or burial of contaminated waste.

The third grouping of seven sites were known municipal landfills and sewage discharge outfalls operating during the period 1960 to 1980. With each of these sites there is no direct link to IWD. If disposal of contaminated wastes occurred it was in all probability in accordance with the standards of the time and undertaken by a range of parties ie, contractors, councils and the company.

The fourth grouping of twelve sites centres on alleged substantial dump sites and alleged contaminated seepages. This grouping was of sites generally not known or previously investigated by the Council and was identified in the course of the Stage One interviews.

Table 3 contains the recommendations and conclusions with respect to each site sorted by the groupings identified.

Table 3 Summary of recommendations

Group 1 IWD premises (current and historical)	
F	IWD-1 From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.
U	IWD-2 From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial of agrichemical wastes at this site. There is no evidence of an environmental risk.
Zf	IWD-3 From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial of drums at this site. There is no evidence of site contamination, or of an environmental risk.
Zg	IWD-4 From the investigations carried out by the Council, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. Where there is evidence of groundwater contamination, there is no evidence of an environmental risk.
M	Beach Road-1 From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.
N	Waireka Rehabilitated Dumpsite

	From the investigations carried out by the Council at this site, there is no evidence of an environmental risk arising from the low level continuing discharge of groundwater and leachate at this site.
R	Beach Road-2 From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site since the removal of known wastes and remediation. There is no evidence of site contamination, or of an environmental risk.
Z	Ngahoro From the investigations carried out by the Council at this site, there is no new evidence of inappropriate disposal of agrichemical wastes at this site, other than that already known and remediated. There is no evidence of a significant environmental risk.
Ze	Tank 3500 From the investigations carried out by the Council at this site, there is no evidence of ongoing site contamination, or of an environmental risk, since the site was remediated.
Zb	Buller Street From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of contamination above recognised guidelines, or of an environmental risk.
Zc	Tarahua Road Following a detailed site inspection and discussion with the current owner, no further investigations were considered justified or were undertaken. The site is effectively capped by buildings and paved areas, such that there is no risk pathway even if contamination did exist.
Group 2 Alleged IWD stormwater discharges	
D	34 Rangitake Drive From the investigations carried out by the Council at this site, there is no evidence of the use of this site as a drum dumpsite or for the inappropriate burial or disposal of agrichemical wastes. Council staff will liase with the site owner if any further work to determine the nature of the objects shown in the GPR data is desired. There is no evidence of site contamination, or of an environmental risk.
Da	44 Rangitake Drive From the investigations carried out by the Council at this site, there is no evidence of the use of this site as a drum dumpsite or for the inappropriate burial or disposal of agrichemical wastes. Council staff will liase with the site owner if any further work to determine the nature of the objects shown in the GPR data is desired. There is no evidence of site contamination, or of an environmental risk.
L	23C Taurangi Place From the investigations carried out by the Council at this site, there is no evidence of inappropriate disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.
P	26A Rangitake Drive From the investigations carried out by the Council at this site, there is no evidence of the use of this site as a drum dumpsite or for the inappropriate burial or disposal of agrichemical wastes. Council staff will liase with the site owner if any further work to determine the nature of the objects shown in the GPR data is desired. There is no evidence of site contamination, or of an environmental risk.
V	Centennial-2 From the investigations carried out by the Council at this site, there is no evidence of inappropriate discharge of agrichemical wastes at this site. There is no evidence of an environmental risk.
W	Herekawe Stream From the investigations carried out by the Council at this site, there is no evidence of any effects arising from inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of contamination, or of an environmental risk.
Group 3 Municipal waste disposal systems	
G	Marfell Park (landfill) From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical-contaminated wastes at this site. There is no evidence of contamination of the site by such wastes, or of an environmental risk.
H	Ngamotu Domain (landfill)

	From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical-contaminated wastes at this site. There is no evidence of contamination of the site by such wastes, or of an environmental risk.
O	Pioneer Road Another identification of the Ngamotu Domain site (see site H).
I	7A Squire Place From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.
Q	Rifle Range Road/Bewley Road (landfill) From the investigations carried out by the Council at this site, there is no evidence of the use of this site as a drum dumpsite, or of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of contamination of the site by agrichemicals, or of an environmental risk.
T	Colson Road landfill From the routine ongoing monitoring carried out by the Council at this site, there is no evidence of the use of the site as a drum dumpsite, or of the inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of contamination of the site by agrichemicals, or of an environmental risk.
Zd	Tasman Sea (Elliot Street outfall) From the investigations carried out by the Council at this site, there is no evidence of inappropriate disposal of agrichemical wastes through the outfall. Dioxin levels in marine biota are in accord with background levels elsewhere. There is no evidence of an environmental risk.
Group 4 Alleged burial/seepages	
A	Lawry Street From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.
B	Seaview Road From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.
C	Pylon 3 From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site.
Ca	Centennial Drive From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.
E	Omata Reserve From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.
J	Belt Road From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical-contaminated wastes at this site. There is no evidence of site contamination, or of an environmental risk, either on the site or in the adjoining marine environment.
K	Victoria Road, Oakura A detailed site inspection by Council staff found no reason to conduct further investigations. From the investigations carried out by the Council at this site, while there was unorthodox weed control operations, there is no evidence of inappropriate burial of agrichemical wastes at this site.
Za	60 Marama Crescent From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site.
Zk	Jury site From the investigations carried out by the Council at this site, it was concluded that the original allegations concerned other sites rather than this one. There is no evidence of inappropriate burial or disposal of agrichemical wastes at this site.
X	Roto Street

	From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial of drums or disposal of agrichemical wastes at this site. There is no evidence of contamination of the seep, or of an environmental risk.
Zh	Car park From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of contamination of the seep, or of an environmental risk.
Zi	Herekawe cliff site (Pylon 4) From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of an environmental risk.

In conclusion the results of the Council's Stage Two investigation indicate:

- There is no evidence that any disposal of agrichemical wastes at sites (other than those already known as disposal sites) has led to environmental contamination. In particular, no contamination was found at or near any residential property.
- At the known sites, this investigation has confirmed what was already known or expected to be the situation, in respect of the presence and levels of some agrichemical contaminants.
- There is no evidence of environmental risk at any site, or in the marine environment in the vicinity of those sites that were on the coast.
- No new drum dumpsites have been found.

The Council at this point has no evidence that any further action is required at any of the sites investigated.