APPENDIX 5

Preliminary Site Investigation and Detailed Site Investigation

LAND DEVELOPMENT & EXPLORATION LTD.

RDT Pacific

Soil Contamination Preliminary & Detailed Site Investigation Report

For Proposed New School Site, Located at

Lot 2 DP 566 and Lot 2 DP 11280 Block XV1 Heretaunga SD, Bennett Road, Waipatu, Hastings

Project Reference: 13348: PSI/DSI
5 September 2017

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EXECUTIVE SUMMARY

A contamination preliminary and detailed site investigation (PSI & DSI) has been conducted for a piece of land located at Bennett Road, Hastings, within an area of the lot boundaries legally described '*Lot 2 DP 566 Lot 2 DP 11280 BLK XV1 Heretaunga SD*' The area of investigation is referred to in this report as 1A (as per the client supplied plans) and the subject site.

The report was prepared for our client as part of the supporting documentation for the notice of requirement. The objectives of the assessment was to identify any potential sources of contamination from past and present land use activities at the subject site and surrounding area, to determine the contamination status of soils at the subject site, and to subsequently assess compliance with the NES in regards to the possible subdivision and development of a school for preschool to high school aged children at the subject site.

We anticipate that such a development would result in a '*change of land use*' and would also result in '*land disturbance*' across the area of the development, as defined by the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES).

The investigation comprised a PSI (i.e. site history review) and DSI (i.e. intrusive soil sampling investigation).

Evidence from the site history review indicate horticulture use at the subject site and surrounding area. Therefore it is more likely than not, that A10 of the Ministry for the Environment's (MfE) Hazardous Activities and Industries List (HAIL) described as *'Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds'* has occurred as part of the historical horticultural activities undertaken on the subject site. HAIL G3 '*Landfill sites*' associated with the filling of the former swale (now infilled stream gully) within the current legal boundaries of the site was also identified, that could potentially extend across onto the subject site.

Soil sampling was therefore carried out to provide an indication of the level of contamination in the soil (if any) from contaminants that have commonly been applied as part of horticultural activities, and filling which are recognised to persistently accumulate in the soil.

All contaminant concentrations in the soil samples were below MfE's soil contaminate standards for a '*residential 10% produce*' land use scenario applicable to the proposed school development.

The soil samples results are below Hawkes Bay background concentrations, however, DDT isomers were present in the soil as a result of the historical land use at the subject site. As such a resource 'controlled activity' consent from the Hastings District Council is required under the NES in the event that consent for change of land use, subdivision and/or development related earthworks were sought.

1 INTRODUCTION

Land Development & Exploration Ltd has been engaged by RDT Pacific on behalf of the Ministry of Education to undertake a combined soil contamination Preliminary and Detailed Site Investigation (PSI and DSI) of the subject site located at Bennett Road, Hastings, within the lot boundaries legally described as '*Lot 2 DP 566 Lot 2 DP 11280 BLK XV1 Heretaunga SD.*

A contamination investigation has been undertaken at the subject site in order to determine whether it is suitable to be used as a school for children ranging in age from pre-school to high school. Currently the subject site is vacant of any structures and is in pasture. LDE considers that the speculated development of the land will be a change of land use relative to Regulation 5(6) of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES).

Additionally, it is likely that greater than 25 cubic meters of soil disturbance will occur as part of the construction of new school buildings, paved areas and access ways as part of the site development. The change of land use and the projected volume of soil disturbance are both activities covered by the NES. That combined with the discovery of soil contamination exceeding natural background levels will trigger the necessity for the school development to obtain consent from Hastings District Council (HDC) consistent with the NES. If contamination is found to exceed soil contaminant standards applicable to the intended land use the school development will required remedial action to address human health risks.

This investigation has been carried out in general accordance with the *Contaminated Land Management Guidelines No.1- Reporting on Contaminated Site in New Zealand* (Revised 2011) and *Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils (revised 2011).* The scope of the investigation is consistent with the LDE Proposal to RDC Pacific (on behalf of the New Zealand Ministry of Education,) Proposal Reference 13348 and dated 19 April 2017.

The two-part investigation included a preliminary site investigation (PSI) and a detailed site investigation (DSI). The PSI was comprised of a review of available historic aerial photographs showing the site, site specific council records, existing investigation reports, an interview with the current lessee of the site, and a walkover/inspection of the site. The DSI component of the investigation included the collection and analysis of soil samples taken at the subject site.

The objectives of the investigation were to:

- Identify any potential sources of contamination from past and present land use activities at the site which are listed on the Ministry for the Environment's (MfE) Hazardous Activities and Industries List (HAIL) (MfE, 2011)
- Assess compliance with the soil contaminate standards for the scenario school site land use (comparable to a residential land use scenario)
- Assess compliance with the NES due to the potential for subdivision, change of use of land and development related soil disturbance.

In addition to the objectives listed above, it is our intention that this report will help advise the Ministry of Education so that they can develop the site appropriately in regards to human health risks associated with the proposed school site development.

2 Site Details & Setting

2.1 Proposed Site Development

We understand that the proposed development includes:

- Constructing new school buildings and facilities for up to 300 year 1 to 13 students.
- Constructing the kohanga reo building, which has the capacity for up to 50 children.

The actual building types, layout, size, foundation systems and locations of the new buildings/facilities have not been specified at the time of this report, and among other factors, will be subject to the findings of this investigation and other site specific investigations (e.g. geotechnical). These details, once decided upon, will have bearing on the location, volume and depth of soil that will be disturbed during the development process, which may then affect the level and nature of site management planning necessary to obtain consent to undertake the development in the event that contamination is found at the site.

2.2 Site Identification and Zoning

The subject site is located at the northern end of Bennett Road, Hastings and will comprise an area of land within the current legal boundaries of *Lot 2 DP 566* and *Lot 2 DP 11280 BLK XV1 Heretaunga SD.* The area of investigation is referred to in this report as 1A and the subject site.

Refer to Appendix A for a copy of the site plan and area of investigation –1A.

The subject site is bounded by Bennett Road to the west and is currently surrounded by production land to the north, east and south of the site. Rural residential land and the

Hastings rugby and sports club are located to the west of the site. A location map is presented in Figure 1.

The site is zoned '*Plains-Zone*' in the Hastings Proposed District Plan 2015 and is part of the Heretaunga Ward.

Figure 1: Location map showing the site. Source: LINZ Data Service.

2.3 Site Description and Current Land Use

The subject site comprises flat land covered in pasture and is vacant from any structures. It is bordered to the north and east by orchards on separate properties, to the west by Bennett Road and an orchard beyond it, and pasture to the south. High hedgerows separate the subject site from the orchards on the north and east.

It should be noted here that the section of land being considered for development is a portion of a larger lot that is currently entirely pasture land. The orchards at the east of the subject site are separated from the subject site by a section of pasture. Refer to the aerial image of the site in Figure 2. The neighbouring and surrounding properties generally comprise of horticultural and lifestyle blocks with residential dwellings.

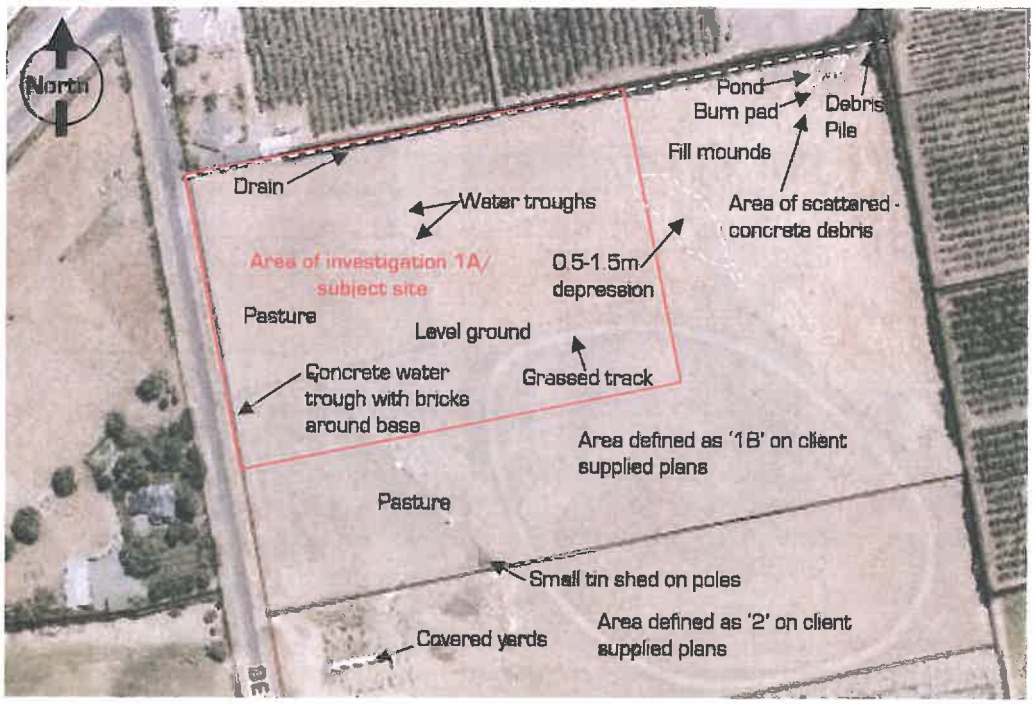

Figure 2: Subject site and surrounding features and current land use. 2017 photograph, source: HDC GIS database approximate area of investigation (1A) shown inside red border.

2.4 Geology

The New Zealand Geology Web Map by GNS[1] science identifies the site as being underlain by '*poorly consolidated alluvial gravel, sand and mud*'.

2.5 Hydrology

The Ruahapia Stream is located approximately 400m south of the subject site.

Groundwater was encountered at 1.9 to 2.4m bgl in the geotechnical boreholes undertaken in June 2017 by LDE.

3 Preliminary Site Investigation

A desktop assessment was undertaken to provide an overview of any potential contaminants of concern that may be present at the site as a result of any documented past and present activities.

The following information was reviewed in order to establish the history of the site:

- Contamination related records held by Hawkes Bay Regional Council (HBRC)
- Hasting District Council (HDC) property file

[1]GNS Science New Zealand Geology Web Map: http://data.gns.cri.nz/geology/. Retrieved April 2017.

- Certificate of Title
- Historical aerial photographs
- An anecdotal account of site history and current land use

3.1 Hawke's Bay Regional Council Information

Andrew Gass, an Environmental Officer at the HBRC has confirmed that the site (area within the legal lot boundaries) is not currently listed in the HBRC landuse register. Andrew has also stated the following: "*I have also searched our incidents database and have found one from 2001 that may affect the property. It identified some fill being placed in a natural detention dam but is not location specific. From discussions with Council Staff, it appears this fill was not known to be contaminated*".

Refer to the email correspondence in Appendix B.

3.2 HDC Property File Information

The Hastings District Council (HDC) property file was electronically reviewed in April 2017. The property file contained three documents, two of which were associated with the application and documents for sheds which are not located within the area of investigation. The other document appeared to be administrative related.

The documents in the property file did not provide any evidence of actual or potential contaminating activities having occurred or occurring at the subject site.

A screen snip showing a list of the documents held within the property file, as of April 2017 is shown in Appendix C.

3.3 Historic Aerial Imagery

Aerial images from 1949 to 2016 made available on the HDC GIS, Retrolens.nz and Google Earth have been analysed as part of this investigation. A summary of our review of these images is shown below. Copies of the pertinent sections of the available photographs are presented in Appendix D.

1949 Photograph – The subject site is vacant from any structures, and appears to be in pasture. A swale/stream gully is located within the legal lot boundaries of the site on the land defined as 1B. It appears as though the swale is located close to the subject site boundary at the east but it doesn't appear as though the swale extends across onto the subject site (1A). Fence lines can be seen sectioning off portions of the part of the site intended for the school development.

The neighbouring property to the west appears to be used for cropping and includes a small building, the neighbouring property to the northeast comprises of a number of small to medium sized structures (assumingly dwellings and sheds/garages) with surrounding pastoral land, and the neighbouring properties to the northwest, east and south are vacant and also comprise of pastoral land.

1969 Photograph - The site remains vacant of any structures, the swale is still evident on the 1B land but less defined in this photograph. The fencing layout has changed. A change in ground cover is noted associated with the fencing change, where a distinct area, rectangular shape can be seen across the majority of the subject site, but falls short of the eastern boundary of the subject site..

Buildings are now evident on the neighbouring land to the northwest and south of the site. The land use on the neighbouring land to the east of the site appears to be horticultural.

1974 Photograph - The subject site remains vacant, however, once again the fencing arrangement has changed and a vertical strip of land at the east of the subject site shows a change in ground cover. It is uncertain what this strip of ground cover comprises. The swale is still present within the 1B land.

There is generally no change in land use across the neighbouring properties.

1977 Photograph –It now appears as the subject site is covered in pasture, as the strip of differing ground cover is no longer evident in this photograph. The swale is still present within the 1B land.

The neighbouring properties generally remain unchanged.

1999 Photograph – Three photographs intercept at the location of the site, this makes the 1999 image illegible and the land use at this point in time unclear.

2004, 2008, 2010/2011, 2014 and 2017 Photographs - The high resolution colour photos taken between 2004 and 2017 show little change at the site over this time period except that by 2004 the area of the site targeted for development has been divided into a number of smaller pastures by fencing.

The swale identified in the earlier photographs as located on the 1B land (close to the subject site boundary to the east) appears to have been filled in.

The subject site remains vacant from any structures, and no stock or horticultural activities are noted. The northern part of a circular shaped track is first noted in the 2008 photograph and remains present to the 2017 photograph. The recent aerial photographs document that for more than two years high hedgerows have separated the subject site from orchards on neighbouring properties to the north and east.

No significant changes are noted on the adjacent and surrounding land over this time period.

3.4 LDE Geotechnical Investigation

Installation of hand augered boreholes at the subject site for a geotechnical investigation undertaken by LDE in June of 2017 (report reference 13348) generally describes the upper 2m of soil profile as silts underlain by sand.

We note that the borehole labelled 'HA03' was located near the eastern boundary of the subject site (on 1A located near to the former swale located on 1B). No fill was recorded within HA03 or in any other boreholes undertaken at the site during the geotechnical investigation. An extraction from the LDE geotechnical report showing the location and borehole log for HA03 is included in Appendix E.

3.5 Interview with Lessee

Richard Hunt was interviewed in June 2017, Richard has leased the land from the Aorangi Maori Trust Board from around the 1980's. During this time Richard has used the site for cropping (peas and beans), however, cropping has not occurred on the site for more than two years. More recently the site has been used for grazing. Richard stated that Percy (surname unknown and deceased), leased the land prior to this and thought that Percy had also used the site for cropping.

Richard stated that there were no above or below fuel tanks on site, and when asked about pesticide use, said that it was more than likely they were used across the site.

3.6 Certificate of Title

The current title was issued on the 2nd of March 1966 to the proprietors, Aorangi Maori Trust Board. Refer to Appendix F showing the certificate of title.

4 Site Walkover Assessment

An initial walkover inspection was undertaken on 25 May 2017 as part of the PSI. The subject site was in pasture but no stock were present on the site during the walkover assessment. The subject site generally comprised flat topography. Refer to Figures 3 and 4.

Figure 3: Photograph taken facing southwest towards Bennet Road.

Figure 4: Photograph taken facing north, across to the neighbouring property.

No HAIL activities were noted to be currently occurring on the subject site (1A). The current land owner has reported that cropping of peas and beans has occurred on the subject

property, however more than two years has passed since the last crop, and since then the land has been pasture.

The land immediately to the east of the subject site, shown as 1B on the client supplied plan (refer to Appendix A) is undulating (Figure 5). A depression of around 0.5 to 1.5m located outside the area of investigation, a small portion of the depression may extend across onto the eastern boundary of the subject site.

During the site walk over the potential for overspray of pesticides onto the site from neighbouring orchards was considered. However, owing to the distance between the subject site and the orchards located east and west of the site, and the height of the hedge row separating the subject site from the orchard to the north, it is considered unlikely that overspray migration of pesticides would have occurred.

It was unclear during the site walkover if the filling of the swale, formerly located across area of 1B (east of the subject site but with the current legal lot boundaries) impacted the subject site.

Figure 5: Photograph taken on adjacent land (1B). Photograph taken in the northeast direction.

5 Summary Potential HAIL Activities Identified

Table 1 shows a summary of potential HAIL activities that have been identified during the site walkover investigation and from the desktop study undertaken at the site.

Table 1: HAIL activities identified at the site.

Land Use/Activity	HAIL	Description	Potential Contaminants
Potential for historical pesticide use at the site.	A10	*Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds*	Arsenic, lead, copper, DDT lead, mercury; wide range of organic compounds including organochlorines.
Filling of the former swale/stream gully located on the land described as 1B has occurred. A small portion of the filling may have extended onto the subject site (1A).	G3	*Landfill sites*	Dependent on origin of fill; potentially heavy metals, polycyclic aromatic hydrocarbons, and pesticides

6 Detailed Site Investigation

Based on the findings of the PSI, it was determined that further investigation was required in order to establish if significant contamination is present at the subject site that could impede or prohibit the development of the site into a child educational facility. To that end, our investigation was designed to establish whether the site soil has contaminant concentrations exceeding the soils contaminate standards applicable to residential land use (outlined in MfE's guidance document), and to determine the type of consent that will be required for the earthworks and change of land use inherent with the proposed site development.

6.1 Contaminants of Concern

Potential contamination sources identified in the PSI are associated with horticultural activities undertaken at the subject site and from overspray from neighbouring properties. Heavy metals, mercury, organochlorine, organophosphorus and organonitrogen pesticides may have been used as part of the horticultural activities undertaken at the site. However, it has been more than two years since the last cropping, and that is beyond the persistence period organophosphorus and organonitrogen pesticides. Therefore those two categories of contaminants are not considered of concern for this site.

Historical filling has occurred to level and infill the swale formerly located across the area shown as 1B on the client supplied plan. It is not known where the fill was sourced from. A small portion of this filling may have extended across onto the subject site (1A) as the swale was located close to subject site eastern boundary. Dependent on the origin of the fill material, potential contaminants could include heavy metals, polycyclic aromatic hydrocarbons (PAH), and persistent organochlorine pesticides.

6.2 Field Investigation

The field investigation included the systematic collection of 18 surface soil samples (S1 to S18) for the former cropping land use at the subject site.

Although no fill was identified in the geotechnical investigation soil logs, to be conservative, two additional surface soil samples (S19 to S20) were collected to target any potential historical filling of the former swale which may have extended onto the subject site.

All the soil samples were collected from a depth of 0.0 m to 0.15 m below the ground surface (bgs) across the site. The approximate sampling locations are depicted on Figure 6.

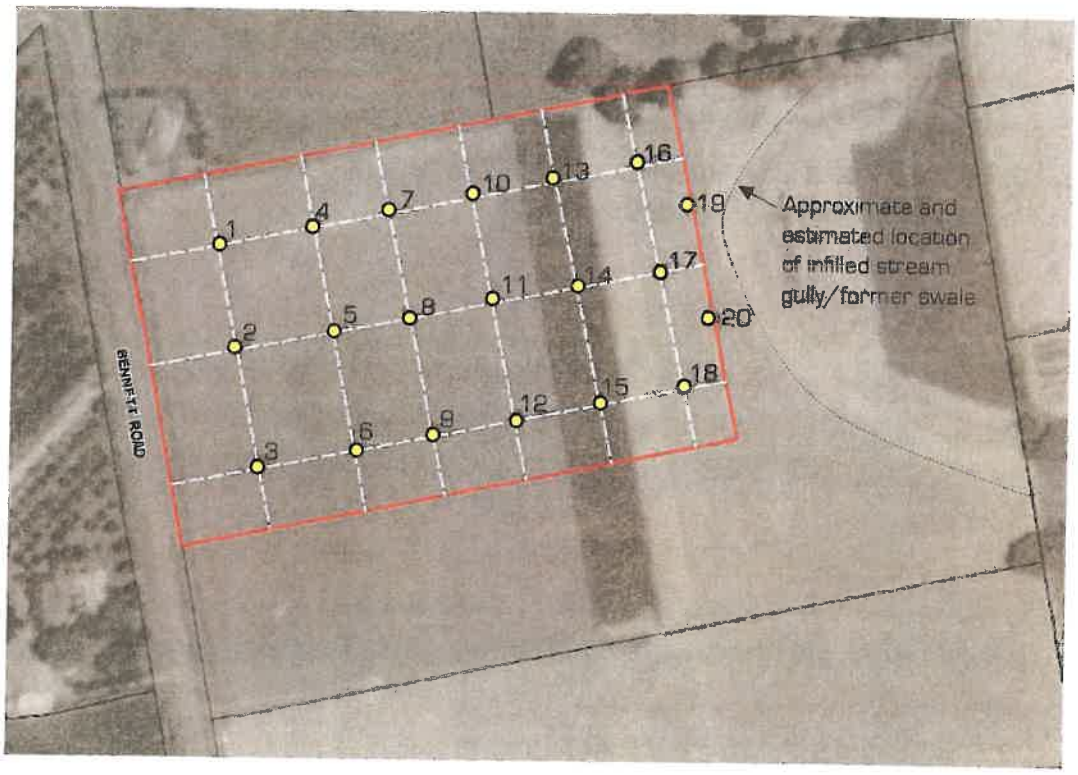

Figure 6: Soil sampling site plan, shown on the 1974 historical aerial photograph (Source HDC GIS).

At each surface soil sample location, samples were collected using a pre-cleaned steel hand trowel. The hand trowel was cleaned using water and dried between samples to prevent cross contamination. Shallow soil was homogenised with gloved hands. All samples were placed into labelled jars supplied by Analytica Laboratories. Following collection, the samples were placed immediately into a chilly bin containing frozen ice packs. The chilly bin was sent with chain of custody documentation on the same day as collection to Analytica Laboratories located in Hamilton.

The field investigation was undertaken on the 1st of June 2017 by LDE and the samples were received the following day after shipment. The chain of custody documentation is attached in Appendix G.

6.3 Exposure Scenario

There are no New Zealand or international soil contaminant standards specifically applicable to the exposure scenarios associated with schools. However, the '*Technical Review Group (MfE, 2005) suggested that early childhood centres should be included under either the residential or high-density residential land uses, depending on how much paving the site had (while acknowledging that the residential land-use scenario includes produce consumption), but that calculations should be performed to determine the best fit.*'[2]

Based on the conceptual site model and taking into consideration the methodology for deriving contaminant levels, and the proposed development at the site (with the potential for growing vegetables), we've determined a conservative land use scenario of *'Residential (10% home grown produce)'* is applicable to the site.

6.4 Selected Guideline Values

The NES references the *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health* (MfE, 2011) with regard to establishing a national risk-based methodology for deriving soil contaminant concentrations protective of human health.

Following the guidance, the Soil Contaminant Standards (SCS) for selected priority contaminants for non- priority contaminants guidelines values were selected following the Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values (Revised 2011) as screening criteria for the risk to humans at the site and to inform on-site management actions. If exceeded, further investigation and a Tier 2 assessment would be considered.

No applicable New Zealand guideline criteria exist for some of the tested metals (i.e. nickel and zinc) and therefore Health Investigation Level (HIL) values form the Australian Guideline on the Investigation Levels for Soil and Groundwater[3] have been used under the residential land use scenario as outlined in the MfE document.

The soil samples were tested at the laboratory for total chromium. However, the Methodology document distinguishes between the stable chromium III and the potentially

[2] Ministry for the Environment. 2011. *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health.* Wellington: Ministry for the Environment.

[3] National Environmental Protection Council (NEPC), 1999, Guideline on the Investigation for Soil and Groundwater.

toxic and less stable chromium VI. For the purposes of this analysis all total chromium results have been conservatively compared to the chromium VI.

6.5 Soil Sample Results

Table 2 summarises the laboratory results for heavy metals and mercury. All the soil samples collected across the subject site are below the soil contaminate standards (SCS) for a '*residential 10%*' land use and they are also below the Hawkes Bay Region derived background soil concentrations (HB BG).

Table 2: laboratory tests (heavy metal suite and mercury) compared against the soil contaminant standards (SCS) for a 'residential' land use and background concentrations from the Hawkes Bay.

Sample Name	As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
S1	5.61	0.12	14	18.1	15.1	11.6	62	0.041
S2	5.14	0.13	14	23.5	14.5	11.5	61.6	0.046
S3	5.8	0.1	15.6	20.9	15.7	12.8	68.4	0.044
S4	6	0.1	15.4	21.9	16.5	12.9	66.2	0.043
S5	5.38	0.11	14.5	20.7	14.7	11.8	63.4	0.042
S6	5.26	0.11	13.6	19.9	13.9	11.4	64.2	0.043
S7	6.68	0.13	17	24.3	17.6	14.8	75.6	0.05
S8	5.89	0.13	14.9	21.8	15.1	12.9	68.1	0.045
S9	5.27	0.1	14.3	20.4	14.1	11.5	61.3	0.047
S10	6.7	0.12	15.9	22.8	16.6	13.9	71.2	0.048
S11	5.3	0.12	14.5	20.2	15	11.5	62.2	0.034
S12	5.37	0.12	14.2	20.9	14.9	11.4	62.9	0.036
S13	6.69	0.13	15.6	20.9	17	13.8	73.4	0.041
S14	5.62	0.11	15	17.2	15.7	11.6	64.7	0.045
S15	5.2	0.11	14.2	17.9	14.5	11.6	63.2	0.043
S16	5.6	0.14	15.1	14.5	16.2	11.4	64.2	0.043
S17	5.36	0.12	14.8	13.1	16.6	11.4	61.2	0.05
S18	5.26	0.13	14.7	13.5	15.4	11.5	60.5	0.055
S19	5.94	0.13	16.6	14.7	17.9	11.4	60.4	0.047
S20	5.63	0.13	15.2	14.4	16.6	13.1	67.4	0.061
SCS	20	3	460	NL	210	400	7400	310
HB BG	9	0.7	24	32	27	17	105	-

1. All results, standard values and background concentrations are presented in mg/kg
2. All metals tested for 'Total Recoverable' at screen level
3. Methodology for Deriving Soil Guideline Values Protective of Human Health (MfE, 2011)
4. 'Residential A' values - Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 1999)
5. NL – 'No Limit'. Derived value exceeds 10,000 mg/kg.
6. NA – 'Not Applicable'. Indicates estimated criterion exceeds 20,000mg/kg, at which point residual separate phase is expected to have formed within the material.
7. Hawke's Bay region background soil concentration (HB BG)

Trace levels of organochlorine pesticides (DDT isomer 4,4-DDD) were detected in soil samples S16 and S20 with concentrations of 0.006 mg/kg and 0.007 mg/kg, respectively. The organochlorine pesticide concentrations are well below SCSs applicable to the subject site. No other organochlorine pesticides were detected in any of the other soil samples collected at the subject site. As organochlorine pesticides do not occur naturally we know they have been introduced through land use activities.

Soil sample S19 and S20 were tested for polycyclic aromatic hydrocarbons (PAH) per MfE guidance for uncontrolled fill. There was no detection of PAH (above the lab's reporting limit) in the soil samples. No uncontrolled fill was visually evident in the surface soil samples collected across the site, or specifically at S19 and S20.

A full copy of the laboratory test results is provided in Appendix H.

7 DSI Conclusions

The laboratory soil analysis shows the presence of trace levels of organochlorine pesticides. As such we consider it likely that chemicals have been applied at the site through historical horticulture and activities related to HAIL activity 'A10' likely though spray application. Therefore the NES applies to the '*piece of land*'.

The results are all within the soil contaminate standards (SCS) for a '*residential 10% produce*' land use which is applicable to the proposed school development.

We consider that due to the low level of contamination concentrations identified, and the nature of contamination, that further testing is unnecessary.

8 Recommendations

Based on the findings of the preliminary and detailed site investigations we consider that the proposed development on the piece of land is suitable. However, a resource consent under the NES for the change of land use from the Hastings District Council for a 'controlled activity' is required.

Earthworks associated with the construction of access ways and building platforms is likely to occur if the proposed development is to proceed. In the event that greater than 25 m^3 of soil disturbance occurs within a 500 m^2 area of the site, and/or greater than 5 m^3 of soil is exported from the site for disposal, the development project will also require an earthworks consent under the NES as a 'controlled activity'. Since DDT Isomers were detected in the soil,

any soil exported off the site for disposal cannot be considered clean fill and therefore it will have to be disposed of at a managed or licensed land fill.

We note that in order to meet the requirements of a controlled activity this report shall be submitted to the Hastings District Council as part of the resource consent application for the change of land use and/or soil disturbance.

8.1 Additional Recommendations

As requested by our client, the PSI/DSI solely covered the area defined as 1A on the client supplied site plan, this was referred to in the report as the subject site.

If a subdivision was required to legally define the areas of 1A, 1B and 2, then resource consent under the NES would be required unless the land was deemed 'production land', and the HAIL activities identified on the 1B land would need to be investigated further.

9 Report Limitations

This investigation presents a preliminary and detailed site investigations of the potential for ground contamination, prepared exclusively for RDT Pacific on behalf of the Ministry of Education with respect to the particular brief given to us. The report is intended to be used as part of the supporting documentation for the notice of requirement from MfE.

Information, opinions and recommendations contained in it cannot be used for any other purpose or by any other entity without our review and written consent. Land Development & Exploration Ltd accepts no liability or responsibility whatsoever for or in respect of any use or reliance upon this report by any third party.

Opinions given in this report are based on a review of existing data, evidence gathered during a site walkover, anecdotal information and specific soil sampling at discrete locations.

There is still some possibility that contaminating activities have taken place or contamination at the site is in excess of that described in this report and we should be contacted immediately if the conditions are suspected to differ from that described.

For and on behalf of LDE Ltd

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Find out more about LDE professionals

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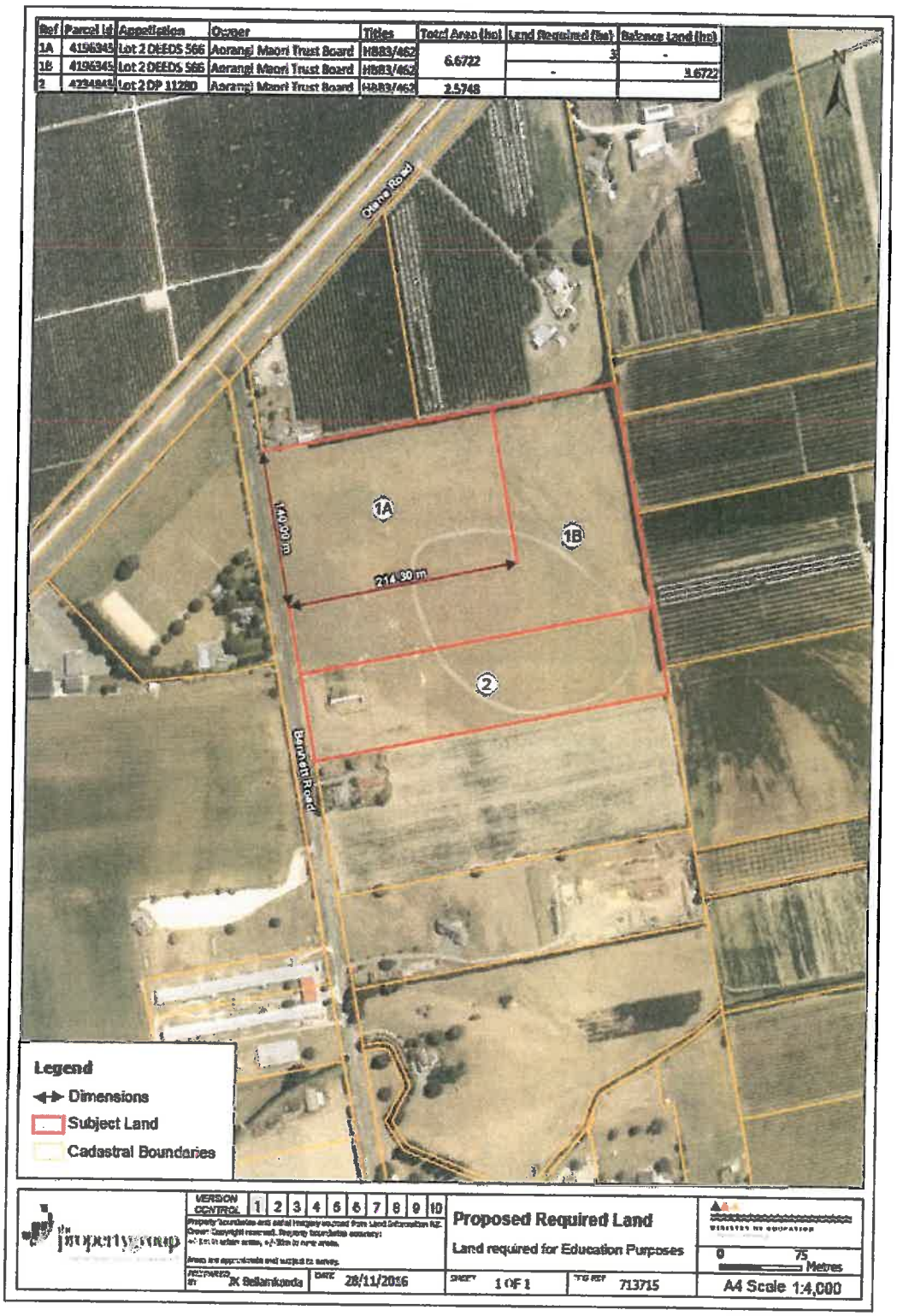
APPENDIX A: SITE PLAN AND AREA OF INVESTIGATION – 1A

Ref	Parcel Id	Appellation	Owner	Titles	Total Area (ha)	Land Required (ha)	Balance Land (ha)
1A	4196345	Lot 2 DEEDS 566	Aorangi Maori Trust Board	HBB3/462	6.6722	3	-
1B	4196345	Lot 2 DEEDS 566	Aorangi Maori Trust Board	HBB3/462		-	3.6722
2	4294845	Lot 2 DP 11280	Aorangi Maori Trust Board	HBB3/462	2.5748		



APPENDIX B: HBRC EMAIL CORRESPONDENCE

Sarah Harding

From: Andrew Gass <andrewg@hbrc.govt.nz>
Sent: Thursday, 11 May 2017 11:28 a.m.
To: Sarah Harding
Subject: RE: HBRC Land Use Register - Bennett Road, Hastings

Follow Up Flag: Follow up
Flag Status: Completed

Hi Sarah,

I can confirm the property below at Bennett Road is not currently listed in the HBRC landuse register.

Note: The register is a list of sites which may have stored or used hazardous substances and was compiled from an old telephone book survey and is not an accurate or up to date list of sites. Where the property is rural land, consideration will need to be given as to whether the property has the potential for contamination due to having a historical sheep dip, farm tip, fuel storage tanks or possible pesticide contamination. As new information about sites becomes available the status of the sites may change.

I have also searched our incidents database and have found one from 2001 that may affect the property. It identified some fill being placed in a natural detention dam but is not location specific. From discussions with Council Staff, it appears this fill was not known to be contaminated.

Kind regards,
Andrew

Please help us to improve our service to you by taking this short survey - https://www.surveymonkey.com/r/QRZXDYZ - thank you.

Andrew Gass
Environmental Officer– Resource Management Group
Hawke's Bay Regional Council
159 Dalton Street | Private Bag 6006 | Napier 4142
06 835 9030 | 027 201 4515
www.hbrc.govt.nz | Fb HBRegionalCouncil

HAWKE'S BAY REGIONAL COUNCIL

The Resource Management Group of the Hawke's Bay Regional Council is ISO 9001:2008 certified

APPENDIX C: HDC PROPERTY FILE – SCREEN SNIP

Documents for Property 55294

Help New Search

Date	Title	Trim Ref	Size	Type	
27/06/2003	ABA9826 AO PLANS 01-02	#005	2.15 MB	TIF	
26/06/2003	ABA9826 Erect Implement Shed 1983	#004	0.13 MB	TIF	
7/07/2003	CS (Property ID 55294)	#003	0.03 MB	TIF	

APPENDIX D: HISTORIC AERIAL PHOTOGRAPHS

Figure 7: '*Manateretere 1949*'. Source: HDC GIS database. Approximate area of investigation (1A) is shown in red.

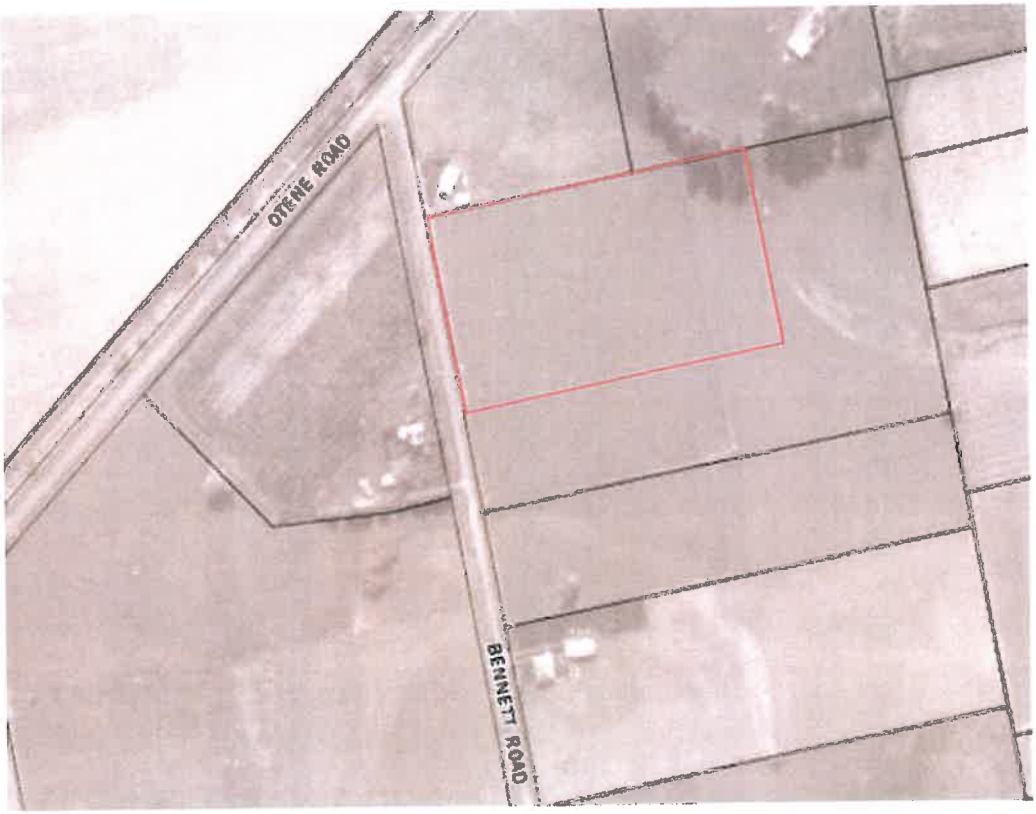


Figure 8: '*Whakatu Mangateretere 1969*'. Source: HDC GIS database. Approximate area of investigation (1A) is shown in red.

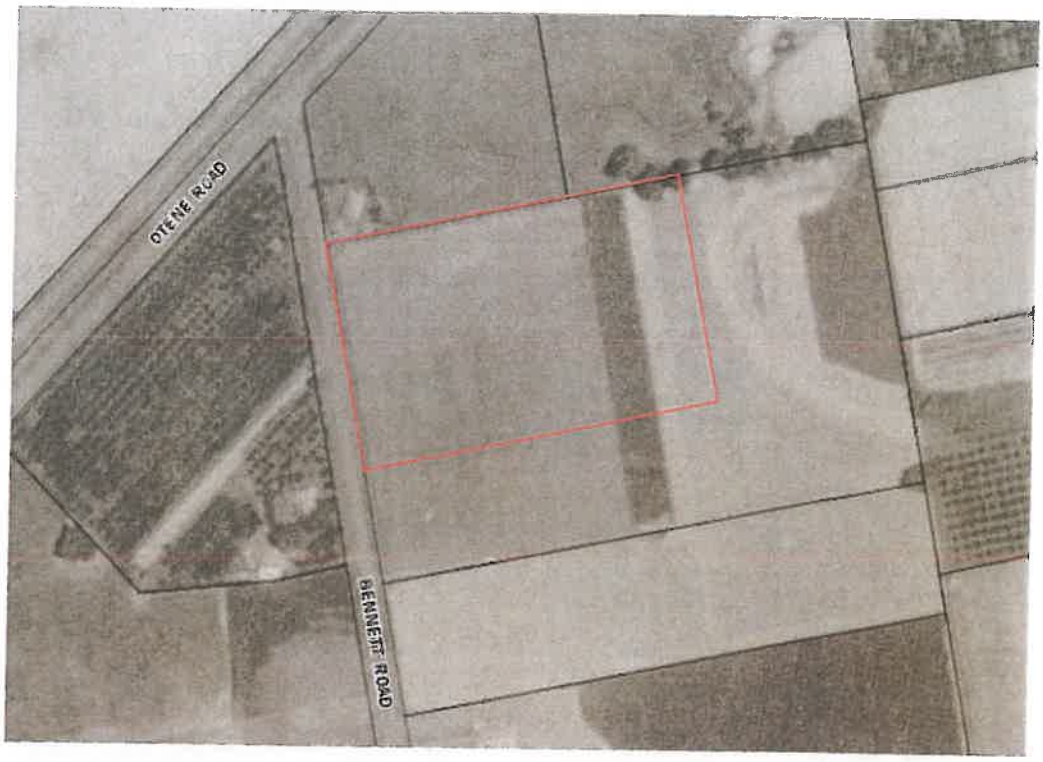


Figure 9: '*Tomoana 1974*'. Source: HDC GIS database. Approximate area of investigation (1A) is shown in red.

Figure 10: '*Whakatu Pakowhai 1977*'. Source: HDC GIS database. Approximate area of investigation (1A) is shown in red.

Figure 11: 1999 photograph. Source: HDC GIS database. Approximate area of investigation (1A) is shown in red.

Figure 12: 2004 photograph. Source: HDC GIS database. Approximate area of investigation (1A) is shown in red.

Figure 13: 2008 photograph. Source: HDC GIS database. Approximate area of investigation (1A) is shown in red.

Figure 14: '*2010/2011*' photograph. Source: HDC GIS database. Approximate area of investigation (1A) is shown in red.

Figure 15: 2014 photograph. Source: HDC GIS database. Approximate area of investigation (1A) is shown in red.

Figure 16: 2017 photograph. Source: HDC GIS database. Approximate area of investigation (1A) is shown in red.

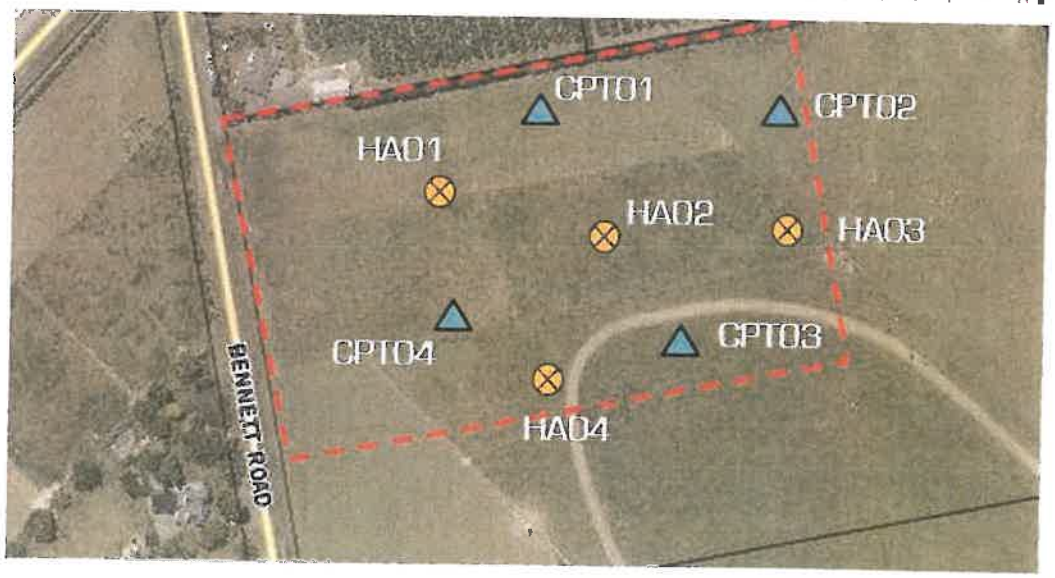
APPENDIX E: GEOTECHNICAL BOREHOLE LOG AND LOCATION FOR HA03

BOREHOLE LOG

Client: RDT Pacific Ltd	Project: Geotechnical Investigation	BOREHOLE No: HA3
Project Location: Bennett Road, Hastings	Borehole Location: Refer to Site Investigation Plan	LDE Project No: 13348
Co-ordinates: mN mE	Drill method: 50mm handauger	Hole started: 5/09/2017 Hole completed: 5/09/2017 Drilled by: B.Archer Logged by: B.Archer

Depth (m)	Graphic	Moisture	Strength	Soil Description	Geology
0.0		M-W		SILT, brown, moist to wet	Organic Topsoil
0.1					
0.2			VF		
0.3					
0.4		M		SILT, trace sand, light brown, moist	Weathered Alluvium
0.5					
0.6					
0.7					
0.8					
0.9					
1.0					
1.1					
1.2					
1.3				some clay	
1.4					
1.5					
1.6					
1.7					
1.8		W		wet	
1.9					
2.0				yellowish brown	
2.1					
2.2					
2.3					
2.4		S		SAND, grey, saturated	
2.5					
2.6					
2.7					
2.8				End of Borehole @ 2.8m	
2.9				Unable to complete borehole due to saturated sand inflow	
3.0				Water table @ 2.4m	

Undrained Shear Strength (kPa)



APPENDIX F: CERTIFICATES OF TITLE

COMPUTER FREEHOLD REGISTER
UNDER LAND TRANSFER ACT 1952
Limited as to Parcels

Search Copy

R.W. Muir
Registrar-General of Land

Identifier	**HBB3/462**
Land Registration District	**Hawkes Bay**
Date Issued	02 March 1966

Prior References
HB118/147 HBB1/568

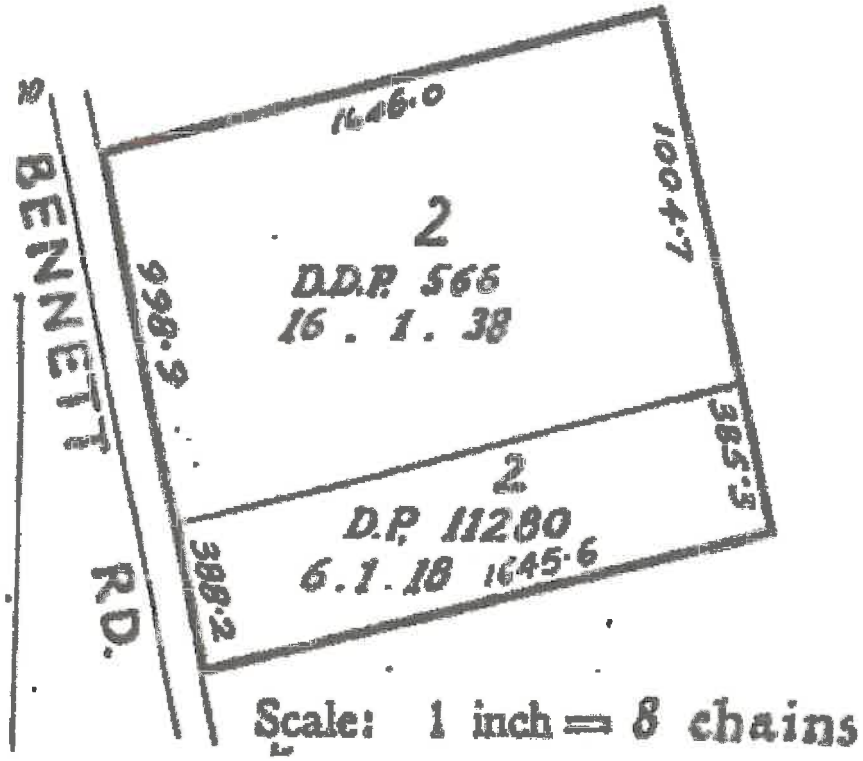
Estate	Fee Simple
Area	9.2471 hectares more or less
Legal Description	Lot 2 Deeds Plan 566 and Lot 2 Deposited Plan 11280

Proprietors
Aorangi Maori Trust Board

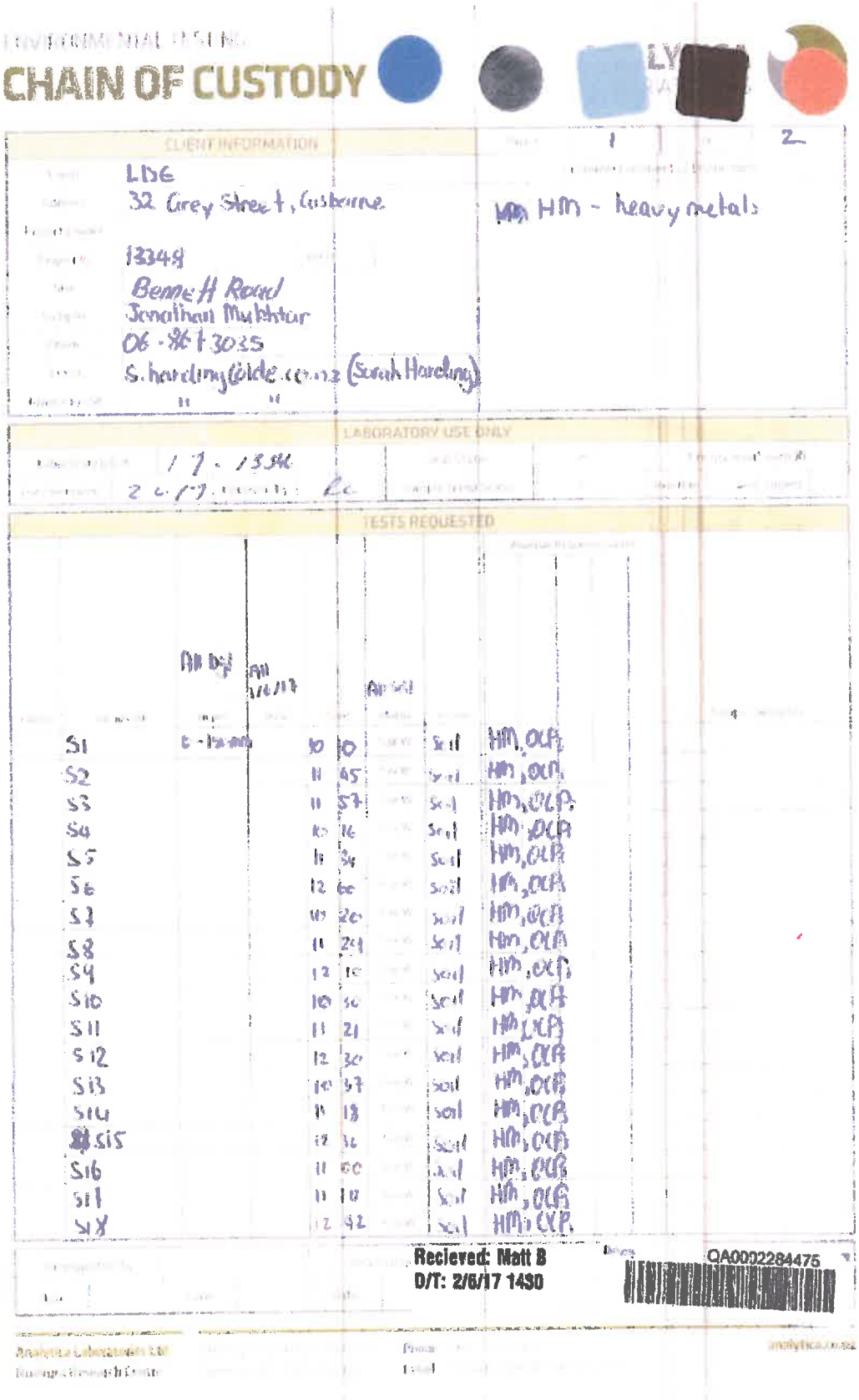
Interests
Subject to Section 36 (4) Counties Amendment Act 1961
9935339.1 Mortgage to Bank of New Zealand - 22.12.2014 at 9:05 pm

Transaction Id *49888762*
Client Reference *713715*

Search Copy Dated 17/03/17 11:40 am, Page 1 of 1
Register Only


BENNETT RD.
1646.0
1004.7
998.9
2
D.D.P. 566
16. 1. 38
345.5
2
D.P. 11280
6.1.18 1645.6
388.2
Scale: 1 inch = 8 chains

APPENDIX G: CHAIN OF CUSTODY RECORD



ENVIRONMENTAL TESTING

CHAIN OF CUSTODY

CLIENT INFORMATION

LDE
32 Grey Street, Gisborne
13348
Bennett Road
Jonathan Mubhtar
06-868 3035
S.hardingwilde.co.nz (Sarah Harding)

1 2

HM HM - heavy metals

LABORATORY USE ONLY

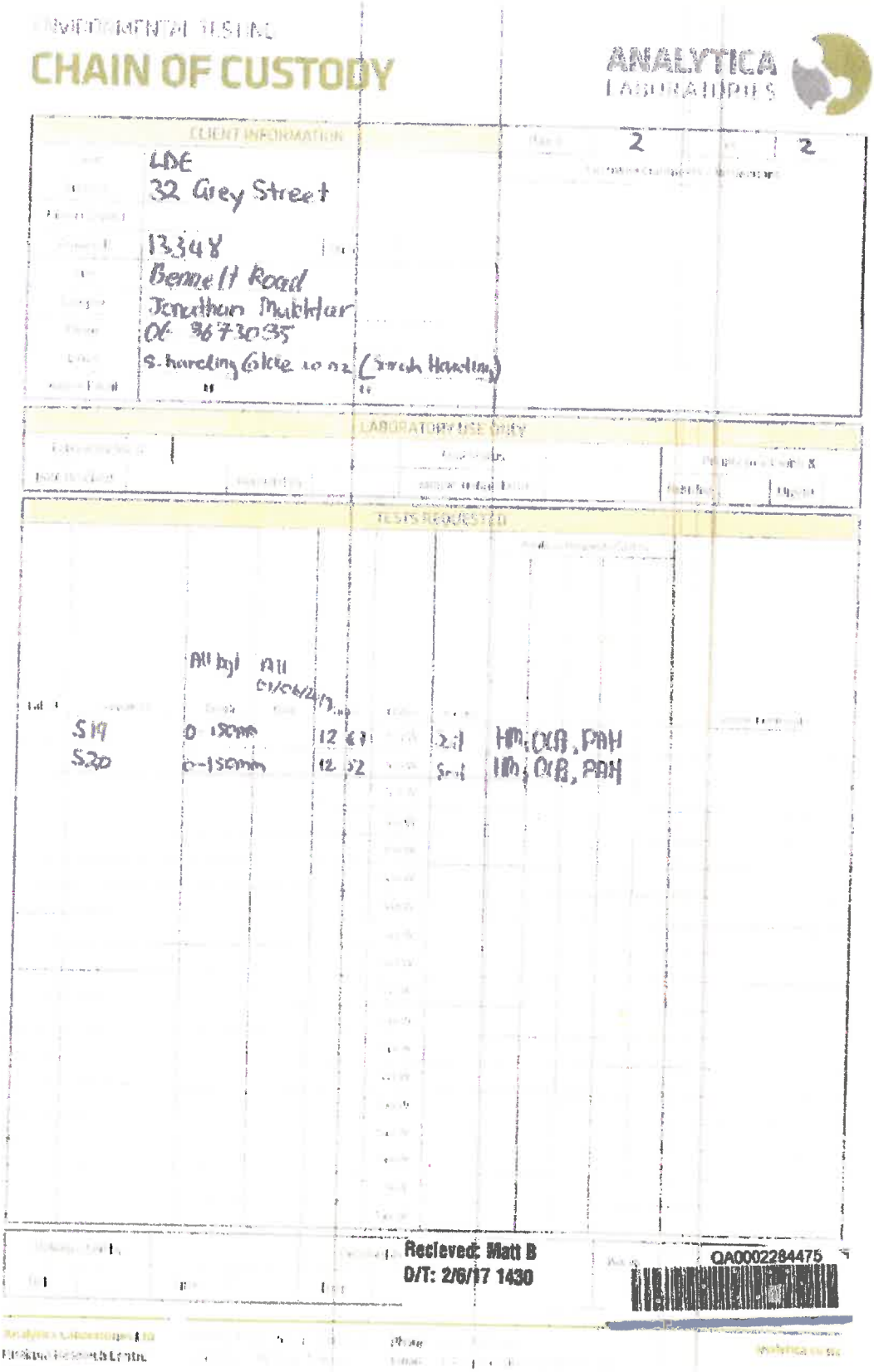
17-1396

TESTS REQUESTED

S1		10	10	Soil	HM, OCP
S2		11	45	Soil	HM, OCP
S3		11	57	Soil	HM, OCP
S4		12	16	Soil	HM, OCP
S5		11	34	Soil	HM, OCP
S6		12	00	Soil	HM, OCP
S7		10	20	Soil	HM, OCP
S8		11	24	Soil	HM, OCP
S9		12	10	Soil	HM, OCP
S10		10	30	Soil	HM, OCP
S11		11	21	Soil	HM, OCP
S12		12	30	Soil	HM, OCP
S13		10	37	Soil	HM, OCP
S14		11	13	Soil	HM, OCP
S15		12	36	Soil	HM, OCP
S16		11	00	Soil	HM, OCP
S17		11	10	Soil	HM, OCP
S18		12	42	Soil	HM, OCP

Recieved: Matt B
D/T: 2/6/17 1430

QA0002284475



ENVIRONMENTAL TESTING

CHAIN OF CUSTODY

ANALYTICA LABORATORIES

CLIENT INFORMATION

LDE
32 Grey Street

13348
Bennett Road
Jonathan Muhlhar
04 9673035
S.harding@lde.co.nz (Sarah Harding)

2 2

LABORATORY USE ONLY

TESTS REQUESTED

All bgl All
01/06/17

S19	0-150mm	12/61	2:1	HM, OCP, PAH
S20	0-150mm	12/62	2:1	HM, OCP, PAH

Recieved: Matt B
D/T: 2/6/17 1430

QA0002284475

APPENDIX H: LABORATORY TEST RESULTS

Analytica Laboratories Limited
Ruakura Research Centre
10 Bisley Road
Hamilton 3214, New Zealand
Ph +64 (07) 974 4740
sales@analytica.co.nz
www.analytica.co.nz

Certificate of Analysis

Land Development & Exploration
32 Grey Street
Gisborne 4010
Attention: Sarah Harding
Phone: 06 8673035
Email: s.harding@lde.co.nz

Lab Reference: 17-13548
Submitted by: Jonathan Mukhtar
Date Received: 2/06/2017
Date Completed: 9/06/2017
Order Number:
Reference: 13348

Sampling Site:

Heavy Metals in Soil

Client Sample ID			S1	S2	S4	S5	S6
Date Sampled			1/06/2017	1/06/2017	1/06/2017	1/06/2017	1/06/2017
Analyte	Unit	Reporting Limit	17-13548-1	17-13548-2	17-13548-3	17-13548-4	17-13548-5
Arsenic	mg/kg dry wt	0.125	5.61	5.14	5.80	6.00	5.36
Beryllium	mg/kg dry wt	0.013	0.62	0.58	0.76	0.76	0.69
Boron	mg/kg dry wt	1.25	4.60	4.55	5.12	4.78	4.77
Cadmium	mg/kg dry wt	0.005	0.12	0.13	0.10	0.10	0.11
Chromium	mg/kg dry wt	0.125	14.0	14.9	15.6	15.4	14.5
Copper	mg/kg dry wt	0.075	18.1	23.5	20.9	21.9	20.7
Lead	mg/kg dry wt	0.05	15.1	14.5	15.7	16.5	14.7
Mercury	mg/kg dry wt	0.025	0.041	0.048	0.044	0.043	0.042
Nickel	mg/kg dry wt	0.05	11.8	11.5	12.8	12.9	11.8
Zinc	mg/kg dry wt	0.05	62.2	61.6	68.4	66.2	63.4

Heavy Metals in Soil

Client Sample ID			S6	S7	S8	S9	S10
Date Sampled			1/06/2017	1/06/2017	1/06/2017	1/06/2017	1/06/2017
Analyte	Unit	Reporting Limit	17-13548-6	17-13548-7	17-13548-8	17-13548-9	17-13548-10
Arsenic	mg/kg dry wt	0.125	5.25	6.68	5.89	5.27	6.70
Beryllium	mg/kg dry wt	0.013	0.65	0.83	0.74	0.67	0.80
Boron	mg/kg dry wt	1.25	5.04	5.18	5.48	4.71	4.86
Cadmium	mg/kg dry wt	0.005	0.11	0.13	0.13	0.10	0.12
Chromium	mg/kg dry wt	0.125	13.6	17.0	14.9	14.3	15.9
Copper	mg/kg dry wt	0.075	19.9	24.3	21.8	20.4	22.8
Lead	mg/kg dry wt	0.05	13.9	17.6	15.1	14.1	16.6
Mercury	mg/kg dry wt	0.025	0.043	0.050	0.045	0.047	0.048
Nickel	mg/kg dry wt	0.05	11.4	14.8	12.9	11.5	13.9
Zinc	mg/kg dry wt	0.05	64.2	75.8	68.1	61.3	71.2

IANZ ACCREDITED LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation, with the exception of tests marked *, which are not accredited

Report ID: 17-13548-[illegible] Page 1 of 5 Report Date: 9/06/2017

Heavy Metals in Soil

Client Sample ID			S11	S12	S13	S14	S15
Date Sampled			1/09/2017	1/09/2017	1/09/2017	1/09/2017	1/09/2017
Analyte	Unit	Reporting Limit	17-13546-11	17-13546-12	17-13546-13	17-13546-14	17-13546-15
Arsenic	mg/kg dry wt	0.125	5.39	5.37	5.69	5.52	5.20
Beryllium	mg/kg dry wt	0.013	0.73	0.69	0.80	0.73	0.67
Boron	mg/kg dry wt	1.25	4.47	4.50	4.71	4.94	4.42
Cadmium	mg/kg dry wt	0.005	0.12	0.12	0.13	0.11	0.11
Chromium	mg/kg dry wt	0.125	14.5	14.2	15.6	16.9	14.2
Copper	mg/kg dry wt	0.075	20.2	20.9	20.9	17.2	17.9
Lead	mg/kg dry wt	0.05	15.9	14.9	17.0	15.7	14.5
Mercury	mg/kg dry wt	0.025	0.054	0.036	0.041	0.045	0.043
Nickel	mg/kg dry wt	0.05	11.5	11.4	13.8	11.6	11.6
Zinc	mg/kg dry wt	0.05	62.2	62.9	73.4	64.7	59.2

Heavy Metals in Soil

Client Sample ID			S16	S17	S18	S19	S20
Date Sampled			1/09/2017	1/09/2017	1/09/2017	1/09/2017	1/09/2017
Analyte	Unit	Reporting Limit	17-13546-16	17-13546-17	17-13546-18	17-13546-19	17-13546-20
Arsenic	mg/kg dry wt	0.125	5.50	5.26	5.28	5.94	5.68
Beryllium	mg/kg dry wt	0.013	0.75	0.79	0.75	0.89	0.77
Boron	mg/kg dry wt	1.25	4.92	4.50	4.20	5.15	5.13
Cadmium	mg/kg dry wt	0.005	0.14	0.12	0.13	0.13	0.13
Chromium	mg/kg dry wt	0.125	15.1	14.8	14.7	16.6	15.2
Copper	mg/kg dry wt	0.075	14.5	15.1	13.6	14.7	14.4
Lead	mg/kg dry wt	0.05	16.2	16.8	15.4	17.9	15.6
Mercury	mg/kg dry wt	0.025	0.050	0.055	0.047	0.051	0.049
Nickel	mg/kg dry wt	0.05	11.4	11.5	11.4	13.1	11.8
Zinc	mg/kg dry wt	0.05	61.2	60.5	60.4	67.4	62.9

Organochlorine Pesticides - Soil

Client Sample ID			S1	S2	S3	S4	S5
Date Sampled			1/09/2017	1/09/2017	1/09/2017	1/09/2017	1/09/2017
Analyte	Unit	Reporting Limit	17-13546-1	17-13546-2	17-13546-3	17-13546-4	17-13546-5
2,4'-DDD	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2,4'-DDE	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2,4'-DDT	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDD	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDE	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDT	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total DDT	mg/kg dry wt	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
alpha-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Aldrin	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
beta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-Chlordane	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-Nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
delta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dieldrin	mg/kg dry wt	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan I	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan II	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan sulphate	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endrin	mg/kg dry wt	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Organochlorine Pesticides - Soil

	Client Sample ID		S1	S2	S3	S4	S5
	Date Sampled		1/06/2017	1/06/2017	1/06/2017	1/06/2017	1/06/2017
Endrin ketone	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
gamma-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor epoxide	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methoxychlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-Chlordane	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlordane (sum)	mg/kg dry wt	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
TCMX (Surrogate)	%	1	84.5	94.9	88.0	87.3	88.3

Organochlorine Pesticides - Soil

	Client Sample ID		S6	S7	S8	S9	S10
	Date Sampled		1/06/2017	1/06/2017	1/06/2017	1/06/2017	1/06/2017
Analyte	Unit	Reporting Limit	17-13546-6	17-13546-7	17-13546-8	17-13546-9	17-13546-10
2,4'-DDD	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2,4'-DDE	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2,4'-DDT	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDD	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDE	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDT	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total DDT	mg/kg dry wt	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
alpha-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Aldrin	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
beta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-Chlordane	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-Nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
delta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dieldrin	mg/kg dry wt	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan I	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan II	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan sulphate	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endrin	mg/kg dry wt	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin ketone	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
gamma-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor epoxide	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methoxychlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-Chlordane	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlordane (sum)	mg/kg dry wt	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
TCMX (Surrogate)	%	1	84.4	97.0	89.3	90.9	87.7

Organochlorine Pesticides - Soil

	Client Sample ID		S11	S12	S13	S14	S15
	Date Sampled		1/06/2017	1/06/2017	1/06/2017	1/06/2017	1/06/2017
Analyte	Unit	Reporting Limit	17-13546-11	17-13546-12	17-13546-13	17-13546-14	17-13546-15
2,4'-DDD	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2,4'-DDE	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Organochlorine Pesticides - Soil

Client Sample ID			S11	S12	S13	S14	S15
Date Sampled			7/11/2017	7/11/2017	7/11/2017	7/11/2017	7/11/2017
Analyte	Unit	Reporting Limit	17-13548-11	17-13548-12	17-13548-13	17-13548-14	17-13548-15
2,4'-DDD	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDD	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDE	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDT	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total DDT	mg/kg dry wt	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
alpha-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Aldrin	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
beta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-Chlordane	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-Nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
delta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dieldrin	mg/kg dry wt	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan I	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan II	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan sulphate	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endrin	mg/kg dry wt	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin ketone	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
gamma-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor epoxide	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methoxychlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-Chlordane	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlordane (sum)	mg/kg dry wt	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
TCMX (Surrogate)	%	1	86.9	85.2	88.5	85.8	83.9

Organochlorine Pesticides - Soil

Client Sample ID			S16	S17	S18	S19	S20
Date Sampled			7/11/2017	7/11/2017	7/11/2017	7/11/2017	7/11/2017
Analyte	Unit	Reporting Limit	17-13548-16	17-13548-17	17-13548-18	17-13548-19	17-13548-20
2,4'-DDD	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2,4'-DDE	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2,4'-DDT	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDD	mg/kg dry wt	0.005	0.008	<0.005	<0.005	<0.005	0.007
4,4'-DDE	mg/kg dry wt	0.005	0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDT	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total DDT	mg/kg dry wt	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
alpha-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Aldrin	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
beta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-Chlordane	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-Nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
delta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dieldrin	mg/kg dry wt	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan I	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan II	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan sulphate	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endrin	mg/kg dry wt	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin ketone	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
gamma-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Organochlorine Pesticides - Soil

		Client Sample ID	S16	S17	S18	S19	S20
		Date Sampled	1/06/2017	1/06/2017	1/06/2017	1/06/2017	1/06/2017
Heptachlor	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor epoxide	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methoxychlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-Chlordane	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlordane (sum)	mg/kg dry wt	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
TCMX (Surrogate)	%	1	92.7	92.4	88.9	86.5	88.9

Polycyclic Aromatic Hydrocarbons - Soil

		Client Sample ID	S19	S20
		Date Sampled	1/06/2017	1/06/2017
Analyte	Unit	Reporting Limit	17-13546-19	17-13546-20
1-Methylnaphthalene	mg/kg	0.01	<0.01	<0.01
2-Methylnaphthalene	mg/kg	0.01	<0.01	<0.01
Acenaphthene	mg/kg	0.01	<0.01	<0.01
Acenaphthylene	mg/kg	0.01	<0.01	<0.01
Anthracene	mg/kg	0.01	<0.01	<0.01
Benz[a]anthracene	mg/kg	0.02	<0.02	<0.02
Benzo[a]pyrene	mg/kg	0.01	<0.01	<0.01
Benzo[b&j] fluoranthene	mg/kg	0.02	<0.02	<0.02
Benzo[g,h,i]perylene	mg/kg	0.02	<0.02	<0.02
Benzo[k]fluoranthene	mg/kg	0.01	<0.01	<0.01
Chrysene	mg/kg	0.01	<0.01	<0.01
Dibenz[a,h]anthracene	mg/kg	0.01	<0.01	<0.01
Fluoranthene	mg/kg	0.02	<0.02	<0.02
Fluorene	mg/kg	0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg	0.01	<0.01	<0.01
Naphthalene	mg/kg	0.01	<0.01	<0.01
Phenanthrene	mg/kg	0.01	<0.01	<0.01
Pyrene	mg/kg	0.02	<0.02	<0.02
Benzo[a]pyrene TEQ (LOR)	mg/kg	0.01	0.03	0.03
Benzo[a]pyrene TEQ (Zero)	mg/kg	0.01	<0.01	<0.01
Anthracene-d10 (Surrogate)	%	1	92.6	93.4

Moisture Content

		Client Sample ID	S19	S20
		Date Sampled	1/06/2017	1/06/2017
Analyte	Unit	Reporting Limit	17-13546-19	17-13546-20
Moisture Content	%	1	23	24

Method Summary

Elements in Soil	Acid digestion followed by ICP-MS analysis. US EPA method 200.8.
OCP in Soil	Samples are extracted with hexane, pre-concetrated then analysed by GC-MSMS. In house method. (Chlordane (sum) is calculated from the main actives in technical Chlordane: Chlordane, Nonachlor and Heptachlor)
Total DDT	Sum of DDT, DDD and DDE (4,4' and 2,4 isomers)

Method Summary

PAH in Soil	Solvent extraction, silica cleanup, followed by GC-MS analysis. **Benzo[a]pyrene TEQ (LOR):** The most conservative TEQ estimate, where a result is reported as less than the limit of reporting (LOR) the LOR value is used to calculate the TEQ for that PAH. **Benzo[a]pyrene TEQ (Zero):** The least conservative TEQ estimate, PAHs reported as less than the limit of reporting (LOR) are not included in the TEQ calculation. Benzo[a]pyrene toxic equivalence (TEQ) is calculated according to *'Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health'*. Ministry for the Environment. 2011.
Moisture	Moisture content is determined gravimetrically by drying at 103 °C.

Report Comments

Samples were received by Analytica Laboratories in acceptable condition unless otherwise noted on this report.

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