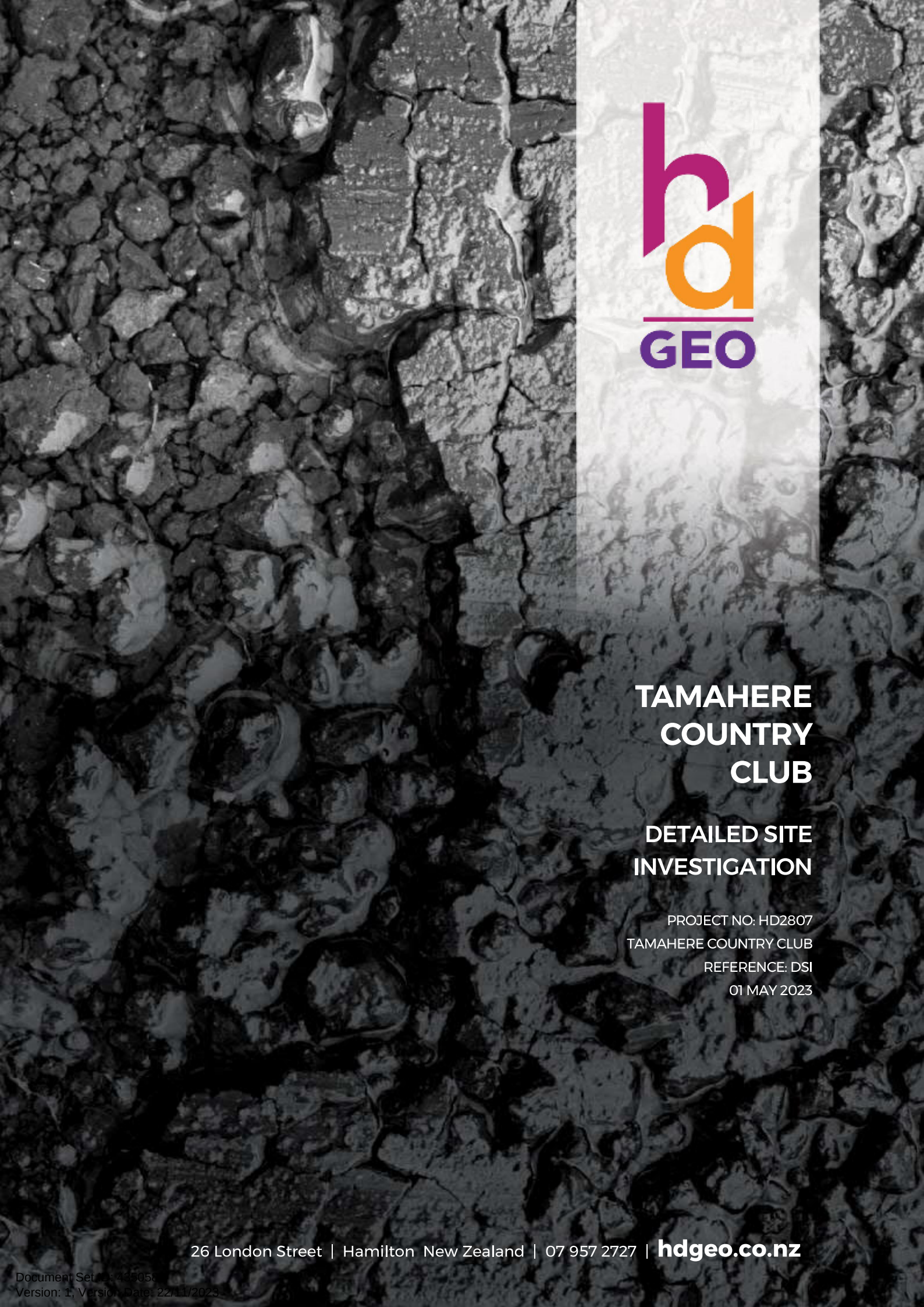
Appendix H – Detailed Site Investigation prepared by HD Geo



TAMAHERE COUNTRY CLUB

DETAILED SITE INVESTIGATION

PROJECT NO: HD2807
TAMAHERE COUNTRY CLUB
REFERENCE: DSI
01 MAY 2023

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Executive summary

The Tamahere Country Club (the client) propose to develop 56, 70, 82, and 92 Tamahere Drive, Tamahere (the site) with an expansion of their existing retirement village.

The site historically contained a mix of orchards and market gardens. Both orchards and market gardens can be considered hazardous activities and industries list (HAIL) sites due to the potential application and/or bulk storage of persistent pesticides. Before and following the orchard activities, the site was used as pasture for grazing. While grazing is not a HAIL activity, use of superphosphate fertiliser associated with farming activities can lead to elevated cadmium in soil. The site also contained several buildings constructed pre-1970. The age of the buildings indicates that lead-based paint and asbestos-containing materials (ACM) may have been used in their construction; the degradation of either of these materials may have impacted the soil surrounding the buildings, presenting a risk to human health.

The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) requires consideration where subdivision, change in land use, and/or soil disturbance are proposed at confirmed or potential HAIL sites. As the site has potentially been subject to HAIL activities, the NESCS requires investigation under the NESCS. The client has engaged us (HD Geo) to complete this detailed site investigation (DSI).

We identified and investigated the site for:

- HAIL A10, associated with the potential application of persistent pesticides across the historic orchards/market gardens
- HAIL I, associated with the potential application of superphosphate fertiliser across the pasture and the potential use of lead-based paint or ACM on the sheds constructed pre-1970

Based on our site investigation and interpretation of laboratory results, our conclusions are that:

- heavy metals, asbestos, OCPs, and TPH in soil do not present a risk to human health for the proposed residential/retirement village land use
- the site is not subject to HAIL activity I associated with the application of superphosphate fertiliser, use of lead-based paint on buildings, use of ACM building material, or derelict cars present in the paddock at 92 Tamahere Drive
- 92 Tamahere Drive is subject to HAIL activity A10 associated with the former orchard/market garden and is therefore a ‘piece of land’ under the NESCS
- 56, 70, and 82 Tamahere Drive are not subject to HAIL activity A10 associated with the former orchards/market gardens as no persistent pesticides were detected
- the proposed change in land use and soil disturbance for the ‘piece of land’ (92 Tamahere Drive) is a controlled activity under the NESCS

We recommend that:

- this DSI report is submitted to WDC to support a controlled activity consent application for the proposed development
- as a condition of consent, Council requires a SQEP to develop a site management plan to ensure the site can be safely managed during the proposed soil disturbance
- any soil proposed for off-site disposal has a copy of the relevant laboratory reports (Appendix G) provided to the chosen disposal facility to confirm that they can accept the soil

List of acronyms

Acronym	Definition
ACM	asbestos-containing material
bgl	below ground level
CLMG	contaminated land management guideline
COPC	contaminants of potential concern
CSM	conceptual site model
DSI	detailed site investigation
HAIL	hazardous activities and industries list
HD Geo	HD Geo Limited
HD	HAIL Environmental
m	metres
mg/kg	milligrams per kilogram
mm	millimetres
NEPM	National Environment Protection Measures
NESCS	National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health
OCPs	organochlorine pesticides
PSI	preliminary site investigation
RPD	relative percent difference
SQEP	Suitable Qualified and Experienced Practitioner
TPH	total petroleum hydrocarbons
WDC	Waikato District Council
WRC	Waikato Regional Council

Contents

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Introduction

The Tamahere Country Club (the client) proposes to develop 56, 70, 82, and 92 Tamahere Drive, Tamahere (the site) with an expansion of their existing retirement village. We have included a plan showing the proposed development in Appendix A.

The site historically contained a mix of orchards and market gardens. Both orchards and market gardens can be considered hazardous activities and industries list (HAIL) sites due to the potential application and/or bulk storage of persistent pesticides. Before and following the orchard activities, the site was used as pasture for grazing. While grazing is not a HAIL activity, use of superphosphate fertiliser associated with farming activities can lead to elevated cadmium in soil. The site also contained several buildings constructed pre-1970. The age of the buildings indicates that lead-based paint and asbestos-containing materials (ACM) may have been used in their construction; the degradation of either of these materials may have impacted the soil surrounding the buildings, presenting a risk to human health.

The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) requires consideration where subdivision, change in land use, and/or soil disturbance are proposed at confirmed or potential HAIL sites.

As the site has potentially been subject to HAIL activities, the NESCS requires investigation under the NESCS. The client has engaged us (HD Geo) to complete this detailed site investigation (DSI).

Purpose, objectives, and scope

The purpose of this DSI is to evaluate whether the site is suitable for the proposed retirement village in accordance with NESCS regulations. In doing so, this DSI will support the resource consent application to Waipa District Council.

The specific objectives of this DSI are to determine if:

- the site has been subject to HAIL activities
- any identified HAIL activities are likely to have impacted soil in a way that may present a risk to human health
- any risk to human health exists should the proposed change in land use and/or soil disturbance be undertaken
- consent is required for the development under the NESCS
- there is a requirement for any further investigation and/or reporting under the NESCS

This DSI consists of the following elements:

- a desktop study, including review of historic and recent aerial photos, geology and hydrogeology, applicable council records, and any other relevant environmental studies
- a site inspection to identify features of interest and potential contamination sources
- collection and analysis of soil samples
- preparation of a report consistent with Ministry for the Environment's Contaminated Land Management Guidelines No. 1[1]

[1] Ministry for the Environment. 2021. *Contaminated land management guidelines No 1: Reporting on contaminated sites in New Zealand (Revised 2021)*. Wellington: Ministry for the Environment

Site details

Site details are included in Table 1 and site photos are provided in Appendix B.

Table 1: Site details[2]

Item	Description	
Site address and current legal descriptions	56 Tamahere Drive, Tamahere	LOT 1 DPS 59441
	70 Tamahere Drive, Tamahere	LOT 1 DPS 80372
	82 Tamahere Drive, Tamahere	LOT 1 DP 565970
	92 Tamahere Drive, Tamahere	PT LOT 11 DP 9747
Zoning	Rural	
Approximate site area	71,356 m^2	
Current site use	Residential housing, pasture, Christmas tree orchard	
Proposed site use	Retirement village	
District Council	Waikato District Council	
Regional Council	Waikato Regional Council	
Approximate elevation	48 m to 49 m above local datum	

Site description

The site is located at 56, 70, 82, and 92 Tamahere Drive, Tamahere. It is bounded by Tamahere Drive to the east, the extension to the existing Tamahere Country Club to the north and west, and rural residential housing to the west and south.

The site being assessed consists of 4 independent properties. The lot addresses and descriptions are:

- 56 Tamahere Drive, containing a residential house in the north-west corner, access drive/gardens in the north-east corner, and paddocks used for animal grazing
- 70 Tamahere Drive, containing the Red Lid commercial building and storage yard in the north, a residential house and sheds in the south-east, and gardens, animal grazing, and a small greenhouse in the south-west
- 82 Tamahere Drive, currently used as a laydown area for the Tamahere Country Club extension
- 92 Tamahere Drive, containing a residential house and sheds in the central and central-south segments and vacant pasture across the balance of the site

We have included a plan showing the site in Appendix A and site photos in Appendix B.

Proposed development

The client proposes to remove the existing structures on the site and construct retirement housing and facilities as part of their wider Tamahere Country Club retirement village development. Plans showing the proposed development have not been developed. Once plans are available, we should review them and update this DSI if needed.

Desktop study

We completed a desktop study prior to the site visit to identify areas of interest. This included a review of historical[3] and recent[4] aerial images, geological maps, and the evaluation of existing records.

[2] Matamata-Piako District Council, Hexagon Geospatial, accessed 24/02/23. https://webmap.mpdc.govt.nz/PublicPortalFull/
[3] Sourced from http://retrolens.nz and licensed by LINZ CC-BY. Accessed 29/03/23
[4] Google Earth Pro

Historical aerial photos

Our aerial photo review evaluated previous land uses and areas of interest. Aerial photos are provided in Appendix C and described in Table 2.

Table 2: Historical aerial photos

Year	Description
1943	Most of the site is currently vacant pasture likely used for stock grazing. There is a shed present along the west side of 56 Tamahere Drive and a house and sheds located near the centre of 92 Tamahere Drive. The site is immediately surrounded by pasture in all cardinal directions.
1953 to 1957	The shed at 56 Tamahere Drive has been removed.
1972 to 1979	70 Tamahere Drive has been developed with an orchard on the north and west part of the property. There are 4 sheds and a house near the centre of the property. 92 Tamahere Drive has been developed with orchards/market gardens within the west half and north-east segment. By 1979: • the orchard/market gardens at 92 Tamahere Drive have been removed • 82 Tamahere Drive has been developed with an orchard/market garden • a new shed has been constructed in the north portion of 70 Tamahere Drive • a house has been constructed in the west portion of 52 Tamahere Drive
1990 to 1995	The west and south-west portions of 52 Tamahere Drive have been developed as part of the wider orchard. A new shed has been constructed along the north boundary of 70 Tamahere Drive.
2008 to 2022	By 2008, the orchards/market gardens at 52 and 70 Tamahere Drive have been removed. Most of the buildings at 70 Tamahere Drive have been removed, with only the house and building near the north boundary remaining. The market garden from 82 Tamahere Drive has been removed and the property planted in crops. No significant changes can be seen on site until: • 2013, where a new shed has been constructed to the west of the house at 70 Tamahere Drive • 2019, where rows of pine trees have been planted in the east side of 92 Tamahere Drive • 2021, where rows of pine trees have been planted in the west side of 92 Tamahere Drive • 2022, where 82 Tamahere Drive has been converted into a laydown area associated with the Tamahere Country Club development to the north

Geology and hydrogeology

The geologic map of the area[5] shows that the site is underlain by the Hinuera Formation, which consists of 'cross-bedded pumice sand, silt and gravel with interbedded peat'.

There are 4 mapped bodies of water within 1 km of the site. These include:

- 2 tributary streams of the Mangaone Stream, located 115 m east and 670 m west of the site
- the Mangaone Stream to the north and east, with the closest point located 620 m north-east
- the Waikato River, located 630 m to the west

[5] 1:250,000 Geological Map of New Zealand (QMAP). *New Zealand Geology Web Map*. GNS, 2013. http://data.gns.cri.nz/geology/. Accessed 26/04/23

Based on the topography of the site and immediately surrounding area, it is likely that groundwater flows either west towards the Waikato River or east towards the Mangaone Stream.

According to Wells Aotearoa New Zealand[6], there are 44 mapped bores within 1 km of the site. Bore depths ranged from 6.09 m to 69.4 m deep. One of the 40 bores is recorded as being used for drinking water but is not currently in use. The depth to water was recorded in 9 of 44 bores and ranged from 5 m to 24.4 m deep.

Council records

We requested records from Waikato District Council and Waikato Regional Council (WRC). We have included the Council records provided in Appendix D.

WRC list 3 of the 4 properties in the land use information register as being subject to HAIL activity A10. This includes:

- 70 Tamahere Drive, listed as an unverified HAIL and associated with C R Roberts Ltd
- 82 Tamahere Drive, listed as a verified HAIL due to the presence of a historic orchard
- 92 Tamahere Drive, listed as an unverified HAIL due to the presence of a historic market garden

We did not order property records from either Council as their responses, and the available historical aerial photos, were sufficient to understand the site history and the site's potentially contaminating activities.

HAIL Environmental – Tamahere Country Club 2021 PSI/DSI

HAIL Environmental (HE) prepared a combined PSI and detailed site investigation (DSI)[7] for an extension of the existing Tamahere Country Club in 2021. The investigation area was located immediately north and west of the site. HE identified that WRC listed the site as an unverified HAIL for activity A10 (persistent pesticide bulk storage or use). HE's investigation found that the site had been used for grazing until 1963, where the site was converted to an orchard then subsequently maize plantings from early 2000s.

Following the desktop study, HE collected soil samples from the orchard area and near a shed used for chemical storage. The samples were analysed for select heavy metals, organochlorine pesticides (OCPs), and organonitrogen-organophosphate pesticides. HE also identified an area as containing building demolition rubble, which was sampled and analysed for asbestos.

HE identified that the proposed retirement village does not fit within the existing land use scenarios within the NESCS. Therefore, HE calculated site-specific soil contaminant standards for arsenic and lead based on the expected age, exposure frequency, and site-grown produce consumption.

The results of HE's analysis showed that:

- arsenic and pesticides were present in soil above background concentrations but below the site-specific soil contaminant standards
- arsenic, copper, and lead were present in soil above Waikato cleanfill criteria at the location of a former shed
- trace concentrations of ACM were present in the location of the building rubble at concentrations below guidelines

[6] Wells Aotearoa New Zealand, Maps, https://wellsnz.teurukahika.nz/wells/map. Accessed 26/04/23
[7] HAIL Environmental. *Lot 1 DPS 83644, Tamahere, Cambridge – Preliminary and detailed site investigations*. Rev A, dated 23/06/21

Based on their investigation and sample results, HAIL Environmental:

- concluded the proposed change in land use and soil disturbance is a controlled activity under the NESCS
- recommended that the area of metal-impacted soil around the existing shed and asbestos-impacted soil at the encountered building rubble is remediated and validated

Site uses and potentially contaminating activities

Our desktop study concludes that all 4 properties within the site have been subject to potential HAIL activities:

- HAIL A10[8], associated with the potential application of persistent pesticides across the historic orchards/market gardens
- HAIL I[9], associated with:
    - the potential application of superphosphate fertiliser across the pasture
    - the potential use of lead-based paint or ACM building materials on the sheds constructed pre-1970

The contaminants of potential concern (COPC) associated with this site include:

- cadmium associated with the use of superphosphate fertiliser
- arsenic and organochlorine pesticides (OCPs) associated with the use and/or bulk storage of persistent pesticides within the orchards/market gardens
- lead associated with the application of lead-based paints to buildings
- asbestos associated with building constructed using asbestos-containing materials (ACM)

Site inspection

We completed a site inspection to identify features that have the potential to contaminate the soil on site. We have included site photos from our walkover in Appendix B.

We confirmed that most of the site is currently vacant, grassed pasture, with a mix of commercial and residential buildings across the 4 individual properties. Features of note encountered during our walkover include:

- an aboveground fuel storage tank at 70 Tamahere Drive, associated with the Red Lid commercial building, which is located on concrete hardstand. There was no hydrocarbon staining on the concrete surrounding the tank
- scattered inorganic material (metal, pipes, bricks, plastic) on the soil in the west side of 82 Tamahere Drive and near the house at 92 Tamahere Drive
- aboveground fuel storage tanks within the gravelled laydown area at 82 Tamahere Drive. There was no hydrocarbon staining on the hardstand surrounding the tanks
- 3 derelict cars within the western paddock at 92 Tamahere Drive, which have the potential to have leached contamination to the on-site soil (potential HAIL I)

[8] HAIL A10 – Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds
[9] HAIL I - any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment

We observed no visual or olfactory signs of contamination during our site walkover. We found no evidence of underground storage tanks, lagoons, or hazardous substance releases at the time of our inspection. We observed no signs of chemically stressed vegetation.

Conceptual site model

The conceptual site model (CSM) helps identify how potential soil contamination could affect human health should the site be subject to the proposed change in land use or soil disturbance. Our CSM follows the source - pathway - receptor model and is summarised in Table 3.

Table 3: Conceptual site model

Potential HAIL activity	Source	COPC	Pathways	Routes of entry	Potential receptors
A10 - Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds	Application of persistent pesticides	Arsenic, OCPs	Plant uptake, surface water run-off, soil disturbance, dust generation	Dermal adsorption (contact), inhalation of dust, ingestion of dust and/or soil, ingestion of contaminated plants	Current site users, future construction workers, future residents
I - Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment	Application of superphosphate fertiliser	Cadmium	Plant uptake, surface water run-off, soil disturbance, dust generation	Dermal adsorption (contact), inhalation of dust, ingestion of dust and/or soil, ingestion of contaminated plants	Current site users, future construction workers, future residents
	Lead-based paint	Lead	Surface water run-off, soil disturbance, dust generation	Dermal adsorption (contact), inhalation of dust, ingestion of dust and/or soil	Current site users, future construction workers, future residents
	ACM building material	Asbestos	Surface water run-off, soil disturbance, dust/fibre generation	Inhalation of fibres	Current site users, future construction workers, future residents
	Degradation of vehicles and vehicle parts	Heavy metals, TPH	Surface water run-off, soil disturbance, dust generation, migration via groundwater	Dermal adsorption (contact), inhalation of dust, ingestion of dust and/or soil	Current site users, future construction workers, future residents

Site investigation and sampling

Sampling rationale

We considered the following when developing our sampling and analysis plan:

- the Contaminated Land Management Guidelines (CLMG) No. 5[10]
- the potential linkages identified in our CSM
- our knowledge of transport and behaviour of the identified COPC

We used systematic sampling to investigate HAIL A10 associated with the orchards/market gardens and HAIL I associated with the application of superphosphate fertiliser. As arsenic, cadmium, and OCPs are relatively immobile in soil, and both fertiliser and pesticides are applied from the top-down, residual contamination from these COPC are likely highest in the top 100 mm of soil

[10] Ministry for the Environment. 2021. Contaminated land management guidelines No. 5: Site investigation and analysis of soils (Revised 2021). Wellington: Ministry for the Environment

Therefore, we collected and analysed samples from the near-surface soil across the pasture on site. As cadmium toxicity is highly pH dependant, we used targeted sampling to investigate the natural pH of the site soils.

We used targeted sampling to investigate the remaining COPC, including HAIL I associated with:

- lead-based paint and ACM building material. The main transport mechanism for these COPC is via weathering and degradation (paint flakes and damage to ACM) over time, which results in contaminated around the curtilage of affected buildings. Therefore, we targeted the curtilage of buildings on site for sampling and analysis
- leaching of contamination (heavy metals and TPH) from the derelict cars at 92 Tamahere Drive. The main transport mechanism for heavy metals and TPH to enter the soil is from leaking of fluids (fuel pipes, batteries, containers) and weathering/degrading of materials over time. Consequently, the COPC associated with derelict cars are likely to be limited to the near-surface soil under the cars. Therefore, we targeted near-surface soil under the cars for sampling and analysis

Site sampling

The site investigation included the collection of:

- near-surface (50 mm to 100 mm below ground level [bgl]) samples taken from across the pasture on site (ES01 to ES16)
- near surface and shallow subsurface samples taken from a grassed area within the laydown area at 82 Tamahere Drive (ES17 and ES18)
- near-surface samples taken from underneath the rubbish stockpiles at 92 Tamahere Drive (ES19 and ES20)
- near-surface samples taken from the curtilage of buildings suspected to contain lead-based paint and/or ACM building materials (ES21 to ES26)
- a near-surface sample taken from underneath 1 of the derelict cars at 92 Tamahere Drive (ES27)

We had the near-surface samples at locations:

- ES01 to ES16 analysed for arsenic and cadmium
- ES04, ES08, ES10, and ES14 analysed for OCPs
- ES17 to ES20 analysed for heavy metals
- ES21 to ES26 analysed for lead
- ES23 to ES26 analysed for the presence/absence of asbestos
- ES27 analysed for heavy metals and TPH

We used decontaminated sampling equipment and gloved hands to collect and place soil samples in suitable containers. We changed gloves between each sample collected. Samples were collected in accordance with CLMG No 5. We transported samples to Hill Laboratories under chain-of-custody protocols. Hill Laboratories is IANZ accredited for the analyses requested.

A suitably qualified and experienced practitioner (SQEP) with contaminated land experience oversaw the investigation. An experienced environmental specialist collected the samples.

HD Geo also completed a geotechnical investigation of the site[11]. The investigation found that the site is surfaced with up to 0.5 m of topsoil underlain by silt and sand consistent with the mapped Hinuera Formation. We have included a soil log of the recovered material in Appendix E.

Laboratory results and evaluation

We have provided a summary table of laboratory results in Appendix F and full laboratory reports in Appendix G. For risk evaluation, we used:

- site-specific arsenic and lead concentrations for retirement village land use
- the National Environment Protection Measures (NEPM) for nickel and zinc[12]
- the NESCS residential soil contaminant standards for all other heavy metals and OCPs[13]
- the MfE petroleum hydrocarbon Tier 1 guidelines for hydrocarbons[14]
- the New Zealand guidelines for assessing and managing asbestos in soil[15]
- Waikato background concentrations for disposal[16]
- the Waikato regional cleanfill criteria for suitability for off-site disposal as cleanfill[17]

The wider Tamahere Country Club is a retirement village and has previously used site-specific soil guideline values for arsenic and lead based on:

- an average length of occupancy of 15 years
- the gardens surrounding the residential units being used for ornamental purposes only (a community vegetable garden is provided on site for residents)

In addition, we expect that other receptors (children and adults) have the potential to be exposed to the on-site soil while visiting residents. Due to the low exposure frequency and limited soil contact, we consider the calculated site-specific guideline appropriate to manage risk for the proposed land use.

For consistency, we have adopted the site-specific soil contaminant standards calculated by HAIL Environmental for the Tamahere Country Club. While the HAIL Environmental 2021 PSI used concentrations of 200 mg/kg for arsenic and 7,000 for lead, they referenced their 2019 RAP for the calculations which showed lower concentrations (arsenic of 90 mg/kg, lead of 2,200 mg/kg). Therefore, we have used the concentrations shown in the RAP calculations to be conservative.

The analysis found that:

- arsenic and lead are below the calculated site-specific guideline concentrations
- cadmium, chromium, and copper are below the NESCS guidelines for residential land use
- nickel and zinc are below the NEMP guidelines using the residential A scenario
- all heavy metals except for chromium and nickel were encountered at concentrations above Waikato regional background concentrations

[11] HD Geo Limited. *Tamahere Country Club – Preliminary geotechnical assessment*. Ref: HD2812
[12] National Environmental Protection Measure. *Schedule B1 – Guideline on investigation levels for soil and groundwater*. Revised 2013
[13] Ministry for the Environment. 2012. Users' Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.
[14] Ministry for the Environment. *Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand (revised 2011)*. Module 4: Tier 1 soil acceptance criteria. Dated August 1999
[15] Building Research Association of New Zealand. *New Zealand guidelines for assessing and managing asbestos in soil*. November 2017
[16] Waikato Regional Council. *Natural background concentrations in the Waikato region*. https://www.waikatoregion.govt.nz/services/regional-services/waste-hazardous-substances-and-contaminated-sites/contaminated-sites/natural-background-concentrations/. Accessed 08/11/23
[17] Waikato Regional Council. *Standard operating policies for defining cleanfill acceptance criteria*. Revised 15/09/2018

- arsenic, lead, and zinc were encountered at concentrations above Waikato cleanfill criteria
- 4,4'-DDE were detected in 1 of 4 tested samples at concentrations well below NESCS guidelines
- no TPH or asbestos was detected in the tested soil

We calculated the relative percent difference (RPD) for the arsenic and cadmium results from the duplicate samples, ES08 and ES11. RPD is calculated to evaluate the replication of laboratory results in samples. RPD is considered to be acceptable when it is at 30% or less. The RPDs for arsenic and cadmium ranged from 6% to 32%. Due to the heterogenous nature of the encountered soil, we consider the laboratory results to be representative (see Appendix F).

Application to guidelines

In order for HAIL A10 to apply to the site, there must be evidence that persistent pesticides were either used or stored in bulk on site. The use and/or bulk storage of persistent pesticides are often linked to orchards and market gardens, both of which were identified across the site in our review of historic aerial images. The laboratory results show that arsenic is elevated well above Waikato background concentrations at 92 Tamahere Drive and that a DDT-isomer (4,4'-DDE) is present at 1 of 4 tested locations on the same property. Based on the sample results, we conclude that:

- it is more likely than not that the footprints of the historic orchard/market garden at 92 Tamahere Drive has been subject to the application of persistent pesticides and therefore HAIL A10 applies to the 'piece of land'
- it is unlikely that the remaining 3 properties (56, 70, and 82 Tamahere Drive) have been subject to the application of persistent pesticides and therefore HAIL A10 does not apply

In order for HAIL activity I to apply to the site, potentially contaminating activities on site must have impacted the on-site soil at concentrations that have the potential to cause risk to either human health. All analytes targeted to assess HAIL I are below their applied human health criteria for the proposed land use. As the COPC associated with superphosphate fertiliser, lead-based paint, ACM building material, stockpiled rubbish, and derelict cars are not present above the applied human health criteria, the site has not been subject to HAIL activity I.

Based on our investigation and laboratory data, we consider it unlikely that there is a risk to human health associated with developing the site into a retirement village. Our assessment is based on all lab data for the identified COPC being below their respective human health criteria for the proposed land use.

For the identified 'piece of land', a controlled activity consent under the NESCS is required as contamination is above background but below human health guidelines. Consenting under the NESCS is not required for the remainder of the site as no HAIL has been identified. We have included a plan showing the identified 'piece of land' in Appendix A.

Conclusions and recommendations

Our conclusions are that:

- heavy metals, asbestos, OCPs, and TPH in soil do not present a risk to human health for the proposed residential/retirement village land use
- the site is not subject to HAIL activity I associated with the:
  - application of superphosphate fertiliser
  - use of lead-based paint on buildings

    - use of ACM building material
    - derelict cars present in the paddock at 92 Tamahere Drive
- 92 Tamahere Drive is subject to HAIL activity A10 associated with the former orchard/market garden and is therefore a 'piece of land' under the NESCS
- 56, 70, and 82 Tamahere Drive are not subject to HAIL activity A10 associated with the former orchards/market gardens as no persistent pesticides were detected
- the proposed change in land use and soil disturbance for the 'piece of land' (92 Tamahere Drive) is a controlled activity under the NESCS

We recommend that:

- this DSI report is submitted to WDC to support a controlled activity consent application for the proposed development
- as a condition of consent, Council requires a SQEP to develop a site management plan to ensure the site can be safely managed during the proposed soil disturbance
- any soil proposed for off-site disposal has a copy of the relevant laboratory reports (Appendix G) provided to the chosen disposal facility to confirm that they can accept the soil

Limitations

This document does not include any assessment or consideration of potential health and safety issues under the Health and Safety Work Act 2015. HD Geo has relied upon information provided by the Client and other third parties to prepare this document, some of which has not been fully verified by HD Geo. This document may be transmitted, reproduced, or disseminated only in its entirety. This report has been prepared for our client, their professional advisers, and the relevant territorial and regional authorities for the purposes detailed above and may not be relied on by any other party for any other purposes.

From a technical perspective, the subsurface environment at the site may present substantial uncertainty. It is a heterogeneous, complex environment, in which small subsurface features or changes in geologic conditions can have substantial impacts on water, vapour, or chemical movement. HD Geo's professional opinions are based on its professional judgement, experience, and training. It is possible that testing and analysis might produce different results and/or different opinions. Should additional information become available, this report should be updated accordingly.

Certification

This report presents information from an environmental site investigation conducted by and under the oversight of a SQEP with contaminated land expertise, as required by the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health and who is a Certified Environmental Practitioner. Detailed qualifications are available upon request.

Paul Gibbins

Certified Environmental Practitioner, CEnvP #1410

APPENDIX A – SITE PLANS

CLIENT

Tamahere Country Club

0 30 60 90 120 150 m

Scale: 1:4500

TITLE

Tamahere Country Club
Soil samples

GENERAL NOTES AND DISCLAIMER

1. Coordinates are in NZTM
2. Imagery and cadastral information sourced from LINZ. Crown copyright reserved
3. Areas and dimensions are approximate only, any use or reliance on this plan is at the users risk

DRAWN	M.MOORE	30/03/23
CHECKED	P.GIBBINS	30/03/23
LOCATION	Tamahere	
JOB NUMBER	HD2807	

REV	BY	CHKD	DATE

DRAWING NO	SHEET	REVISION
HD2807-101	1	0

hd GEO

CLIENT

Tamahere Country Club

0 30 60 90 120 150 m

Scale: 1:4500

TITLE

Tamahere Country Club
Identified 'piece of land'

GENERAL NOTES AND DISCLAIMER

1. Coordinates are in NZTM
2. Imagery and cadastral information sourced from LINZ. Crown copyright reserved
3. Areas and dimensions are approximate only, any use or reliance on this plan is at the users risk

DRAWN	M.MOORE	27/04/23
CHECKED	P.GIBBINS	27/04/23
LOCATION	Tamahere	
JOB NUMBER	HD2807	

REV	BY	CHKD	DATE

DRAWING NO	SHEET	REVISION
HD2807-102	1	0

APPENDIX B – SITE PHOTOS

HD2807 – Tamahere Country Club photo log – Taken 29.03.23

Photo 1: Existing pasture and buildings at 56 Tamahere Drive, facing south

Photo 2: Existing pasture at 56 Tamahere Drive, facing west

Photo 3: Existing house at 56 Tamahere Drive, facing south

HD2807 – Tamahere Country Club photo log – Taken 29.03.23

Photo 4: Existing lawn and house at 70 Tamahere Drive, facing north

Photo 5: Existing lawn and house at 70 Tamahere Drive, facing east

Photo 6: Existing commercial building (Red Lid) at 70 Tamahere Drive, facing west

HD2807 – Tamahere Country Club photo log – Taken 29.03.23

Photo 7: Existing pasture at 92 Tamahere Drive, facing west

Photo 8: Existing pasture at 92 Tamahere Drive, facing east

Photo 9: Existing pasture at 92 Tamahere Drive, facing east

HD2807 – Tamahere Country Club photo log – Taken 29.03.23

Photo 10: Existing shelter at 92 Tamahere Drive, facing west

Photo 11: Rubbish stockpiled at 92 Tamahere Drive, facing north

Photo 12: Rubbish stockpiled at 92 Tamahere Drive, facing north

HD2807 – Tamahere Country Club photo log – Taken 29.03.23

Photo 13: Existing house and stockpiled rubbish at 92 Tamahere Drive, facing west

Photo 14: Existing shed at 92 Tamahere Drive, facing south

Photo 15: Existing shed at 92 Tamahere Drive, facing west

HD2807 – Tamahere Country Club photo log – Taken 29.03.23

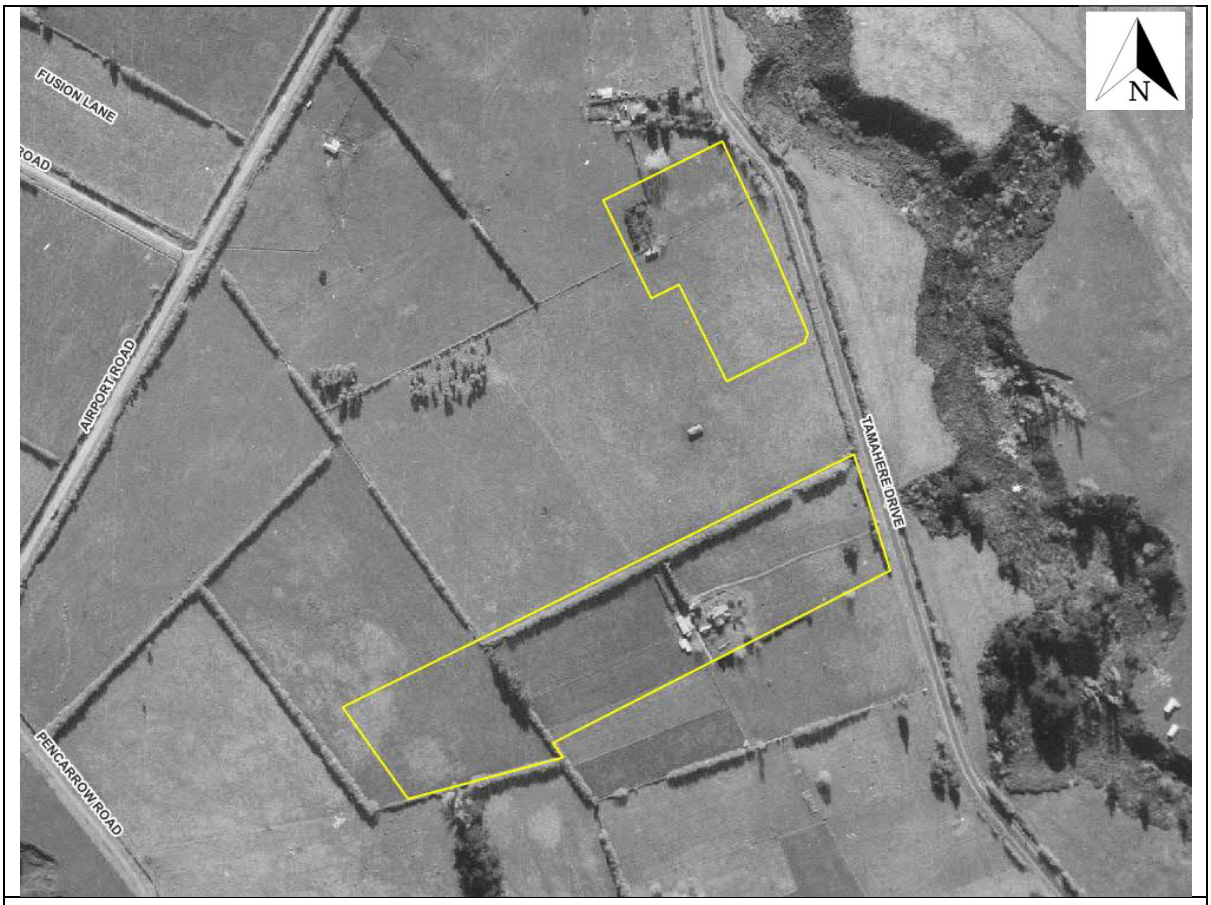
Photo 16: Recent laydown area at 92 Tamahere Drive, facing north

Photo 17: Recent laydown area at 92 Tamahere Drive, facing north

Photo 18: Recent laydown area at 92 Tamahere Drive, facing north

APPENDIX C – HISTORIC AERIAL IMAGES

HD2807 – Tamahere Country Club historical aerials – Accessed 29.03.23



1943 (Retrolens, boundary is approximate)

1953 (Retrolens, boundary is approximate)

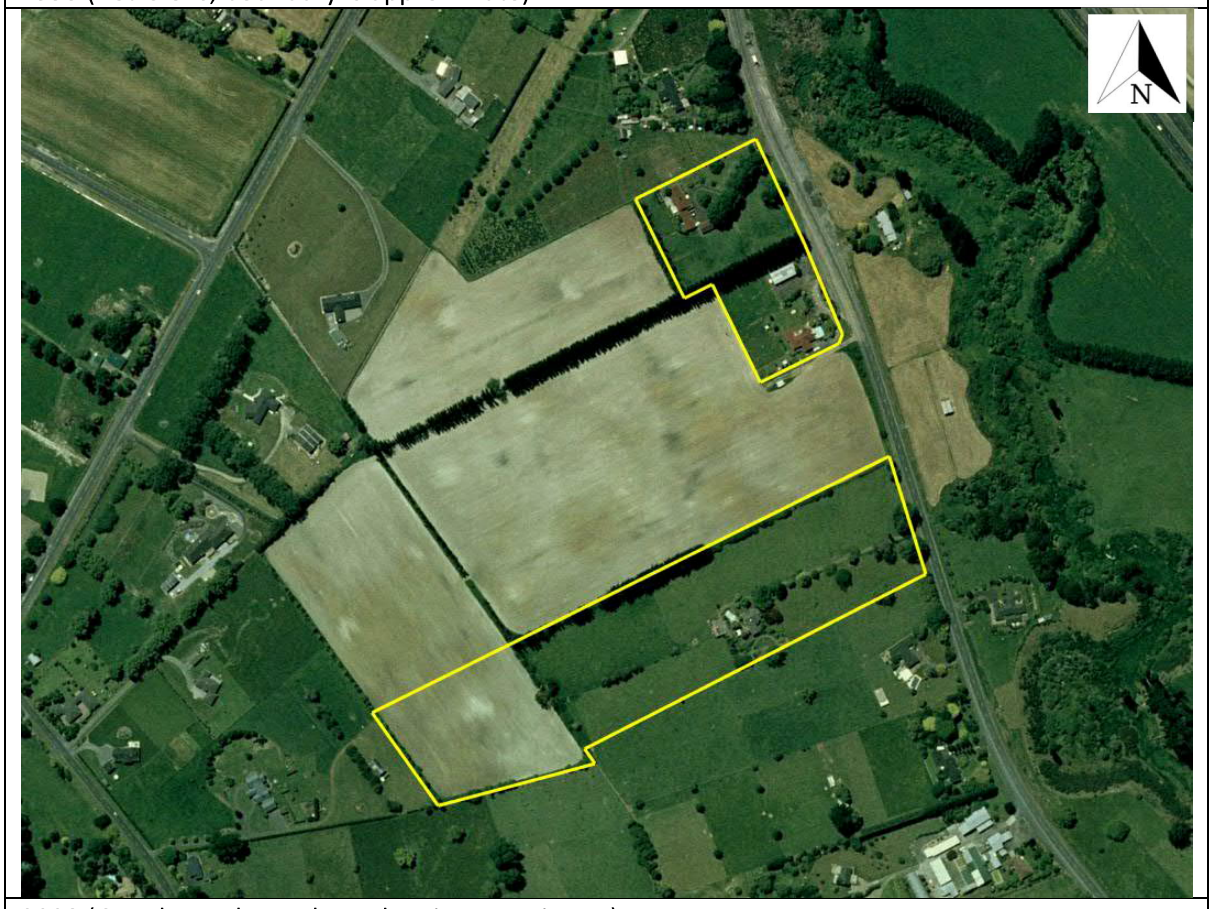
HD2807 – Tamahere Country Club historical aerials – Accessed 29.03.23

1973 (Retrolens, boundary is approximate)

1979 (Retrolens, boundary is approximate)

HD2807 – Tamahere Country Club historical aerials – Accessed 29.03.23

1995 (Retrolens, boundary is approximate)



2008 (Google Earth Pro, boundary is approximate)

HD2807 – Tamahere Country Club historical aerials – Accessed 29.03.23

2015 (Google Earth Pro, boundary is approximate)

2022 (Google Earth Pro, boundary is approximate)

APPENDIX D – COUNCIL RECORDS

Matt Moore

From: Caitlin Holm <Caitlin.Holm@waikatoregion.govt.nz>
Sent: Thursday, 13 April 2023 2:45 pm
To: Matt Moore
Subject: RE Land Use Information Register enquiry 56, 70, 82 & 92 Tamahere Drive, Tamahere (REQ197142) LUI05990, LUI11122 & LUI12766

Dear Matt,

Thank you for your enquiry regarding information the Waikato Regional Council may hold relating to potential contamination at the properties indicated below:

- **56 Tamahere Drive, Tamahere: LOT 1 DPS 59441 (VRN 04443/288/01)**
- **70 Tamahere Drive, Tamahere: LOT 1 DPS 80372 (VRN 04443/288/02)**
- **82 Tamahere Drive, Tamahere: LOT 1 DP 565970 (VRN 04443/283/02)**
- **92 Tamahere Drive, Tamahere: PT LOT 11 DP 9747 (VRN 04443/289/00)**

Background: The Waikato Regional Council maintains a register of properties known to be contaminated on the basis of chemical measurements, or potentially contaminated on the basis of past land use. This register (called the Land Use Information Register) is still under development and should not be regarded as comprehensive. The

'potentially contaminated' category is gradually being compiled with reference to past or present land uses that have a greater than average chance of causing contamination, as outlined in the Ministry for the Environment's Hazardous Activities and Industries List (HAIL): http://www.mfe.govt.nz/sites/default/files/hazards/contaminated-land/is-land-contaminated/hazardous-activities-industries-list.pdf

These properties:

- I can confirm that **several** sites within your area of interest **do** appear on the Land Use Information Register, as indicated by the areas shaded the map below.

WRC REF	Site name	Classification	HAIL Code & Description	Comments and files or documents held
LUI05990 (Pink area)	Historic Orchard and Chemical Shed - 70 Tamahere Drive, Tamahere	Verified HAIL - Limited Sampling	**A10**. Persistent pesticide bulk storage or use	The following documents are available on request: • RAP completed by HAIL Environmental in 2019 (DOC# 13767049) • SMP completed by HAIL Environmental in 2021 (DOC# 21891348) • Revised DSI completed by HAIL Environmental in 2021 (DOC# 21893023)
LUI11122 (Green area)	ex CR Roberts Ltd	Unverified HAIL	**A10**. Persistent pesticide bulk storage or use	This site is included on the register for land use information only; we do not hold soil investigation reports regarding the presence or otherwise of hazardous substances in the soil.
LUI12766 (Yellow area)	Historic Market Gardens - 85, 92, 110 & 120	Unverified HAIL	**A10**. Persistent pesticide	This site is included on the register for land use information only; we do not hold soil investigation

	Tamahere Drive, Tamahere		bulk storage or use	reports regarding the presence or otherwise of hazardous substances in the soil.

District Councils: Our records are not integrated with those of territorial authorities, so it would also be worth contacting the Waikato District Council to complete your audit of Council records if you have not already done so. In general, information about known contaminated land will be included on a property LIM produced by the territorial authority.

Rural Land Considerations: Examples of sites that are "more likely than not" to have soil contamination (HAIL sites) include timber treatment activities, service stations and/or petroleum storage, panel beaters, spray painters, etc. Whilst pastoral farming is not included on this list, typical farming activities of horticulture, sheep dipping, chemical storage, petroleum storage and workshops are; but are more difficult to identify and may not be as well represented on the Land Use Information Register. Therefore, individuals interested in pastoral land may be interested in completing further investigations in accordance with Ministry for the Environment Guidelines prior to land purchase and/or development.

Additional Information: Please note that:

- Significant use of lead-based paint on buildings can, in some cases, pose a contamination risk; the use of lead-based paint is not recorded on the Land Use Information Register.
- Buildings in deteriorated or derelict condition which contain asbestos can result in asbestos fibres in soil; the use of asbestos in building materials is not recorded on the Land Use Information Register.
- The long term, frequent use of superphosphate fertilisers can potentially result in elevated levels of cadmium in soil; the use of superphosphate fertiliser is not recorded on the Land Use Information Register.
- We are not currently resourced to fully incorporate historic aerial photographs in our region-wide assessment of HAIL activities. A significant proportion of the Crown historical aerial image archive for the Waikato region is available to view free of charge at http://retrolens.nz/. We recommend this resource is consulted for any HAIL assessment.
- Due to the large volume of enquiries being received, we may not be able to respond to your enquiry as quickly as previously. We are resourced to meet **20 day** response times as per LGOIMA, but endeavour to respond more quickly when workload permits. If your enquiry is urgent, please note this first in your enquiry and we will do our best to assist.

Please feel free to contact me if you have any further queries on this matter. For any new enquiries or requests for information please continue to use the Request for Service form for 'Contaminated Land/HAIL.'

Regards,

Caitlin Holm | SCIENTIST - GEOTHERMAL AIR LAND ECOLOGY AND CONTAMINATION | Geothermal & Air, Land Ecology & Contamination,
WAIKATO REGIONAL COUNCIL | Te Kaunihera ā Rohe o Waikato
P: +6479497129
M: +64212133330
F: facebook.com/waikatoregion
Private Bag 3038, Waikato Mail Centre, Hamilton, 3240

APPENDIX E – SOIL INVESTIGATION LOGS

INVESTIGATION LOG

Client:	Tamahere Country Club
Project:	Tamahere Country Club PGR
Location:	-
Co-ordinates:	1807557mE, 5809993mN
Elevation:	Ground

Job No.: HD2812

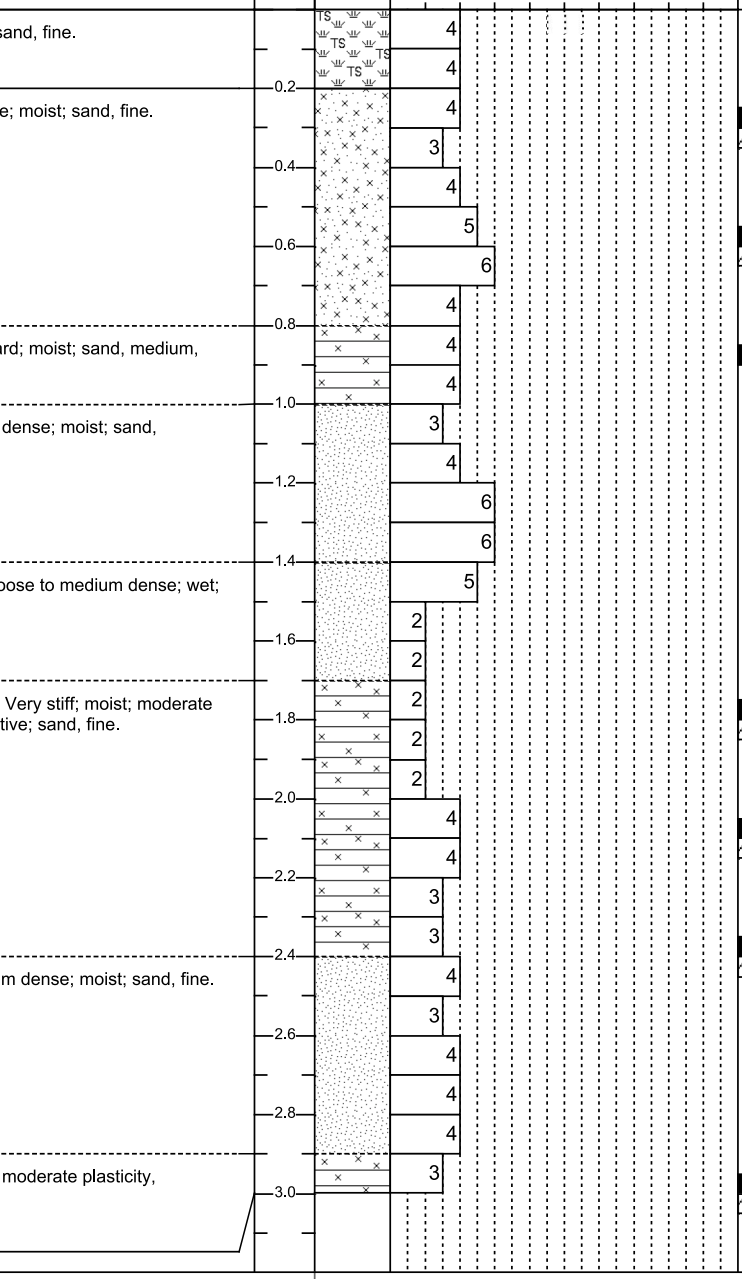
No.: HA01

Date: 04.04.23

Logged By: SW

Checked By: RR

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	Sandy TOPSOIL; greyish brown. Dry; sand, fine.	0.2
Hinuera Formation	Sandy SILT; light brown. Medium dense; moist; sand, fine.	0.4
		0.6
	Silty CLAY, with some sand; brown. Hard; moist; sand, medium, Quartz.	0.8
	SAND, with trace clay; brown. Medium dense; moist; sand, medium.	1.0
		1.2
	SAND, with trace silt; greyish brown. Loose to medium dense; wet; sand, fine to medium.	1.4
		1.6
	Silty CLAY, with minor sand; light grey. Very stiff; moist; moderate plasticity, sensitive to moderately sensitive; sand, fine.	1.8
		2.0
		2.2
	SAND, with minor silt; light grey. Medium dense; moist; sand, fine.	2.4
		2.6
		2.8
	Silty CLAY; light grey. Very stiff; moist; moderate plasticity, moderately sensitive.	3.0
	EOH: 3.00 m	



Photo

Remarks

End of HA at 3.0 meters_ Target depth achieved.

Shear Vanes
- Peak
- Remoulded

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Investigation Pit
- [ ] Machine Borehole

INVESTIGATION LOG

Client: Tamahere Country Club	**Job No.:** HD2812
Project: Tamahere Country Club PGR	**No.:** HA06
Location: -	**Date:** 04.04.23
Co-ordinates: 1807231mE, 5809548mN	**Logged By:** SW
Elevation: Ground	**Checked By:** RR

Geology	Geological Interpretation (refer to separate Geotechnical and Geological Information sheet for further information)	Depth (m)
Topsoil	TOPSOIL; dark blackish brown. Moist.	0.2
Hinuera Formation	SAND, with some clay, with trace silt; light brown. Loose to medium dense; moist; sand, fine.	0.4
	SAND, with minor silt; light grey brown. Very loose to medium dense; moist; sand, fine.	0.6
		0.8
		1.0
		1.2
	SAND; grey. Loose; moist to wet; sand, fine.	1.4
	SILT, with some clay and sand; brown grey. Very stiff; wet, sensitive; sand, fine.	1.6
	SAND, with trace clay; light brown grey. Medium dense; wet; poorly graded; sand, fine to medium.	1.8
		2.0
	SILT, with some sand; light grey. Medium dense; wet; sand, fine.	2.2
	SAND, with trace silt; light grey. Loose to medium dense; wet; poorly graded; sand, fine to medium.	2.4
	SILT, with minor sand; light grey. Medium dense; wet; moderate dilatency; sand, fine.	2.6
	SAND; grey. Medium dense to dense; wet; sand, fine to coarse.	2.8
	EOH: 3.00 m	3.0

Legend: TS

Scala Penetrometer (Blows / 100 mm): 4, 3, 2, 2, 2, 3, 3, 1, 2, 3, 2, 4, 2, 2, 4, 5, 3, 4, 4, 4, 4, 2, 3, 5, 4, 8, 6, 6, 6, 5

Vane Shear Strength (kPa) — Vane: 2639: 154 / 30; 95 / 27; 148 / 30

Water: Groundwater Not Encountered

Photo

Remarks

End of log at 3.0 meters_ Target depth achieved.

Shear Vanes
- Peak
- Remoulded

Water
- Standing Water Level
- Out flow
- In flow

Investigation Type
- [x] Hand Auger
- [ ] Investigation Pit
- [ ] Machine Borehole

APPENDIX F – RESULTS SUMMARY TABLE

HD2807 - Tamahere Country Club
Laboratory results summary table (Heavy metals and asbestos)

	Sample Name:	Residential assessment criteria*	Waikato regional cleanfill criteria	Waikato background concentrations[1]	ES01-50 29-03-23	ES02-50 29-03-23	ES03-50 29-03-23	ES04-50 29-03-23	ES05-50 29-03-23	ES06-50 29-03-23	ES07-50 29-03-23	ES08-50 29-03-23	ES09-50 29-03-23	ES10-50 29-03-23	ES11-50 29-03-23	ES12-50 29-03-23
	Lab Number:				3220406	3220406	3220406	3220406	3220407	3220407	3220407	3220407	3220407	3220406	3220406	3220406
Heavy Metals, Screen Level																
Total Recoverable Arsenic	mg/kg dry wt	90**	17	6.8	7	9	4	6	10	11	11	29	11	25	24	23
Total Recoverable Cadmium	mg/kg dry wt	3	0.8	0.22	0.22	0.25	0.35	0.11	0.45	0.23	0.36	0.28	0.3	0.31	0.33	0.32
Total Recoverable Chromium	mg/kg dry wt	460	56	30	-	-	-	-	-	-	-	-	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	>10,000	120	25	-	-	-	-	-	-	-	-	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	2,200**	78	20	-	-	-	-	-	-	-	-	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	400	33	7.6	-	-	-	-	-	-	-	-	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	8,000	175	53	-	-	-	-	-	-	-	-	-	-	-	-

* Assessment criteria from the NESCS and NEPM. Standard residential assumes 10% of consumed produce will be grown on site.

** Using site-specific guideline values, assuming retirement village land use.

[1] Waikato Regional Council, *Upper limit background concentrations for selected elements in soil of the Waikato region, acid recoverable data* .

	Sample Name:	Residential assessment criteria*	Waikato regional cleanfill criteria	Waikato background concentrations[1]	ES13-50 29-03-23	ES14-50 29-03-23	ES15-50 29-03-23	ES16-50 29-03-23	ES17-50 29-03-23	ES18-50 29-03-23	ES19-50 29-03-23	ES20-50 29-03-23	ES21-50 29-03-23	ES22-50 29-03-23	ES23-50 29-03-23	ES24-50 29-03-23
	Lab Number:				3220406	3220406	3220406	3220406	3220406	3220406	3220406	3220406	3220406	3220406	3220406	3220406
Heavy Metals, Screen Level																
Total Recoverable Arsenic	mg/kg dry wt	90**	17	6.8	8	8	10	8	5	9	13	18	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	3	0.8	0.22	0.35	0.74	0.22	0.39	< 0.10	0.38	0.26	0.38	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	460	56	30	-	-	-	-	6	8	8	11	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	>10,000	120	25	-	-	-	-	5	46	9	33	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	2,200**	78	20	-	-	-	-	11.8	16.1	180	270	230	182	24	17.5
Total Recoverable Nickel	mg/kg dry wt	400	33	7.6	-	-	-	-	2	4	3	4	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	8,000	175	53	-	-	-	-	25	195	104	320	-	-	-	-
Asbestos	Presence/absence				-	-	-	-	-	-	-	-	-	-	Absent	Absent

* Assessment criteria from the NESCS and NEPM. Standard residential assumes 10% of consumed produce will be grown on site.

** Using site-specific guideline values, assuming retirement village land use.

[1] Waikato Regional Council, *Upper limit background concentrations for selected elements in soil of the Waikato region, acid recoverable data* .

	Sample Name:	Residential assessment criteria*	Waikato regional cleanfill criteria	Waikato background concentrations[1]	ES25-50 29-03-23	ES26-50 29-03-23	ES27-50 29-03-23	ES08r-50 29-03-23	ES11r-50 29-03-23	ES10-300 29-03-23	ES11-300 29-03-23	ES12-300 29-03-23	ES08-400 29-03-23	PH1 29-03-23	PH2 29-03-23
	Lab Number:				3220406	3220406	3220406	3220406	3220406	3220406	3220406	3220406	3220406	3220406	3220406
pH	pH Units				-	-	-	-	-	-	-	-	-	5.8	5.8
Heavy Metals, Screen Level															
Total Recoverable Arsenic	mg/kg dry wt	90**	17	6.8	-	-	24	21	27	83	39	16	49	-	-
Total Recoverable Cadmium	mg/kg dry wt	3	0.8	0.22	-	-	0.56	0.26	0.31	-	-	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	460	56	30	-	-	6	-	-	-	-	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	>10,000	120	25	-	-	71	-	-	-	-	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	2,200**	78	20	37	26	16.8	-	-	-	-	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	400	33	7.6	-	-	3	-	-	-	-	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	8,000	175	53	-	-	30	-	-	-	-	-	-	-	-
Asbestos	Presence/absence				Absent	Absent	-	-	-	-	-	-	-	-	-

* Assessment criteria from the NESCS and NEPM. Standard residential assumes 10% of consumed produce will be grown on site.

** Using site-specific guideline values, assuming retirement village land use.

[1] Waikato Regional Council, *Upper limit background concentrations for selected elements in soil of the Waikato region, acid recoverable data* .

Relative percent differences

Sample Name:	ES08-50 29-03-23	ES08r-50 29-03-23	**RPD*** **
Lab Number:	3220406.8	3220406.28	
Arsenic	29	21	32%
Cadmium	0.28	0.26	7%

Sample Name:	ES11-50 29-03-23	ES11r-50 29-03-23	**RPD*** **
Lab Number:	3220406.11	3220406.29	
Arsenic	24	27	12%
Cadmium	0.33	0.31	6%

***Relative Percent Difference. Calculated as ((x2 - x1)|/((x2 + x1)/2)

HD2807 - Tamahere Country Club
Laboratory results summary table (OCPs and TPH)

	Sample Name:	Residential assessment criteria*	Waikato regional cleanfill criteria	Waikato background concentrations[1]	ES04-50 29-03-23	ES08-50 29-03-23	ES10-50 29-03-23	ES14-50 29-03-23	ES27-50 29-03-23
	Lab Number:				3220406	3220407	3220406	3220406	3220406
Dry Matter	g/100g as rcvd				62	66	69	64	75
Organochlorine Pesticides Screening in Soil									
Aldrin	mg/kg dry wt	2.6	0.2		< 0.016	< 0.015	< 0.014	< 0.015	-
alpha-BHC	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
beta-BHC	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
delta-BHC	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
gamma-BHC (Lindane)	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
cis-Chlordane	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
trans-Chlordane	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
2,4'-DDD	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
4,4'-DDD	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
2,4'-DDE	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
4,4'-DDE	mg/kg dry wt				< 0.016	< 0.015	0.064	< 0.015	-
2,4'-DDT	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
4,4'-DDT	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
Total DDT Isomers	mg/kg dry wt	70	0.7		< 0.10	< 0.09	< 0.09	< 0.09	-
Dieldrin	mg/kg dry wt	2.6	0.2		< 0.016	< 0.015	< 0.014	< 0.015	-
Endosulfan I	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
Endosulfan II	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
Endosulfan sulphate	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
Endrin	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
Endrin aldehyde	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
Endrin ketone	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
Heptachlor	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
Heptachlor epoxide	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
Hexachlorobenzene	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
Methoxychlor	mg/kg dry wt				< 0.016	< 0.015	< 0.014	< 0.015	-
Total Petroleum Hydrocarbons in Soil									
C7 - C9	mg/kg dry wt	500	120		-	-	-	-	< 20
C10 - C14	mg/kg dry wt	510	58		-	-	-	-	< 20
C15 - C36	mg/kg dry wt	NA			-	-	-	-	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt				-	-	-	-	< 80

* OCPs from the NESCS. TPH from the Petroleum Hydrocarbon Tier 1 guidelines, using sandy silt soil <1 m depth.

[1] Waikato Regional Council, *Upper limit background concentrations for selected elements in soil of the Waikato region, acid recoverable data* .

APPENDIX G – LABORATORY REPORTS

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **322 0406**
Date Recv: 29-Mar-23 15:14
Received by: Isaac Broadbent
3132204060

Quote No 91878
Primary Contact Matt Moore
Submitted By Matt Moore
Client Name HD Geo Limited 245781
Address PO Box 9266, Waikato Mail Centre
Hamilton 3240
Phone 07 957 2727 *Mobile* 027 701 9529
Email matt@hdgeo.co.nz
Charge To HD Geo Limited 245781
Client Reference ~~ES02807~~ HD2807
Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*
☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other paul@hdgeo.co.nz
☐ Other
Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
☑ *Tick if you require COC to be emailed back*
Date & Time: 29-3-23 14:45
Name: Matt Moore
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 18.9

☐ Sample & Analysis details checked
Signature:

ADDITIONAL INFORMATION / KNOWN HAZARDS

All 250 containers are for metals (inc. PSoil250Asb containers)

Priority ☐ Low ☐ Normal ☑ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)
NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 10 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

Quoted Sample Types
Soil (Soil), Dried Paint (Paint), Building Material (BM), Ground Water (GW)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	ES01-50 to ES16-150	29-3-23	Soil	Arsenic + cadmium
2	ES17-50 to ES20-50			Heavy metals
3	ES27-50			Heavy metals, TPH
4	ES23-50 to ES26-50			Lead, p/a asbestos
5	ES08r-50, ES14-50			Arsenic, cadmium
6	PH1, PH2			pH
7	ES04-50, ES08-50, ES10-50, ES14-50			OCPs
8	All depth samples			Hold cold
9				
10				

Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

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Certificate of Analysis

Client:	HD Geo Limited	**Lab No:**	3220406	SPv2
Contact:	Matt Moore	**Date Received:**	29-Mar-2023	
	C/- HD Geo Limited	**Date Reported:**	14-Apr-2023	**(Amended)**
	PO Box 9266	**Quote No:**	91878	
	Waikato Mail Centre	**Order No:**		
	Hamilton 3240	**Client Reference:**	HD2807	
		Submitted By:	Matt Moore	

Sample Type: Soil

Sample Name:		ES01-50 29-Mar-2023	ES02-50 29-Mar-2023	ES03-50 29-Mar-2023	ES04-50 29-Mar-2023	ES05-50 29-Mar-2023
Lab Number:		3220406.1	3220406.2	3220406.3	3220406.4	3220406.5
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	-	62	-
Total Recoverable Arsenic	mg/kg dry wt	7	9	4	6	10
Total Recoverable Cadmium	mg/kg dry wt	0.22	0.25	0.35	0.11	0.45
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	-	< 0.016	-
alpha-BHC	mg/kg dry wt	-	-	-	< 0.016	-
beta-BHC	mg/kg dry wt	-	-	-	< 0.016	-
delta-BHC	mg/kg dry wt	-	-	-	< 0.016	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.016	-
cis-Chlordane	mg/kg dry wt	-	-	-	< 0.016	-
trans-Chlordane	mg/kg dry wt	-	-	-	< 0.016	-
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.016	-
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.016	-
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.016	-
4,4'-DDE	mg/kg dry wt	-	-	-	< 0.016	-
2,4'-DDT	mg/kg dry wt	-	-	-	< 0.016	-
4,4'-DDT	mg/kg dry wt	-	-	-	< 0.016	-
Total DDT Isomers	mg/kg dry wt	-	-	-	< 0.10	-
Dieldrin	mg/kg dry wt	-	-	-	< 0.016	-
Endosulfan I	mg/kg dry wt	-	-	-	< 0.016	-
Endosulfan II	mg/kg dry wt	-	-	-	< 0.016	-
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.016	-
Endrin	mg/kg dry wt	-	-	-	< 0.016	-
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.016	-
Endrin ketone	mg/kg dry wt	-	-	-	< 0.016	-
Heptachlor	mg/kg dry wt	-	-	-	< 0.016	-
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.016	-
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.016	-
Methoxychlor	mg/kg dry wt	-	-	-	< 0.016	-

Sample Name:		ES06-50 29-Mar-2023	ES07-50 29-Mar-2023	ES08-50 29-Mar-2023	ES09-50 29-Mar-2023	ES10-50 29-Mar-2023
Lab Number:		3220406.6	3220406.7	3220406.8	3220406.9	3220406.10
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	66	-	69
Total Recoverable Arsenic	mg/kg dry wt	11	11	29	11	25
Total Recoverable Cadmium	mg/kg dry wt	0.23	0.36	0.28	0.30	0.31

Sample Type: Soil						
Sample Name:		ES06-50 29-Mar-2023	ES07-50 29-Mar-2023	ES08-50 29-Mar-2023	ES09-50 29-Mar-2023	ES10-50 29-Mar-2023
Lab Number:		3220406.6	3220406.7	3220406.8	3220406.9	3220406.10
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	< 0.015	-	< 0.014
alpha-BHC	mg/kg dry wt	-	-	< 0.015	-	< 0.014
beta-BHC	mg/kg dry wt	-	-	< 0.015	-	< 0.014
delta-BHC	mg/kg dry wt	-	-	< 0.015	-	< 0.014
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.015	-	< 0.014
cis-Chlordane	mg/kg dry wt	-	-	< 0.015	-	< 0.014
trans-Chlordane	mg/kg dry wt	-	-	< 0.015	-	< 0.014
2,4'-DDD	mg/kg dry wt	-	-	< 0.015	-	< 0.014
4,4'-DDD	mg/kg dry wt	-	-	< 0.015	-	< 0.014
2,4'-DDE	mg/kg dry wt	-	-	< 0.015	-	< 0.014
4,4'-DDE	mg/kg dry wt	-	-	< 0.015	-	0.064
2,4'-DDT	mg/kg dry wt	-	-	< 0.015	-	< 0.014
4,4'-DDT	mg/kg dry wt	-	-	< 0.015	-	< 0.014
Total DDT Isomers	mg/kg dry wt	-	-	< 0.09	-	< 0.09
Dieldrin	mg/kg dry wt	-	-	< 0.015	-	< 0.014
Endosulfan I	mg/kg dry wt	-	-	< 0.015	-	< 0.014
Endosulfan II	mg/kg dry wt	-	-	< 0.015	-	< 0.014
Endosulfan sulphate	mg/kg dry wt	-	-	< 0.015	-	< 0.014
Endrin	mg/kg dry wt	-	-	< 0.015	-	< 0.014
Endrin aldehyde	mg/kg dry wt	-	-	< 0.015	-	< 0.014
Endrin ketone	mg/kg dry wt	-	-	< 0.015	-	< 0.014
Heptachlor	mg/kg dry wt	-	-	< 0.015	-	< 0.014
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.015	-	< 0.014
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.015	-	< 0.014
Methoxychlor	mg/kg dry wt	-	-	< 0.015	-	< 0.014

Sample Name:		ES11-50 29-Mar-2023	ES12-50 29-Mar-2023	ES13-50 29-Mar-2023	ES14-50 29-Mar-2023	ES15-50 29-Mar-2023
Lab Number:		3220406.11	3220406.12	3220406.13	3220406.14	3220406.15
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	-	64	-
Total Recoverable Arsenic	mg/kg dry wt	24	23	8	8	10
Total Recoverable Cadmium	mg/kg dry wt	0.33	0.32	0.35	0.74	0.22
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	-	< 0.015	-
alpha-BHC	mg/kg dry wt	-	-	-	< 0.015	-
beta-BHC	mg/kg dry wt	-	-	-	< 0.015	-
delta-BHC	mg/kg dry wt	-	-	-	< 0.015	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.015	-
cis-Chlordane	mg/kg dry wt	-	-	-	< 0.015	-
trans-Chlordane	mg/kg dry wt	-	-	-	< 0.015	-
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.015	-
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.015	-
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.015	-
4,4'-DDE	mg/kg dry wt	-	-	-	< 0.015	-
2,4'-DDT	mg/kg dry wt	-	-	-	< 0.015	-
4,4'-DDT	mg/kg dry wt	-	-	-	< 0.015	-
Total DDT Isomers	mg/kg dry wt	-	-	-	< 0.09	-
Dieldrin	mg/kg dry wt	-	-	-	< 0.015	-
Endosulfan I	mg/kg dry wt	-	-	-	< 0.015	-
Endosulfan II	mg/kg dry wt	-	-	-	< 0.015	-
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.015	-
Endrin	mg/kg dry wt	-	-	-	< 0.015	-
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.015	-
Endrin ketone	mg/kg dry wt	-	-	-	< 0.015	-
Heptachlor	mg/kg dry wt	-	-	-	< 0.015	-

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Sample Type: Soil						
Sample Name:		ES11-50 29-Mar-2023	ES12-50 29-Mar-2023	ES13-50 29-Mar-2023	ES14-50 29-Mar-2023	ES15-50 29-Mar-2023
Lab Number:		3220406.11	3220406.12	3220406.13	3220406.14	3220406.15
Organochlorine Pesticides Screening in Soil						
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.015	-
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.015	-
Methoxychlor	mg/kg dry wt	-	-	-	< 0.015	-

Sample Name:		ES16-50 29-Mar-2023	ES17-50 29-Mar-2023	ES18-50 29-Mar-2023	ES19-50 29-Mar-2023	ES20-50 29-Mar-2023
Lab Number:		3220406.16	3220406.17	3220406.18	3220406.19	3220406.20
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	8	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.39	-	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	5	9	13	18
Total Recoverable Cadmium	mg/kg dry wt	-	< 0.10	0.38	0.26	0.38
Total Recoverable Chromium	mg/kg dry wt	-	6	8	8	11
Total Recoverable Copper	mg/kg dry wt	-	5	46	9	33
Total Recoverable Lead	mg/kg dry wt	-	11.8	16.1	180	270
Total Recoverable Nickel	mg/kg dry wt	-	2	4	3	4
Total Recoverable Zinc	mg/kg dry wt	-	25	195	104	320

Sample Name:		ES21-50 29-Mar-2023	ES22-50 29-Mar-2023	ES23-50 29-Mar-2023	ES24-50 29-Mar-2023	ES25-50 29-Mar-2023
Lab Number:		3220406.21	3220406.22	3220406.23	3220406.24	3220406.25
Individual Tests						
Total Recoverable Lead	mg/kg dry wt	230	182	24	17.5	37

Sample Name:		ES26-50 29-Mar-2023	ES27-50 29-Mar-2023	ES08r-50 29-Mar-2023	ES11r-50 29-Mar-2023	PH1 29-Mar-2023
Lab Number:		3220406.26	3220406.27	3220406.28	3220406.29	3220406.30
Individual Tests						
Dry Matter	g/100g as rcvd	-	75	-	-	-
Total Recoverable Arsenic	mg/kg dry wt	-	-	21	27	-
Total Recoverable Cadmium	mg/kg dry wt	-	-	0.26	0.31	-
Total Recoverable Lead	mg/kg dry wt	26	-	-	-	-
pH*	pH Units	-	-	-	-	5.8
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	24	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	-	0.56	-	-	-
Total Recoverable Chromium	mg/kg dry wt	-	6	-	-	-
Total Recoverable Copper	mg/kg dry wt	-	71	-	-	-
Total Recoverable Lead	mg/kg dry wt	-	16.8	-	-	-
Total Recoverable Nickel	mg/kg dry wt	-	3	-	-	-
Total Recoverable Zinc	mg/kg dry wt	-	30	-	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	-	< 20	-	-	-
C10 - C14	mg/kg dry wt	-	< 20	-	-	-
C15 - C36	mg/kg dry wt	-	< 40	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	-	< 80	-	-	-

Sample Name:		PH2 29-Mar-2023	ES10-300 29-Mar-2023	ES11-300 29-Mar-2023	ES12-300 29-Mar-2023	ES08-400 29-Mar-2023
Lab Number:		3220406.31	3220406.40	3220406.41	3220406.42	3220406.48
Individual Tests						
Total Recoverable Arsenic	mg/kg dry wt	-	83	39	16	49
pH*	pH Units	5.8	-	-	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces report '3220406-SPv1' issued on 05-Apr-2023 at 9:31 am.
Reason for amendment: Additional lead and arsenic added.

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Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-31, 40-42, 48
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation May contain a residual moisture content of 2-5%.	-	1-16, 21-26, 28-29, 40-42, 48
Soil Prep Dry & Sieve for Agriculture	Air dried at 35°C and sieved, <2mm fraction.	-	30-31
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	4, 8, 10, 14, 27
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-16, 21-26, 28-29, 40-42, 48
Total Recoverable Arsenic	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	1-16, 28-29, 40-42, 48
Total Recoverable Cadmium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.10 mg/kg dry wt	1-16, 28-29
Total Recoverable Lead	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	21-26
pH*	1:2 (v/v) soil : water slurry followed by potentiometric determination of pH. In-house.	0.1 pH Units	30-31
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	17-20, 27
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	4, 8, 10, 14
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	27
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	27
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	27
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	27

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 30-Mar-2023 and 14-Apr-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	HD Geo Limited	**Lab No:**	3222100	A2Pv1
Contact:	Matt Moore	**Date Received:**	30-Mar-2023	
	C/- HD Geo Limited	**Date Reported:**	05-Apr-2023	
	PO Box 9266	**Quote No:**	91878	
	Waikato Mail Centre	**Order No:**		
	Hamilton 3240	**Client Reference:**	HD2807	
		Submitted By:	Matt Moore	

Sample Type: Soil

Sample Name	Lab Number	As Received Weight (g)	Dry Weight (g)	<2mm Subsample Weight (g dry wt)	Asbestos Presence / Absence	Description of Asbestos Form
ES23 -50	3222100.3	169.0	120.9	56.8	Asbestos NOT detected.	-
ES24 -50	3222100.5	135.1	91.6	54.4	Asbestos NOT detected.	-
ES25 -50	3222100.6	115.3	71.7	59.0	Asbestos NOT detected.	-
ES26 -50	3222100.8	147.5	127.3	57.1	Asbestos NOT detected.	-

Glossary of Terms

- Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
- Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
- ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
- ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
- Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
- Trace - Trace levels of asbestos, as defined by AS4964-2004.

For further details, please contact the Asbestos Team.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	3, 5-6, 8
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	3, 5-6, 8
<2mm Subsample Weight	Sample dried at 100 to 105°C, weight of <2mm sample fraction taken for asbestos identification if less than entire fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	3, 5-6, 8
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	3, 5-6, 8
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	3, 5-6, 8

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed on 04-Apr-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Rhodri Williams BSc (Hons)
Technical Manager - Asbestos