ENGEO

Celebrating 10 YEARS IN NZ

Combined Preliminary and Detailed Site Investigation

597 Maddisons Road

Rolleston

Canterbury

Submitted to:

Hughes Development Ltd
8 Millbank Lane
Merivale
Christchurch 8014

ENGEO Limited
124 Montreal Street, Sydenham, Christchurch 8023
PO Box 373, Christchurch 8140, New Zealand
Tel +64 3 328 9012 Fax +64 3 328 9013
www.engeo.co.nz

03.09.2020
12903.000.005_96

ACENZ

Contents

Tables

Figures

Appendices

ENGEO Document Control:

Report Title	Combined Preliminary and Detailed Site Investigation - 597 Maddisons Road, Rolleston			
Project No.	12903.003.000	Doc ID	05	
Client	Hughes Development Ltd	Client Contact	Kelvin Back	
Distribution (PDF)	Hughes Development Ltd			
Date	Revision Details/Status	WP	Author	Reviewer
03/09/2020	Issued to Client	DF	NF/SF	DR

1 Introduction

ENGEO Ltd was requested by Hughes Development Ltd to undertake a combined preliminary and detailed site investigation of the property at 597 Maddisons Road, Rolleston, Canterbury (herein referred to as 'the site'). Figure 1 attached indicates the location of the property. The purpose of the assessment was to assess the property's suitability for a change of land use consent and subdivision under the Resource Management (*National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (NES) and to satisfy the requirements of Selwyn District Council (SDC).

This investigation was undertaken in general accordance with the MfE 2011, *Contaminated Land Management Guidelines (CLMG) No.5: Guidelines for Site Investigation and Site Analysis of Soil* and reported in general accordance with the MfE 2011 *CLMG No.1: Reporting on Contaminated Sites in New Zealand*.

1.1 Objectives of the Assessment

The objective of this Combined PSI / DSI was to assess conditions indicative of releases and threatened releases of hazardous substances on, at, in or to the subject property and report on the potential risk posed to future site users.

1.2 Approach

To satisfy the objectives, ENGEO sought to gather information regarding the following:

- Current and past property uses and occupancies;
- Current and past uses of hazardous substances;
- Waste management and disposal activities that could have caused a release or threatened release of hazardous substances;
- Current and past corrective actions and response activities to address past and on-going releases of hazardous substances at the subject property; and
- Properties adjoining or located near the subject property that have environmental conditions that could have resulted in conditions indicative of releases or threatened releases of hazardous substances to the subject property.

1.2.1 Review of Site Information

During this assessment, a number of sources of information were contacted for information relating to the site regarding its past and present uses. This included contacting Canterbury Regional Council (CRC) to determine if there were records on the Listed Land Use Register (LLUR), reviewing records held by Selwyn District Council (SDC) including the property file, and obtaining the certificate of titles for the property from Land Information New Zealand (LINZ). A review of a number of historical and current aerial photographs was also undertaken using images from Canterbury Maps and Google Earth.

1.2.2 Site Inspection

A site walk over was undertaken on 28 august 2020 by ENGEO staff. Photographs collected from site have been included in Appendix 1.

2 Site Description and Setting

Site information is summarised in Table 1 below.

Table 1: Site Information

Name	Description
Location	597 East Maddisons Road, Rolleston
Legal Description	Lot 1 DP 57004
Site Area	Approximately 20.4 ha
Property Owner	Property is under contract to Hughes Developments Limited.
Current Land Use	Residential and Agricultural Land
Proposed Land Use	Standard residential subdivision, for single dwelling sites with gardens, including home-grown produce consumption (10%).
Building Construction	Dwelling – concrete foundation, brick cladding, metal roof. Various sheds – timber and metal cladding, metal roofs.
Territorial Authority	Selwyn District Council
Zoning	Inner Plains / Living Z / Rural

The site setting is summarised in Table 2 below.

Table 2: Site Setting

Item	Description
Topography	The site is predominantly flat
Local Setting	The surrounding area is a mix of agricultural and residential.
Nearest Surface Water & Use	Two marked drains (ECAN GIS) are present, one on the north eastern boundary of the site (Drain ID 20877) and one on the south eastern side of the property on the far side of Goulds Road (Drain ID 20881).

Item	Description
Geology (GNS Science)	Late Quaternary alluvium and colluvium. Unconsolidated to poorly consolidated mud, sand, gravel and peat of alluvial and colluvial origin
Hydrogeology (ECan GIS)	The site is located over an unconfined / semiconfined gravel aquifer. The on-site well does not record ground water level, however wells directly west (M36/5041) and directly east (M36/4891) record depth of groundwater at 6.8 and 7.38 meters below ground level respectively. Groundwater is presumed to flow from the northwest to the southeast towards Lake Ellesmere.
Groundwater Abstractions (ECan GIS)	There is one groundwater abstraction located on the site and eight within 250 m of the site: M36/4346: Main M. R, active well (26.8 m) for domestic supply onsite. M36/5041: Kajens Trading Development Ltd, active well (32.0 m) for domestic supply to the northwest of the site. M36/5268: Macdonald, K, active well (37.0 m) for domestic supply to the north of the site. M36/3041: Quinton, K. R, active well (24.0 m) for domestic supply to the north of the site. M36/3721: Wilson, N. L, active well (19.0 m) for domestic supply to the north of the site. M36/0038: M. W. B, active well (27.1 m) for domestic supply to the north of the site. M36/20602: Mr David Foskett, active well (36.7 m) for domestic and stockwater supply to the north of the site. M36/4891: Mr & Ms BN & JA Stevens & Gray, active well (25.25 m) for domestic and stockwater supply to the east of the site.
Discharge Consents (ECan GIS)	There are no active discharge consents located on the site, and three active consent within 250 m of the site: CRC052128: Mr & Ms KP & DM Graham, active discharge consent to discharge domestic sewage tank effluent into ground to the north of the site. CRC082098: Brian & Louise Smart & Wilkinson, active discharge consent to discharge domestic sewage effluent into land to the north of the site. CRC190197: BENZ 2007 Limited, active discharge consent to discharge stormwater to land to the north of the site.

3 Site History

A number of sources were used to investigate the past uses of the site. The findings of these information searches have been summarised in this section.

3.1 Discussions with Site Owners

Discussions were had with the current site owners in regards to the past and present uses of the site. The current owners have owned the property since the 1990's when the site was open grazing land. The owner mentioned the offal pit in the far south corner of the site and that is was used for disposing of offal and hardfill. The owner also mentioned the burn pile behind the house where domestic rubbish has been burnt. The remainder of the site has been used for grazing of horses and cattle since it was purchased. The owner cannot recall any other waste pits or burn piles when the land was transferred to them.

3.2 Selwyn District Council Property File

The property file for the site, held by Selwyn District Council, was reviewed on 28 August 2020 as part of the DSI

- 17 February 1994 – Building consent for residential dwelling
- 29 November 1994 – Building consent for garage
- 18 October 1995 – Building consent for implement shed
- 1 November 1999 – Building consent, new / relocated implement shed

The property file information did not indicate asbestos containing materials having being used in the construction of the buildings. Because of the age of the buildings (constructed pre-2000) a full asbestos demolition survey is required; this is to ensure that asbestos materials are identified prior to demolition works so that they can be removed in a safe manner.

3.3 Certificate of Title

A review of the certificate of title was completed with no information related to potential contaminating activities identified. The Certificates of Title are attached in Appendix 2.

3.4 Listed Land Use Register (LLUR)

Potentially hazardous activities are defined on the Ministry for the Environmental (MfE) Hazardous Activities and Industries List (HAIL). Canterbury Regional Council (CRC) maintains a Listed Land Use Register (LLUR) of past and current land uses within the Canterbury region which have potentially had an activity included on the HAIL undertaken on them. Under the NES, the listing of the property on the LLUR triggers the requirement for a contaminated land assessment prior to development.

The CRC LLUR property statement was requested by ENGEO on 28 August 2020 for the site and is presented in Appendix 3. The provided LLUR indicates no recorded information for potentially and / or contaminating activities associated with the site.

3.5 Historical Aerial Photography Review

Aerial photographs dating from 1940 to 2016 have been reviewed. The relevant visible features are summarised in Table 3.

Table 3: Aerial Photography

Date	Source	Site Description	Surrounding Area
1940-1944	Canterbury Maps	The site is a part of a larger block of land which appears to be grassed and likely used for grazing. A fence line is present running along the current fence line in the north west. No buildings are visible on the site.	The surrounding area appears to also be undeveloped and used for grazing or cropping. Forestry is observed to the southeast of the site.
1960-1964	Canterbury Maps	The site has no significant changes from the previous photograph.	The surrounding area remains mainly unchanged from the previous photograph. Some small land disturbance (earth clearance) is observed along the north western boundary of the site however it is unknown what this is associated with.
1970-1974	Canterbury Maps		The surrounding area is mainly unchanged from the previous photograph. New structures (likely residential dwellings and sheds) are observed to the north west and east of the site
1980-1984	Canterbury Maps	No significant changes observed on the site, boundary fences corresponding with the current property boundaries are now present along the south west and south east boarders of the site	The surrounding area is mainly unchanged from the previous photograph.
1990-1994	Canterbury Maps	Multiple small structures are now present on the northern section of the site (likely corresponding with development of a garage and dwelling). Otherwise no significant changes from the previous photograph.	A horse training/race track is observed directly south west of the site in addition to new structures to the south west and east of the site. The majority of the surrounding area still appears to be undeveloped and used for agricultural purposes

Date	Source	Site Description	Surrounding Area
2000-2004	Canterbury Maps	Multiple additional structures are now visible in the northern portion of the site (likely corresponding with development of additional garages and implement sheds). A large white spot is noted on the eastern boundary, cause unknown.	Further residential development is noted on all sides of the site. The former training/race track observed in the preceding photography has been removed and another has been constructed to the west of the site. The site located directly west has been split into grids and appears to have horticultural activities taking place.
2010-2015	Canterbury Maps	A small area of earth disturbance is noted on the western portion of the site (corresponding with a small soakage/wetland area), otherwise no significant changes from earlier photography noted.	Further residential development in the surrounding area, however no significant changes observed.
2017	Canterbury Maps	No significant changes observed on site	Further minor residential development observed to the south, west and north. Significant residential development has occurred to the east of the site.

Table 4 below describes the site conditions during the site walkover on 28 August 2020. Photographs taken during the site walk over have been included in Appendix 1.

Table 4: Current Site Conditions

Site Conditions	Comments
Visible signs of contamination	A burn pile is observed to the south of the dwelling and associated sheds. The material in the burn pile is described as ashy with metal, charcoal and potential asbestos containing material. The burn pile is approximately 5 m in diameter. An offal and waste pit is observed in the southern corner of the site. The pit was approximately 3 m depth. The material observed in the pit was offal, plastics and hardfill including bricks and breeze blocks.
Surface water appearance	The surface water in the stream that feeds into the wetland area and the wetland area was clear.
Current surrounding land use	The majority of the surrounding land is mixed use residential and agricultural.
Local sensitive environments	The wetland area on site and the stream along the western boundary line of the site.
Visible signs of plant stress	No signs of plant stressed observed on the site.

Site Conditions	Comments
Additional observations	A large amount of stored vehicles, machinery and 205 L drums containing domestic house hold rubbish were observed along the southern boundary line of the site. This storage of waste is unlikely to have impacted the underlying soils as it is contained in the drums. The machinery and vehicles have recently been relocated from another site and there was no visual impacts to suggest the underlying soils have been impacted from these stored goods. A few vehicles were stored in the paddock to the south of the dwelling. The soils below the vehicles were visually clear from staining. A large barn to the south of the dwelling had deteriorated paint on the exterior cladding.

4 Potential HAIL Activities

Activities included on the Hazardous Activities and Industries List (HAIL) trigger the requirement for a contaminated land investigation prior to redevelopment. Following the site walkover and review of the desktop information, it is considered that the following HAIL activities are or have been present at the site.

Table 5: Potential HAIL Activities

Potential Source of Contamination	Contaminants of Concern	Possible Extent of Contamination	HAIL Activity as defined by the NES
Waste pit/offal pit	Heavy metals Polycyclic aromatic hydrocarbons	Soils within waste pit	G5: Waste disposal to land
Stockpiled soil near offal pit	Heavy metals Polycyclic aromatic hydrocarbons	Stockpiled soil only	G5: Waste disposal to land
Burn pile to south of the dwelling	Heavy metals Polycyclic aromatic hydrocarbons Asbestos	Burn pile and surrounding soils	G5: Waste disposal to land

Potential Source of Contamination	Contaminants of Concern	Possible Extent of Contamination	HAIL Activity as defined by the NES
Lead based paint – shed to south of the dwelling	Lead	Soils around the shed	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 risk to human health or the environment

Note: Due to the age of the site buildings (constructed in the late 1990's), there is potential for asbestos products to have been used in their construction. Based on experience, asbestos is often present beneath the subfloor of a building or in the upper soil horizon around the halo of a building as a result of cutting of asbestos-containing building material (e.g. for service installation) and weathering of exterior building material. No damaged potential asbestos containing materials were observed around the house during the walkover.

5 Intrusive Investigation

An intrusive investigation was developed to investigate the surface soils around the burn pile, the surface soils within the offal pit and the surface soils near the large shed to the south of the dwelling.

The soils were sampled to assess the suitability of the land (from a contamination / human health perspective) for residential use, and to assess the human health risks posed to site works under the commercial / outdoor worker scenario. The results can also be used to indicate whether there is a likely impact to the surrounding environment.

5.1 Methodology

The following was undertaken during the soil sampling works:

- Collection of three soil samples from the offal/waste pit area in the surface soils (S1-S3). These samples were analysed for heavy metals and polycyclic hydrocarbons (PAHs);
- Collection of three soil samples from the stockpiled topsoil near the waste pit (S4-S6). These samples were analysed for heavy metals and polycyclic hydrocarbons (PAHs);
- Collection of five soil samples (S7-S11) from around the burn pile to the south of the dwelling with analysis for heavy metals and PAHs (PAHs from middle sample only);
- Collection of one PACM cement board from the southern extent of the burn pile;
- Collection of five asbestos soil samples from around the cement board sample with analysis for asbestos semi-quantitative analysis. Additional samples are on hold at the laboratory and may be analysed for delineation purposes;
- Collection of one soil sample from adjacent to the large barn to the south of the dwelling with analysis for lead (S12);
- Each sample was inspected for visual and olfactory indicators of contamination;
- All soil samples collected were placed in jars, which were then sealed, labelled with a unique identifier and placed in chilled containers (chilly bins) prior to transportation to the laboratory. Samples were transported to RJ Hill Laboratories (Hills) and Terra Scientific (Terra) under the standard ENGEO chain of custody documentation provided in Appendix 4;
- To reduce the potential for cross contamination, each sample was collected using disposable nitrile gloves that were discarded following the collection of each sample;
- After collection of each sample, the sampling equipment was decontaminated by scrubbing with a solution of Decon90 and rinsing with tap water followed by deionised water;
- The intrusive sampling was completed in accordance with ENGEO standard operating procedures;
- All fieldwork and sampling was undertaken in general accordance with the procedures for the appropriate handling of potentially contaminated soils as described in the MfE Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils; and
- On receipt of the analytical results, an assessment of the soil concentrations for contaminants of concern with applicable standards and soil acceptance criteria for the protection of human health and the environment was undertaken.

Quality Assurance and Quality Control

The quality assurance / quality control (QA / QC) procedures employed during the works included:

- Standard sample registers and chain of custody records have been kept for all samples;

- The use of Hill Laboratories, ISO/IEC 17025 and IANZ accredited laboratory, to conduct all laboratory analysis. To maintain their International Accreditation, Hill Laboratories undertakes rigorous cross checking and routine duplicate sampling testing to ensure the accuracy of their results;
- Prior to sampling the equipment (hand auger) was decontaminated using a triple wash procedure with potable water, Decon 90 solution and deionised water; and
- During the site investigation every attempt was made to ensure that cross contamination did not occur through the use of the procedures outlined within this document.

6 Regulatory Framework and Assessment Criteria

The regulatory frameworks and rules relating to the management and control of contaminated sites in the Canterbury Region are specified in two documents: the NES and the ECan Regional Plan. A summary of each and its implications for the site is provided in Sections 6.1-6.2.

6.1 NES

The NES came into effect on 1 January 2012 (MfE, 2011f).

The NES introduced soil contaminant standards (SCSs) for 12 priority contaminants for the protection of human health under a variety of land use scenarios.

The NES requires the *Contaminated Land Management Guidelines No.2: Hierarchy and Application in New Zealand of Environmental Guideline Values* be used where a NES SCS is not available. The NES does not consider environmental receptors; accordingly, the application of guidelines relevant to environmental receptors shall be implemented according to the MfE CLMG No. 2 and any relevant rules in the Regional Plan.

In addition, local background levels in soil have been referenced to establish consenting implications under the NES and disposal requirements. Background levels for metals in soils in the area were obtained from ECan's online GIS – Trace Level 2 concentrations.

6.2 Disposal Criteria

An assessment of potential off-site disposal options for excess soil generated during site development works has been conducted. Dependent on the condition of the spoil, off-site disposal options range from disposal to "cleanfill" sites to managed fill sites. As outlined in the publication Waste Management Institute of New Zealand Technical Guidelines for Disposal to Land (August 2018) definition of cleanfill which states:

"Virgin excavated natural materials (VENM) such as clay, soil and rock that are free of:

- Combustible, putrescible, degradable or leachable components;
- Hazardous substances or material (such as municipal solid waste) likely to create leachate by means of biological breakdown;
- Products or materials derived from hazardous waste treatment, stabilisation or disposal practices;

- Materials such as medical and veterinary waste, asbestos or radioactive substances that may present a risk to human health if excavated;
- Contaminated soil and other contaminated materials; and
- Liquid waste."

6.3 Assessment Criteria

Contaminant concentrations in soil were compared to human health criteria based on the following land use:

- Residential land use (10% produce); and
- Commercial / industrial land use (based on an outdoor worker scenario) (for redevelopment workers).

The land use scenarios are relevant to the likely future use of the site and are being used as a surrogate to assess short term risks to redevelopment earth workers on-site during the development activities.

The NES methodology document notes that the exposure parameters assumed for the maintenance / excavation scenario in other New Zealand guidelines are unrealistic (perhaps by a factor of 10 or more). The technical committee preparing the NES decided that a maintenance / excavation worker scenario should not be included in the NES as sites would not be cleaned up to this standard; it was considered more appropriate that exposures to these workers be limited through the use of site-specific controls that are required under health and safety legislation. However, this report uses commercial / industrial outdoor worker criteria to get a general sense of potential risks to excavation workers during the redevelopment. Note that commercial / industrial outdoor worker criteria are based on personnel carrying out maintenance activities involving soil exposure to surface soil during landscaping activities, and occasional shallow excavation for routine underground service maintenance. Exposure to soil is less intensive than would occur during construction works but occurs over a longer period. For a construction worker developing the site, the soil exposure is limited when compared to a large earthworks project (e.g. for a residential subdivision or industrial development). As such, the commercial / industrial outdoor worker criteria are considered suitable for obtaining a high-level understanding of potential risks to excavation workers during site redevelopment and confirming the need for site controls.

The soil analysis results have also been compared to Regional Background concentrations for heavy metals and PAHs. These provide information into the possible disposal options at a cleanfill facility.

6.4 Asbestos Criteria

The field work and reporting for this site have been done in accordance with the New Zealand Guidelines for Assessing and Managing Asbestos in Soil released on 6 November 2017. The BRANZ Asbestos (2017) Guidelines have been developed based on the WA DOH Guidelines but with the New Zealand regulatory environment in mind.

The BRANZ guideline criteria have been adopted as investigation criteria for this assessment and are presented in Table 6 below.

Table 6: Adopted Asbestos Investigation Criteria

Form of asbestos		Soil guideline values for asbestos (w/w)			
		Residential[1]	High-density residential[2]	Recreational[3]	Commercial and Industrial[4]
ACM (bonded)		0.01%	0.04%	0.02%	0.05%
FA and/or AF[5]		0.001%			
All forms of asbestos – surface		No visible asbestos on surface soil[6]			
Capping requirements for residual contamination above selected soil guideline value					
Depth[7]	Hard cap	No depth limitation, no controls – except for long-term management			
	Soft cap	≥ 0.5 m			≥ 0.2 m

Table 8 Notes:

ACM: Asbestos-containing material i.e. asbestos bound in a matrix; material that cannot pass through a 7 mm x 7 mm sieve.

FA: Fibrous asbestos. Encompasses friable asbestos material, such as severely weathered ACM, and asbestos in the form of loose fibrous material such as insulation products. Friable asbestos is defined here as asbestos material that is in a degraded condition, such that it can be broken or crumbled by hand pressure.

AF: Asbestos fines. It includes free fibres of asbestos, small fibre bundles and also ACM fragments that pass through a 7 mm x 7 mm sieve.

Residential: Single dwelling site with garden and / or accessible soil. Also includes daycare centres, preschools, primary and secondary schools and rural residential.

High-density residential: Urban residential site with limited exposed soil / soil contact, including small gardens. Applicable to urban townhouses, flats and ground-floor apartments with small ornamental gardens but not high-rise apartments (with very low opportunity for soil contact).

Recreational: Public and private green areas and sports and recreation reserves. Includes playing fields, suburban reserves where children play frequently and school playing fields.

Commercial and industrial: Includes accessible soils within retail, office, factory and industrial sites. Many commercial and industrial properties are well paved with concrete pavement and buildings that will adequately cover / cap any contaminated soils.

FA and / or AF: Where free fibre is present at concentrations at or below 0.001% w/w, a proportion of these samples should be analysed using the laboratory analysis method described in section 5.4.4 of the BRANZ Guideline (≥10% of samples). This is due to limitations in the AS 4964-2004 and WA Guidelines 500 ml sample method for free fibre (see section 5.4 of the BRANZ guideline for more information).

Surface: Effective options include raking / tilling the top 100 mm of asbestos-contaminated soil (or to clean soil / fill if shallower to avoid contaminating clean material at depth) and hand picking to remove visible asbestos and ACM fragments or covering with a soft cap of virgin natural material (VNM) 100 mm thick delineated by a permeable geotextile marker layer or hard cap. Near-surface fragments of ACM can become exposed in soft soils such as sandy pumiceous soils after periods of rain.

Depth: Capping is used where contamination levels exceed soil guideline values. Considerations of depth need to incorporate the type and likelihood of future disturbance activities at the site and site capping requirements (see section 6.1 of the BRANZ guideline). Ideally, any capping layer should be delineated by a permeable geotextile marker layer between the cap and underlying asbestos / contaminated material. Institutional controls must be used to manage long-term risks, particularly where the cap may be disturbed (see section 7 of the BRANZ guideline). Two forms of capping are typically used:

a. Hard cap comprises surfaces that are difficult to penetrate and isolate the asbestos contamination, such as tar seal or concrete driveway cover. This would typically not include pavers or decking due to maintenance and coverage factors.
b. Soft cap consists of a layer(s) of material which either comprise virgin natural material or soils that meet the asbestos residential soil guideline value from an on-site source. Use of on-site soils may require resource consent.

7 Results

7.1 Soil Encountered

Please refer to Table 7 for a summary of subsurface soils encountered.

The burn pile material is described as ash with charcoal, metal, timber, plastic and PACM.

Table 7: Summary of Subsurface Soils

Depth	Soil Description
0.0-0.3	Fine to medium SAND with trace gravel and rootlets; brown.
0.3-0.5	Sand fine to coarse GRAVEL with minor cobbles.

7.2 Analytical Results

The analytical results from the ENGEO investigation can be summarised as follows:

- All samples collected from the waste pit have returned concentrations below the NES residential land use criteria. Sample S3 has reported concentrations of lead and cadmium slightly above the site specific regional background levels;
- All samples collected from the stockpiled soil have returned concentrations below the NES residential land use criteria and site specific regional background levels;
- Sample S7, S8, S9 and S10 have reported concentrations of heavy metals above the NES residential land use criteria. All samples from the burn pile are also reported above the site specific regional background levels. PAHs were reported as elevated in S7 but are below the NES residential standards and background levels;
- The cement board sample collected from the burn pile was reported positive for chrysotile, amosite and crocidolite asbestos;
- Asbestos soil sample 1 from the burn pile reported asbestos fines and fibres above the BRANZ guidelines. Asbestos soil sample 5 reported cement board in the soil sample above the BRANZ guidelines. Asbestos soil sample 7 reported asbestos fines and fibres below the BRANZ guidelines; and

Please refer to Appendix 4 for the full laboratory certificate and results. Only detectable concentrations of analytes are shown in Table 8 and 9 below.

Table 8: Asbestos Semi-quantitative Analysis Results

Sample Name	Sample Depth	Asbestos Type	ACM weight	AF and FA as % w/w of total sample
Sample 1	0.0	Chrysotile, Amosite and Crocidolite	-	**0.07805**
ASS04	0.0	No asbestos detected	-	-
ASS05	0.0	Chrysotile, Amosite and Crocidolite	**0.01884**	-
ASS06	0.0	No asbestos detected	-	-
ASS07	0.0	Chrysotile	-	0.00083

Table 9: Sample Analysis Results

Sample Name	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	Human health criteria – Residential Land Use	Human health criteria - Commercial / industrial outdoor worker (unpaved)[a]	Regional background - Trace Elements (Level 2)[b]
Soil Type	SILT	SILT	SILT	SILT	SILT	SILT	SILT	SILT	SILT	SILT	SILT	SILT			
Sample Depth, m	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1			
Heavy Metals in soil, mg/kg															
Arsenic	4	4	5	3	3	4	**790**	**149**	**77**	**37**	14	-	20	70	6.35
Cadmium[c]	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	22	7.6	19.6	2.5	0.47	-	3	1,300	0.14
Chromium[d]	14	13	18	12	10	14	260	118	50	22	17	-	460	6,300	19.89
Copper	8	5	11	5	4	4	990	350	191	66	34	-	>10,000	>10,000	11.68
Lead	16.2	15	22	14.2	10.4	14.6	**340**	**550**	107	**1780**	47	**1620**	210	3,300	19.75
Nickel	12	10	14	8	8	10	36	18	13	89	8	-	400[c]	6,000[c]	13.91
Zinc	60	46	78	47	34	49	3,000	1,610	420	430	108	-	7,400[c]	400,000[c]	69.58
Polycyclic aromatic hydrocarbons in soil, mg/kg															
BaP eq.	0.03	0.03	0.03	0.03	0.03	0.03	0.36	-	-	-	-	-	10	35	0.922

[a] Human health criteria from the NES except where noted.
Bold text indicates that the concentration exceeds the Residential land use criterion.
Italics indicates that the concentration exceeds the Commercial/industrial land user criterion.
[b] ECan (2007) Background Concentrations of Selected Trace Elements in Canterbury Soils. Exceedances are underlined.
[c] Assumes soil pH of 5.
[d] Criteria for Chromium VI were conservatively selected.

8 Conceptual Site Model

A conceptual site model consists of four primary components. For contaminants to present a risk to human health or an environmental receptor, all four components are required to be present and connected. The four components of a conceptual site model are:

- Source of contamination;
- Pathway(s) in which contamination could potentially mobilise along (e.g. vapour or groundwater migration);
- Sensitive receptor(s) which may be exposed to the contaminants; and
- An exposure route, where the sensitive receptor and contaminants come into contact (e.g. ingestion, inhalation, dermal contact).

The potential source, pathway, receptor linkages at this subject site are provided in Table 10.

Table 10: Conceptual Site Model

Potential Sources	Contaminants of Concern	Exposure Route and Pathways	Receptors	Acceptable Risk? So samples meet acceptance criteria?
Waste pile/offal pit	Heavy metals PAHs	Dermal contact with the impacted soil, incidental ingestion and inhalation of dust during earthworks	On-site redevelopment workers. Future subsurface maintenance workers. Future site users.	**Yes.** All samples collected are below the NES residential land use criteria.
Stockpiled soils near waste pit	Heavy metals PAHs	Dermal contact with the impacted soil, incidental ingestion and inhalation of dust during earthworks	On-site redevelopment workers. Future subsurface maintenance workers. Future site users.	**Yes.** All samples collected are below the NES residential land use criteria.

Potential Sources	Contaminants of Concern	Exposure Route and Pathways	Receptors	Acceptable Risk? So samples meet acceptance criteria?
Burn pile	Heavy metals PAHs Asbestos	Dermal contact with the impacted soil, incidental ingestion and inhalation of dust during earthworks	On-site redevelopment workers. Future subsurface maintenance workers. Future site users.	**No.** Asbestos was detected above BRANZ guidelines and arsenic and lead are reported above the NES residential land use criteria.
Lead based paint on southern shed	Lead	Dermal contact with the impacted soil, incidental ingestion and inhalation of dust during earthworks	On-site redevelopment workers. Future subsurface maintenance workers. Future site users.	**No.** A sample collected from the soils around the shed are reported above the NES residential land use criteria.

9 Conclusions

ENGEO Ltd were engaged by Hughes Developments Limited to undertake an environmental assessment of a site situated at 597 East Maddisons Road in Rolleston for change in land use, subdivision and soil disturbance consent. Information was gathered and reviewed regarding the potential releases of hazardous substances to the subject property.

A review of information identified that the site had been used for grazing since circa 1940 and residential land use since 1994.

The site is not listed on the Canterbury Regional Council's Listed Land Use Register as being associated with a HAIL related activity. The property file was obtained from Selwyn District Council and Certificate of Titles obtained by Land Information New Zealand and these files contained no information related to potentially hazardous activities having occurred at the site.

During the site walkover, three areas of concern were observed on the site.

- An offal and waste pit was observed in the southern boundary of the site. Three soil samples were collected from the base of the pit and all samples returned concentrations below the NES residential and use criteria. One sample, S3, reported slightly elevated concentrations of zinc and lead which are considered likely due to natural variances in the site soils. An area of stockpiled soils were observed near the offal pit. No visual contamination was observed in the stockpiled soils. Three soil samples were collected from the stockpiled soils and all samples reported concentrations of heavy metals below the NES residential land use criteria and site specific background levels for heavy metals.

- A burn pile was identified towards the south of the dwelling. Four samples collected from the middle of the burn pile and surrounding area reported concentrations of heavy metals above the NES residential land use criteria. Asbestos cement board was also identified in the burn pile and reported positive for chrysotile, amosite and crocidolite. One soil sample (ASS01) collected for asbestos semi-quantitative analysis reported concentrations of fines and fibres above the BRANZ guidelines. Sample (ASS07) collected from the middle of the burn pile reported asbestos fines and fibres below the BRANZ guidelines.
- A large shed was identified to the south of the dwelling which had presumed lead paint in a deteriorated condition. One soil sample was collected in the surface soils from around the shed with concentrations of lead above the NES residential land use criteria.

The burn pile area and soils around the large shed to the south of the dwelling are required to be remediated prior to development of the site.

The remainder of the site is considered highly likely to be suitable for its intended residential end use.

As the redevelopment of the whole site involves a change of land use, subdivision and soil disturbance, it is possible that the identified impacted area can be removed as a permitted activity under Regulation 8(3) of Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulation 2011 due to the small volume in relation to the soil disturbance across the site.

Remediation works should be detailed in a Remedial Action Plan (RAP) which will also include the procedures for the handling, management and disposal of contaminated soils. Following remediation, a validation report will be required to indicate the site is suitable for its intended end use.

The soils from the burn pile are suitable for disposal at Kate Valley Landfill as asbestos contaminated waste. The soils from around the shed should be checked with Kate Valley to assess whether they will accept them. Additional TCLP analysis may be required to be undertaken.

If the buildings on site are to be refurbished or demolished, the presence of asbestos in these buildings should be identified by undertaking full asbestos surveys. If identified on the outside of the buildings in a deteriorated state, the soils surrounding the buildings should be tested.

10 References

ECan (2007a). Background Concentrations of Selected Trace Elements in Canterbury Soils. Addendum 1: Additional Samples and Timaru Specific Background Levels. Report prepared for Environment Canterbury by Tonkin & Taylor Limited, Christchurch, New Zealand. Report Number R07/1/2. Tonkin & Taylor Reference: 50875.003.

MfE (2011a). *Ministry for the Environment Hazardous Activities and Industries List.*

MfE (2011b). *Contaminated Land Management Guidelines No.1: Reporting on Contaminated Sites*.

MfE (2011c). *Contaminated Land Management Guidelines No.2: Hierarchy and Application in New Zealand of Environmental Guideline Values.*

MfE (2011d). *Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils*.

MfE (2011f). *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.*

MfE (2012). *Users' guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.*

11 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Hughes Development Ltd, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by

Natalie Flatman

Environmental Scientist

Sean Freeman

Environmental Scientist

Report reviewed by

Dave Robotham, CEnvP SC

Principal Environmental Consultant

FIGURES

DATE PLOTTED: 01 September 2020 4:59:49 pm BY: NFaitman

Legend

Site boundary

Aerial: LINZ and Eagle Technology, CC BY 4.0.
Map image: Eagle Technology.

0 50 100
Metres

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

Christchurch Office
124 Montreal Street Sydenham, Christchurch 8023
Tel: 03 328 9012, www.engeo.co.nz

Title: Site Location Plan

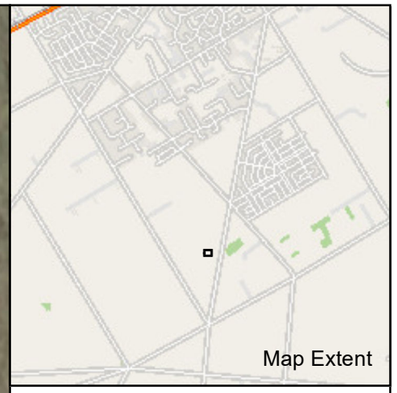
Client: Hughes Developments		Figure No: 1
Project: 597 East Maddisons Road Rolleston	Designed: NF Drawn: NF Checked: DRAFT Date: Sep 20	Size: A3
Proj No: 12903.000.005	Scale: 1:3,000	Revision: A

ORIGINAL FIGURE PRINTED IN COLOUR

PATH: Z:\Projects\12901 to 13000\12903 - Farringdon South Subdivision\59_597 East Maddisons Road\05_GIS\Fig01.mxd

DATE PLOTTED: 03 September 2020 2:08:16 pm BY: NFlatman

PATH: Z:\Projects\12901 to 13000\12903 - Farringdon South Subdivision\09_597 East Maddisons Road\05_GIS\Fig01.mxd



Legend

- Sample locations
- Approximate extent of waste pit
- Site boundary

Aerial: LINZ and Eagle Technology, CC BY 4.0.
Map image: Eagle Technology.

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

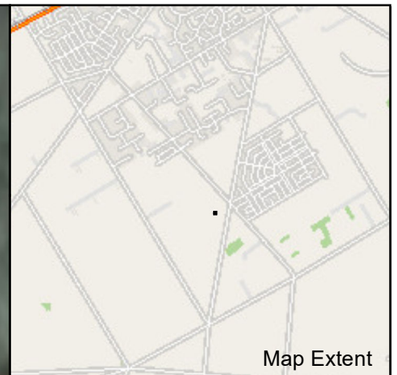
Christchurch Office
124 Montreal Street Sydenham, Christchurch 8023
Tel: 03 328 9012, www.engeo.co.nz

Title: Waste pit locations

Client: Hughes Developments		Figure No: 2
Project: 597 East Maddisons Road Rolleston	Designed: NF Drawn: NF Checked: DRAFT Date: Sep 20	Size: A3
Proj No: 12903.000.005	Scale: 1:250	Revision: A

ORIGINAL FIGURE PRINTED IN COLOUR

DATE PLOTTED: 03 September 2020 2:14:57 pm BY: NFlatman



Legend

- Sample locations
- Approximate extent of waste pit
- Site boundary

Aerial: LINZ and Eagle Technology, CC BY 4.0.
Map image: Eagle Technology.

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

Christchurch Office
124 Montreal Street Sydenham, Christchurch 8023
Tel: 03 328 9012, www.engeo.co.nz

Title: Burn pile sample locations

Client: Hughes Developments		Figure No: 3
Project: 597 East Maddisons Road Rolleston	Designed: NF Drawn: NF Checked: DRAFT Date: Sep 20	Size: A3
Proj No: 12903.000.005	Scale: 1:80	Revision: A

PATH: Z:\Projects\12901 to 13000\12903 - Farrington South Subdivision\59_597 East Maddisons Road\05_GIS\Fig01.mxd

ORIGINAL FIGURE PRINTED IN COLOUR

APPENDIX 1:

Site Photography

Photo 1: Offal/waste pit in southern corner of the site

Photo 2: Mounded topsoil near offal pit in southern corner of the site

Photo 3: Stored machinery and vehicles along southern boundary

Photo 4: 205 L drums containing domestic rubbish

Photo 5: Southern paddocks

Photo 6: Northern paddocks

ENGEO
Expect Excellence

Date taken	Aug 2020	**Client**	**Hughes Developments**		
Taken by	NF	**Project**	**597 East Maddisons Road, Rolleston**		
Approved by	DR	**Description**	**Site Photographs**		
Photo No.	1 to 6	**ENGEO Ref.**	12903	**Appendix No.**	1a

Photo 7: Dwelling

Photo 8: Garages to south of dwelling

Photo 9: Barn to south of dwelling

Photo 10: Disused pool near dwelling

Photo 11: Burn pile in paddock south of dwelling

Photo 12: Asbestos cement board in burn pile material

ENGEO
Expect Excellence

Date taken	Aug 2020	**Client**	**Hughes Developments**		
Taken by	NF	**Project**	**597 East Maddisons Road, Rolleston**		
Approved by	DR	**Description**	**Site Photographs**		
Photo No.	7 to 12	**ENGEO Ref.**	12903	**Appendix No.**	1b

Photo 13: Stream towards western boundary line

Photo 14: Wetland area

Photo 15: Stream feeding into wetland area

Photo 16: Material stored in large barn in paddock south of dwelling

Photo 17: Stored vehicle in paddock south of dwelling

Photo 18: Sleepout near dwelling

ENGEO
Expect Excellence

Date taken	Aug 2020	**Client**	**Hughes Developments**		
Taken by	NF	**Project**	**597 East Maddisons Road, Rolleston**		
Approved by	DR	**Description**	**Site Photographs**		
Photo No.	13 to 18	**ENGEO Ref.**	12903	**Appendix No.**	1c

APPENDIX 2:

Certificate of Title

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Historical Search Copy

R.W. Muir
Registrar-General
of Land

Constituted as a Record of Title pursuant to Sections 7 and 12 of the Land Transfer Act 2017 - 12 November 2018

Identifier **CB33K/65**
Land Registration District **Canterbury**
Date Issued 18 October 1990

Prior References
CB33F/774

Estate	Fee Simple
Area	20.3750 hectares more or less
Legal Description	Lot 1 Deposited Plan 57004

Original Registered Owners
Malcolm Richard Main and Philippa Ruth Main

Interests

Subject to Part IV A Conservation Act 1987

A21096.5 Mortgage to Trust Bank Canterbury Limited - 28.10.1992 at 2.32 pm and varied 30.10.1996 at 9.36 am

5798897.2 Transfer to Malcolm Richard Main, Philippa Ruth Main and Graeme Charles Main - 13.11.2003 at 9:00 am

5798897.3 Variation of Mortgage A21096.5 - 13.11.2003 at 9:00 am

7095691.1 Application pursuant to Section 99A Land Transfer Act 1952 vesting Mortgage A21096.5 in Westpac New Zealand Limited - 2.11.2006 at 9:00 am

8556170.1 Transfer to Malcolm Richard Main and Philippa Ruth Main - 29.7.2010 at 3:14 pm

8577235.1 Variation of Mortgage A21096.5 - 25.8.2010 at 5:05 pm

References
Prior C/T 33F/774

Transfer No.
N/C. Order No. 903207/2

Land and Deeds 69

REGISTER

No. 33K/65

CERTIFICATE OF TITLE UNDER LAND TRANSFER ACT

This Certificate dated the 18th day of October one thousand nine hundred and ninety under the seal of the District Land Registrar of the Land Registration District of CANTERBURY

WITNESSETH that KELVIN ROYCE TAYLOR, Farmer and GILLIAN DOROTHY TAYLOR, Married Woman, both of Springston, Christchurch as tenants in common in equal shares are ---

is seised of an estate in fee-simple (subject to such reservations, restrictions, encumbrances, liens, and interests as are notified by memorial underwritten or endorsed hereon) in the land hereinafter described, delineated with bold black lines on the plan hereon, be the several admeasurements a little more or less, that is to say: All that parcel of land containing 20.3750 hectares or thereabouts being Lot 1 Deposited Plan 57004 ---

ASSISTANT LAND REGISTRAR

Subject to:

Part IVA Conservation Act 1987

A.L.R.

Transfer A21096/4 to Malcolm Richard Main of Christchurch, Scientist and Philippa Ruth Main his wife - 28.10.1992 at 2.32pm

for A.L.R.

Mortgage A21096/5 to Trust Bank Canterbury Limited - 28.10.1992 at 2.32pm

for A.L.R.

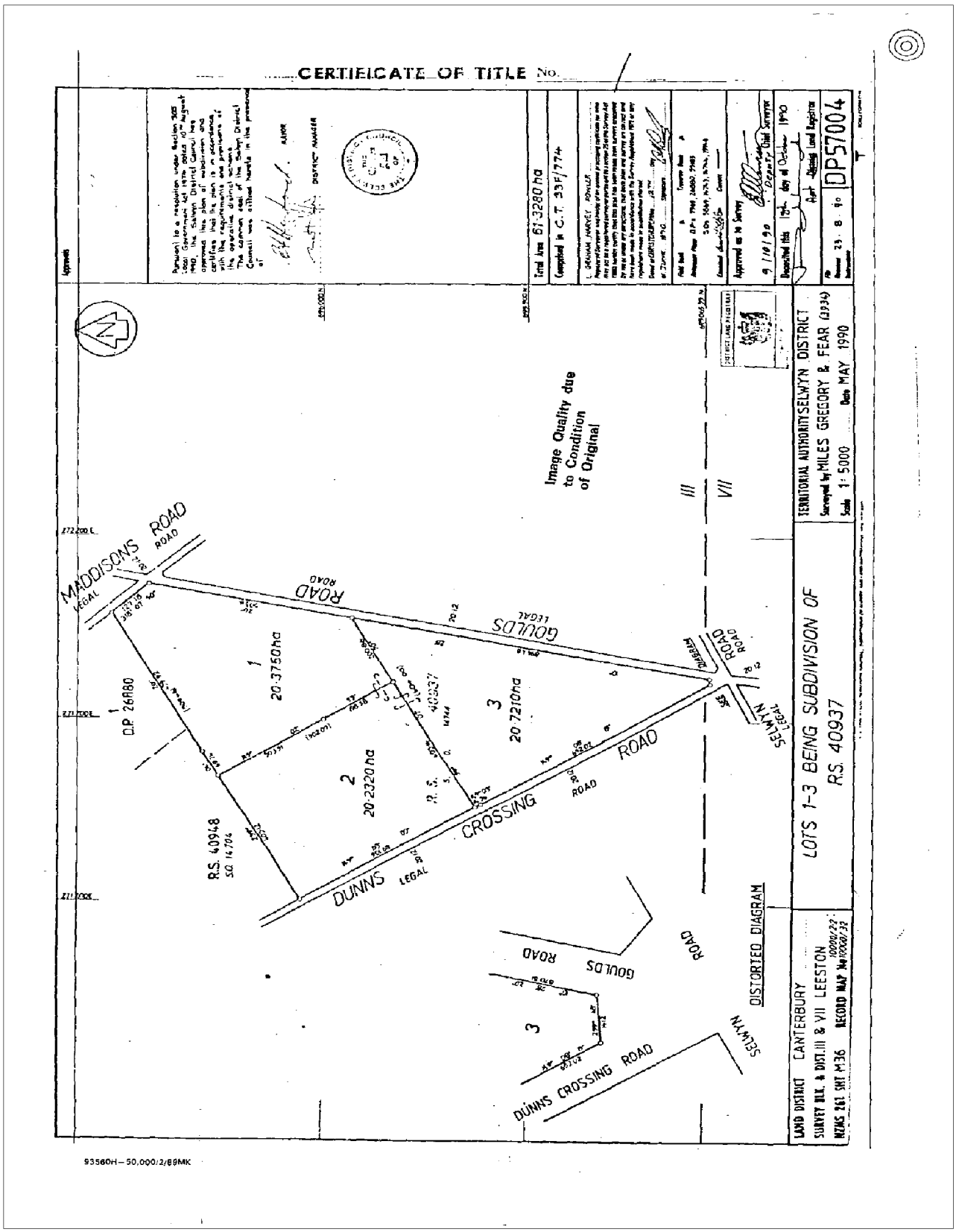
Variation of Mortgage A21096/5 - 30.10.1996 at 9.36am

for A.L.R.

No. 33K/65

Measurements are Metric

Identifier **CB33K/65**



RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**CB33K/65**
Land Registration District	**Canterbury**
Date Issued	18 October 1990

Prior References
CB33F/774

Estate	Fee Simple
Area	20.3750 hectares more or less
Legal Description	Lot 1 Deposited Plan 57004

Registered Owners
Malcolm Richard Main and Philippa Ruth Main

Interests

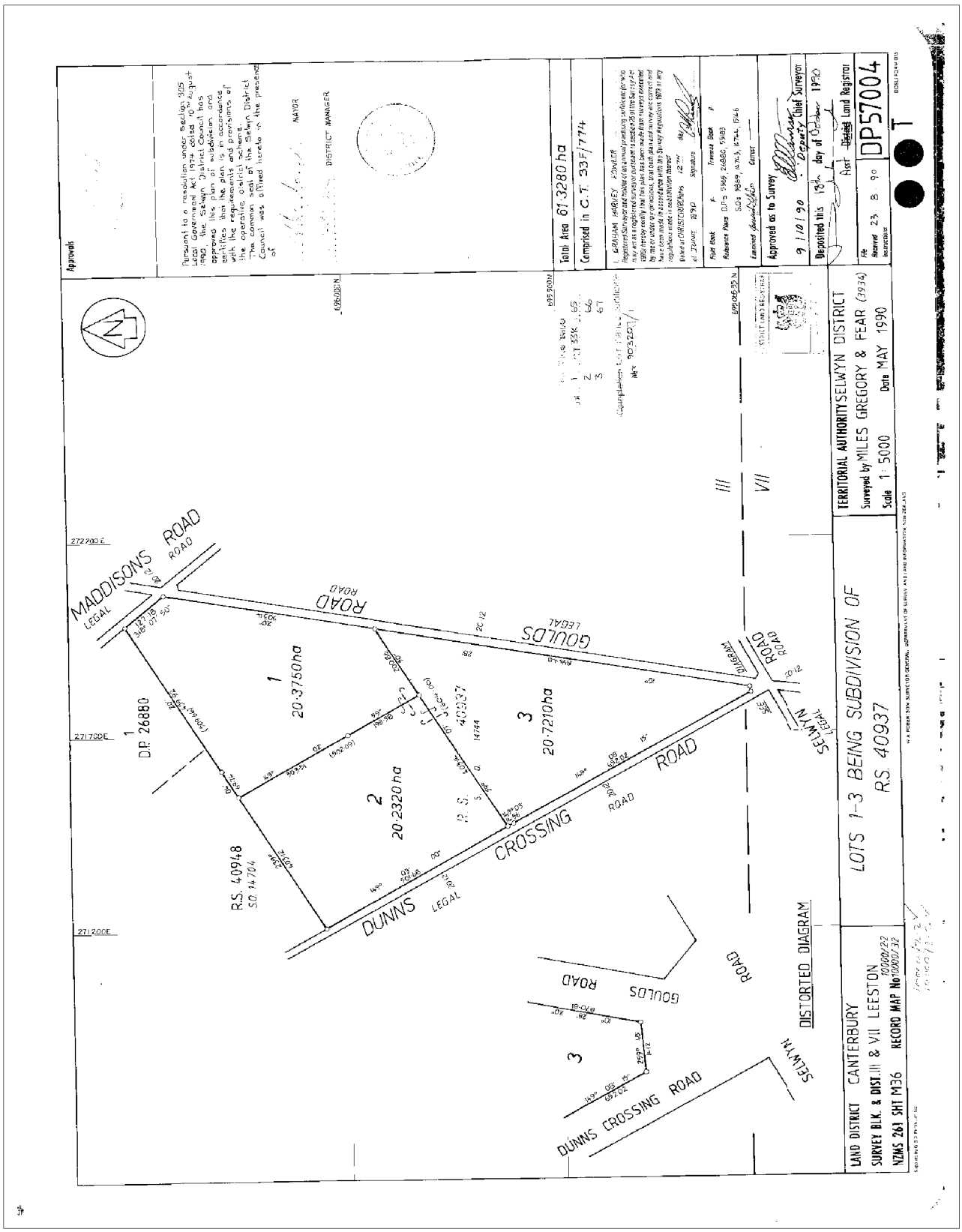
Subject to Part IV A Conservation Act 1987

A21096.5 Mortgage to (now) Westpac New Zealand Limited - 28.10.1992 at 2.32 pm and varied 30.10.1996 at 9.36 am

5798897.3 Variation of Mortgage A21096.5 - 13.11.2003 at 9:00 am

8577235.1 Variation of Mortgage A21096.5 - 25.8.2010 at 5:05 pm

Identifier **CB33K/65**



APPENDIX 3:

LLUR Statement

Environment Canterbury
Regional Council
Kaunihera Taiao ki Waitaha

Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Dear Sir/Madam

Thank you for submitting your property enquiry in regards to our Listed Land Use Register (LLUR) which holds information about sites that have been used, or are currently used for activities which have the potential to have caused contamination.

The LLUR statement provided indicates the location of the land parcel(s) you enquired about and provides information regarding any LLUR sites within a radius specified in the statement of this land.

Please note that if a property is not currently entered on the LLUR, it does not mean that an activity with the potential to cause contamination has never occurred, or is not currently occurring there. The LLUR is not complete, and new sites are regularly being added as we receive information and conduct our own investigations into current and historic land uses.

The LLUR only contains information held by Environment Canterbury in relation to contaminated or potentially contaminated land; other information relevant to potential contamination may be held in other files (for example consent and enforcement files).

If your enquiry relates to a farm property, please note that many current and past activities undertaken on farms may not be listed on the LLUR. Activities such as the storage, formulation and disposal of pesticides, offal pits, foot rot troughs, animal dips and underground or above ground fuel tanks have the potential to cause contamination.

Please contact and Environment Canterbury Contaminated Sites Officer if you wish to discuss the contents of the LLUR statement, or if you require additional information.
For any other information regarding this land please contact Environment Canterbury Customer Services.

Yours sincerely

Contaminated Sites Team

Property Statement
from the Listed Land Use Register

Visit www.ecan.govt.nz/HAIL for more information about land uses.

Environment Canterbury
Regional Council
Kaunihera Taiao ki Waitaha

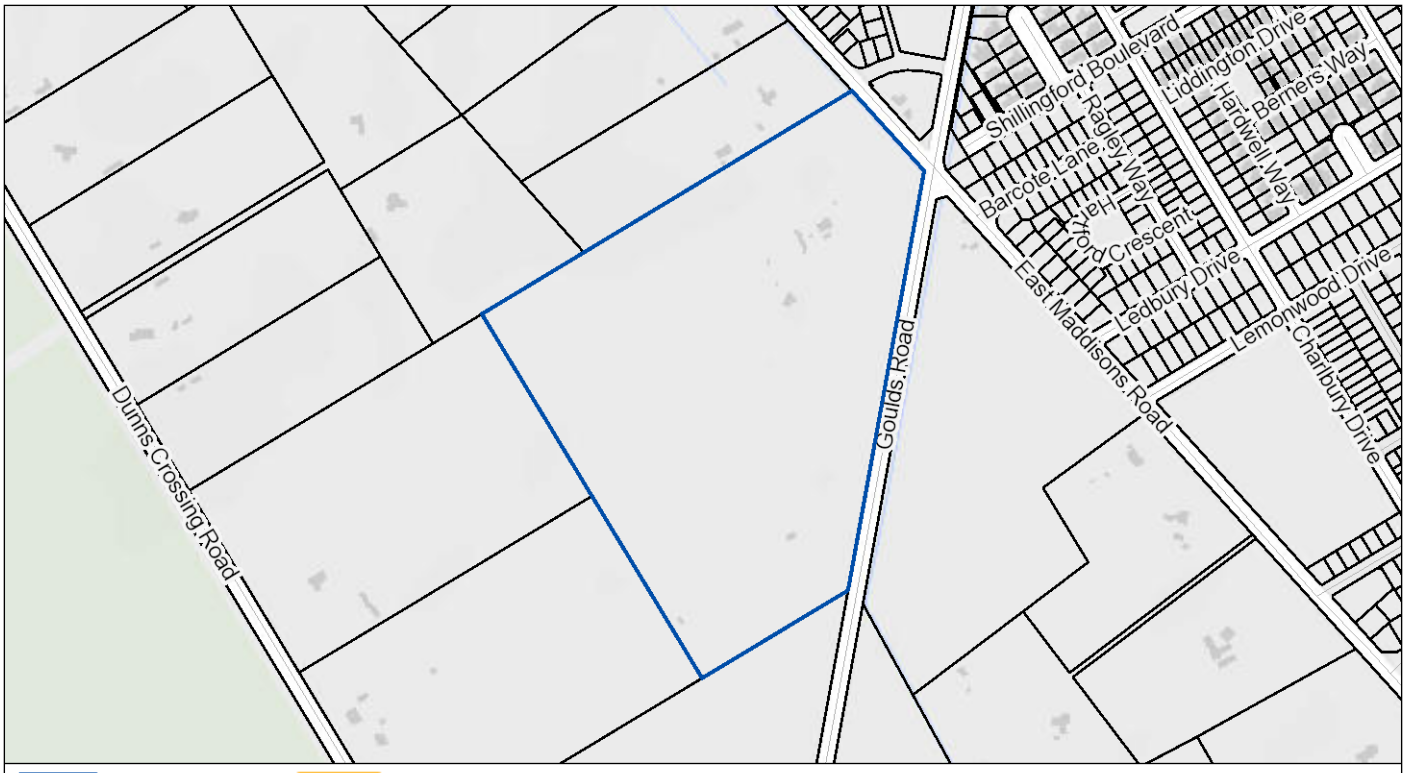
Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Date:	28 August 2020	
Land Parcels:	Lot 1 DP 57004	Valuation No(s): 2405534400



The information presented in this map is specific to the property you have selected. Information on nearby properties may not be shown on this map, even if the property is visible.

Summary of sites:

There are no sites associated with the area of enquiry.

Information held about the sites on the Listed Land Use Register

There are no sites associated with the area of enquiry.

Information held about other investigations on the Listed Land Use Register

For further information from Environment Canterbury, contact Customer Services and refer to enquiry number ENQ262291.

Disclaimer:

The enclosed information is derived from Environment Canterbury's Listed Land Use Register and is made available to you under the Local Government Official Information and Meetings Act 1987 and Environment Canterbury's Contaminated Land Information Management Strategy (ECan 2009).

The information contained in this report reflects the current records held by Environment Canterbury regarding the activities undertaken on the site, its possible contamination and based on that information, the categorisation of the site. Environment Canterbury has not verified the accuracy or completeness of this information. It is released only as a copy of Environment Canterbury's records and is not intended to provide a full, complete or totally accurate assessment of the site. It is provided on the basis that Environment Canterbury makes no warranty or representation regarding the reliability, accuracy or completeness of the information provided or the level of contamination (if any) at the relevant site or that the site is suitable or otherwise for any particular purpose. Environment Canterbury accepts no responsibility for any loss, cost, damage or expense any person may incur as a result of the use, reference to or reliance on the information contained in this report.

Any person receiving and using this information is bound by the provisions of the Privacy Act 1993.

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Listed Land Use Register

What you need to know

Everything is connected

What is the Listed Land Use Register (LLUR)?

The LLUR is a database that Environment Canterbury uses to manage information about land that is, or has been, associated with the use, storage or disposal of hazardous substances.

Why do we need the LLUR?

Some activities and industries are hazardous and can potentially contaminate land or water. We need the LLUR to help us manage information about land which could pose a risk to your health and the environment because of its current or former land use.

Section 30 of the Resource Management Act (RMA, 1991) requires Environment Canterbury to investigate, identify and monitor contaminated land. To do this we follow national guidelines and use the LLUR to help us manage the information.

The information we collect also helps your local district or city council to fulfil its functions under the RMA. One of these is implementing the National Environmental Standard (NES) for Assessing and Managing Contaminants in Soil, which came into effect on 1 January 2012.

For information on the NES, contact your city or district council.

How does Environment Canterbury identify sites to be included on the LLUR?

We identify sites to be included on the LLUR based on a list of land uses produced by the Ministry for the Environment (MfE). This is called the Hazardous Activities and Industries List (HAIL)[1]. The HAIL has 53 different activities, and includes land uses such as fuel storage sites, orchards, timber treatment yards, landfills, sheep dips and any other activities where hazardous substances could cause land and water contamination.

We have two main ways of identifying HAIL sites:

- We are actively identifying sites in each district using historic records and aerial photographs. This project started in 2008 and is ongoing.
- We also receive information from other sources, such as environmental site investigation reports submitted to us as a requirement of the Regional Plan, and in resource consent applications.

[1] The Hazardous Activities and Industries List (HAIL) can be downloaded from MfE's website www.mfe.govt.nz, keyword search HAIL

How does Environment Canterbury classify sites on the LLUR?

Where we have identified a HAIL land use, we review all the available information, which may include investigation reports if we have them. We then assign the site a category on the LLUR. The category is intended to best describe what we know about the land use and potential contamination at the site and is signed off by a senior staff member.

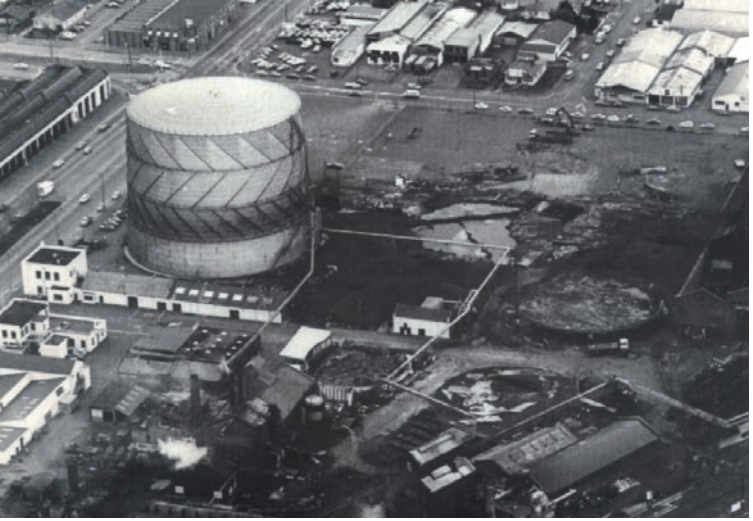
Please refer to the Site Categories and Definitions factsheet for further information.

What does Environment Canterbury do with the information on the LLUR?

The LLUR is available online at www.llur.ecan.govt.nz. We mainly receive enquiries from potential property buyers and environmental consultants or engineers working on sites. An inquirer would typically receive a summary of any information we hold, including the category assigned to the site and a list of any investigation reports.

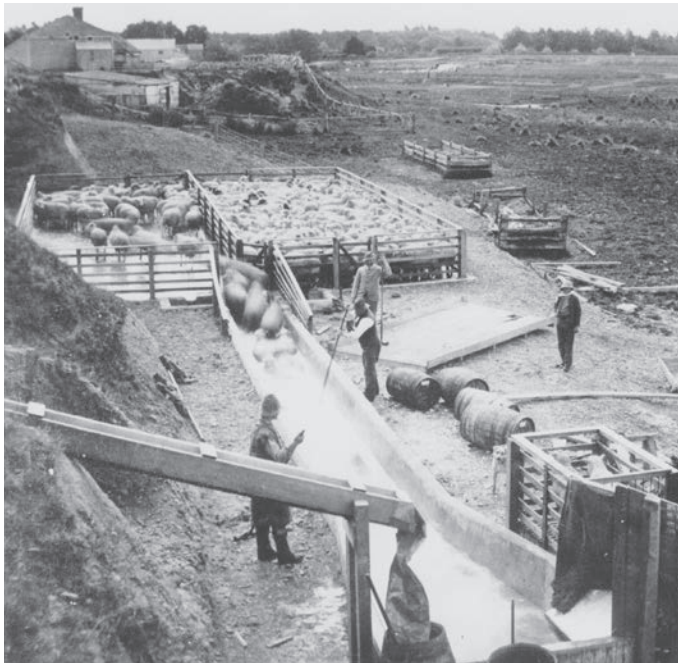
We may also use the information to prioritise sites for further investigation, remediation and management, to aid with planning, and to help assess resource consent applications. These are some of our other responsibilities under the RMA.

If you are conducting an environmental investigation or removing an underground storage tank at your property, you will need to comply with the rules in the Regional Plan and send us a copy of the report. This means we can keep our records accurate and up-to-date, and we can assign your property an appropriate category on the LLUR. To find out more, visit www.ecan.govt.nz/HAIL.



IMPORTANT!

The LLUR is an online database which we are continually updating. A property may not currently be registered on the LLUR, but this does not necessarily mean that it hasn't had a HAIL use in the past.



Sheep dipping (ABOVE) and gas works (TOP) are among the former land uses that have been identified as potentially hazardous. (Photo above by Wheeler & Son in 1987, courtesy of Canterbury Museum.)

My land is on the LLUR – what should I do now?

IMPORTANT! Just because your property has a land use that is deemed hazardous or is on the LLUR, it doesn't necessarily mean it's contaminated. The only way to know if land is contaminated is by carrying out a detailed site investigation, which involves collecting and testing soil samples.

You do not need to do anything if your land is on the LLUR and you have no plans to alter it in any way. It is important that you let a tenant or buyer know your land is on the Listed Land Use Register if you intend to rent or sell your property. If you are not sure what you need to tell the other party, you should seek legal advice.

You may choose to have your property further investigated for your own peace of mind, or because you want to do one of the activities covered by the National Environmental Standard for Assessing and Managing Contaminants in Soil. Your district or city council will provide further information.

If you wish to engage a suitably qualified experienced practitioner to undertake a detailed site investigation, there are criteria for choosing a practitioner on www.ecan.govt.nz/HAIL.

I think my site category is incorrect – how can I change it?

If you have an environmental investigation undertaken at your site, you must send us the report and we will review the LLUR category based on the information you provide. Similarly, if you have information that clearly shows your site has not been associated with HAIL activities (eg. a preliminary site investigation), or if other HAIL activities have occurred which we have not listed, we need to know about it so that our records are accurate.

If we have incorrectly identified that a HAIL activity has occurred at a site, it will be not be removed from the LLUR but categorised as Verified Non-HAIL. This helps us to ensure that the same site is not re-identified in the future.

Contact us

Property owners have the right to look at all the information Environment Canterbury holds about their properties.

It is free to check the information on the LLUR, online at www.llur.ecan.govt.nz.

If you don't have access to the internet, you can enquire about a specific site by phoning us on (03) 353 9007 or toll free on 0800 EC INFO (32 4636) during business hours.

Contact Environment Canterbury:

Email: ecinfo@ecan.govt.nz

Phone:
Calling from Christchurch: (03) 353 9007
Calling from any other area: 0800 EC INFO (32 4636)

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Everything is connected

Promoting quality of life through balanced resource management.

www.ecan.govt.nz E13/101

Listed Land Use Register

Site categories and definitions

When Environment Canterbury identifies a Hazardous Activities and Industries List (HAIL) land use, we review the available information and assign the site a category on the Listed Land Use Register. The category is intended to best describe what we know about the land use.

If a site is categorised as **Unverified** it means it has been reported or identified as one that appears on the HAIL, but the land use has not been confirmed with the property owner.

If the land use has been confirmed but analytical information from the collection of samples is not available, and the presence or absence of contamination has therefore not been determined, the site is registered as:

Not investigated:

- A site whose past or present use has been reported and verified as one that appears on the HAIL.
- The site has not been investigated, which might typically include sampling and analysis of site soil, water and/or ambient air, and assessment of the associated analytical data.
- There is insufficient information to characterise any risks to human health or the environment from those activities undertaken on the site. Contamination may have occurred, but should not be assumed to have occurred.

If analytical information from the collection of samples is available, the site can be registered in one of six ways:

At or below background concentrations:

The site has been investigated or remediated. The investigation or post remediation validation results confirm there are no hazardous substances above local background concentrations other than those that occur naturally in the area. The investigation or validation sampling has been sufficiently detailed to characterise the site.

Below guideline values for:

The site has been investigated. Results show that there are hazardous substances present at the site but indicate that any adverse effects or risks to people and/or the environment are considered to be so low as to be acceptable. The site may have been remediated to reduce contamination to this level, and samples taken after remediation confirm this.

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Managed for:

The site has been investigated. Results show that there are hazardous substances present at the site in concentrations that have the potential to cause adverse effects or risks to people and/or the environment. However, those risks are considered managed because:

- the nature of the use of the site prevents human and/or ecological exposure to the risks; and/or
- the land has been altered in some way and/or restrictions have been placed on the way it is used which prevent human and/or ecological exposure to the risks.

Partially investigated:

The site has been partially investigated. Results:

- demonstrate there are hazardous substances present at the site; however, there is insufficient information to quantify any adverse effects or risks to people or the environment; or
- do not adequately verify the presence or absence of contamination associated with all HAIL activities that are and/or have been undertaken on the site.

Significant adverse environmental effects:

The site has been investigated. Results show that sediment, groundwater or surface water contains hazardous substances that:

- have significant adverse effects on the environment; or
- are reasonably likely to have significant adverse effects on the environment.

Contaminated:

The site has been investigated. Results show that the land has a hazardous substance in or on it that:

- has significant adverse effects on human health and/or the environment; and/or
- is reasonably likely to have significant adverse effects on human health and/or the environment.

If a site has been included incorrectly on the Listed Land Use Register as having a HAIL, it will not be removed but will be registered as:

Verified non-HAIL:

Information shows that this site has never been associated with any of the specific activities or industries on the HAIL.

Please contact Environment Canterbury for further information:

(03) 353 9007 or toll free
on 0800 EC INFO (32 4636)
email ecinfo@ecan.govt.nz

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

E13/102

APPENDIX 4:

Laboratory reports

Hill Laboratories
TRIED, TESTED AND TRUSTED

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

Certificate of Analysis

Client:	Engeo Limited	**Lab No:**	2428499 SPv2
Contact:	Natalie Flatman	**Date Received:**	01-Sep-2020
	C/- Engeo Limited	**Date Reported:**	03-Sep-2020
	PO Box 373	**Quote No:**	82742
	Christchurch 8140	**Order No:**	
		Client Reference:	12903.000.005
		Submitted By:	Natalie Flatman

Sample Type: Soil

Sample Name:		597_S1 28-Aug-2020	597_S2 28-Aug-2020	597_S3 28-Aug-2020	597_S4 28-Aug-2020	597_S5 28-Aug-2020
Lab Number:		2428499.1	2428499.2	2428499.3	2428499.4	2428499.5
Individual Tests						
Dry Matter	g/100g as rcvd	84	97	86	84	90
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	4	5	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	14	13	18	12	10
Total Recoverable Copper	mg/kg dry wt	8	5	11	5	4
Total Recoverable Lead	mg/kg dry wt	16.2	15.0	22	14.2	10.4
Total Recoverable Nickel	mg/kg dry wt	12	10	14	8	8
Total Recoverable Zinc	mg/kg dry wt	60	46	78	47	34
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
2-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Acenaphthylene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Acenaphthene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Benzo[a]anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.012	< 0.011	0.014	< 0.012	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Benzo[e]pyrene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Chrysene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Fluoranthene	mg/kg dry wt	< 0.012	< 0.011	0.019	< 0.012	< 0.011
Fluorene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.012	< 0.011
Phenanthrene	mg/kg dry wt	< 0.012	< 0.011	0.014	< 0.012	< 0.011
Pyrene	mg/kg dry wt	< 0.012	< 0.011	0.021	< 0.012	< 0.011

Sample Type: Soil						
Sample Name:		597_S6 28-Aug-2020	597_S7 28-Aug-2020	597_S8 28-Aug-2020	597_S9 28-Aug-2020	597_S10 28-Aug-2020
Lab Number:		2428499.6	2428499.7	2428499.8	2428499.9	2428499.10
Individual Tests						
Dry Matter	g/100g as rcvd	88	68	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	790	149	77	37
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	22	7.6	19.6	2.5 #1
Total Recoverable Chromium	mg/kg dry wt	14	260	118	50	22
Total Recoverable Copper	mg/kg dry wt	4	990	350	191	66
Total Recoverable Lead	mg/kg dry wt	14.6	340	500	107	1,780
Total Recoverable Nickel	mg/kg dry wt	10	36	18	13	89 #2
Total Recoverable Zinc	mg/kg dry wt	49	3,000	1,610	420	430 #3
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	3.9	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.012	0.076	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.012	0.080	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.012	0.074	-	-	-
Acenaphthene	mg/kg dry wt	< 0.012	< 0.015	-	-	-
Anthracene	mg/kg dry wt	< 0.012	0.063	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.012	0.27	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.012	0.24	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.03	0.36	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.03	0.36	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.012	0.60	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.012	0.36	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.012	0.112	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.012	0.171	-	-	-
Chrysene	mg/kg dry wt	< 0.012	0.22	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.015	-	-	-
Fluoranthene	mg/kg dry wt	< 0.012	0.28	-	-	-
Fluorene	mg/kg dry wt	< 0.012	0.101	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.012	0.126	-	-	-
Naphthalene	mg/kg dry wt	< 0.06	0.42	-	-	-
Perylene	mg/kg dry wt	< 0.012	0.051	-	-	-
Phenanthrene	mg/kg dry wt	< 0.012	0.38	-	-	-
Pyrene	mg/kg dry wt	< 0.012	0.31	-	-	-

Sample Name:		597_S11 28-Aug-2020	597_S12 28-Aug-2020			
Lab Number:		2428499.11	2428499.12			
Individual Tests						
Total Recoverable Lead	mg/kg dry wt	-	1,620	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	14	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.47	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	17	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	34	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	47	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	8	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	108	-	-	-	-

Analyst's Comments

#1 It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample. Rep 1 = 2.5 mg/Kg Rep 2 = 1.7 mg/Kg

#2 It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample. Rep 1 = 89 mg/Kg Rep 2 = 9.6 mg/Kg

#3 It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample. Rep 1 = 430 mg/Kg, Rep 2 = 259 mg/Kg

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
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-12
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%.	-	12
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1-7
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	1-11
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	1-7
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	1-7
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	12
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	12
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	1-7
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	1-7

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

Testing was completed between 02-Sep-2020 and 03-Sep-2020. 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.

Kim Harrison MSc
Client Services Manager - Environmental

TERRA SCIENTIFIC

Terra Scientific Ltd
43a Moorhouse Avenue, Addington, Christchurch, 8011
P: 03 928 2256
E: admin@terrascientific.co.nz
W: www.terrasci.co.nz

ACCREDITED IANZ TESTING LABORATORY Nº 1334

Version Number: 7 | Date Issued: August 2020 | Authorised By: JC | Controlled Document

Client Name:	ENGEO Christchurch	**Job Number:**	T002740.1	**Total Samples Received:**	1
Client Address:	124 Montreal Street, Sydenham, Christchurch, 8023	**Site Reference / Address:**	EM - 12903.000.000	**Date Received:**	31/08/2020
Client Reference:	12903.000.000			**Date Analysed:**	31/08/2020
Client Contact:	Natalie Flatman	**Analyst:**	Lisa Bullock	**Date Reported:**	31/08/2020

ASBESTOS ANALYSIS REPORT

Laboratory Sample Number	Client Sample Number	General Description	Results	Comments
T002740.1.1	1	Burn pile PACM 1, Cement board	**Chrysotile (White Asbestos)** **Amosite (Brown Asbestos)** **Crocidolite (Blue Asbestos)** Organic Fibres	
		Yellow painted cement		
		Sample Weight: 33.25 g		

Method References and Disclaimers

Samples were analysed in accordance with: AS4964-2004 Australian Standard - Method for Qualitative Identification of Asbestos in Bulk Samples

Disclaimers:
- Samples are reported 'As Received'. Terra Scientific takes no responsibility for sampling processes, client sample descriptions and sample locations as these were provided by the client.
- The results presented in this report relate specifically to the samples submitted for this job.
- The detection limit is 0.1g/1kg as stated in the AS4964-2004.
- This report shall not be reproduced, except in full, without the written consent of the Key Technical Person assigned to this report.

For any queries regarding this report, please do not hesitate to contact the laboratory and speak with the Key Technical Person.

Sarah Giles
Laboratory Analyst
Key Technical Person

Terra Scientific Ltd

43a Moorhouse Avenue,
Addington,
Christchurch, 8011

P: 03 928 2256
E: admin@terrascientific.co.nz
W: www.terrasci.co.nz

ACCREDITED TESTING LABORATORY Nº 1334

Version Number: 10	Date Issued: August 2020	Authorised By: JC	Controlled Document

Client Name:	ENGEO Christchurch	**Job Number:**	T002740.2	**Total Samples Received:**	1
Client Address:	124 Montreal Street, Sydenham, Christchurch, 8023	**Site Reference / Address:**	EM - 12903.000.000	**Date Received:**	31/08/2020
Client Reference:	12903.000.000			**Date Analysed:**	1/09/2020
Client Contact:	Natalie Flatman	**Analyst:**	Jessica Campbell	**Date Reported:**	1/09/2020

ASBESTOS IN SOIL ANALYSIS REPORT

Laboratory Sample Number	Client Sample Number	General Description	Received Weight (g)	Dry Weight (g)	Results	ACM Weight (g)	FA Weight (g)	AF Weight (g)	ACM w/w %	FA w/w %	AF w/w %	Combined AF/FA %	Comments
		Burn pile - sample 1, Soil											
T002740.2.1	1	Layer 1: >10 mm	893.91	17.30	Organic Fibres	0.00000	0.00000	0.00000	0.00000%	0.06923%	0.00882%	0.07805%	
		Layer 2: 10 - 2 mm		28.43	**Chrysotile (White Asbestos) Amosite (Brown Asbestos) Crocidolite (Blue Asbestos)** Organic Fibres	N/A	0.46908	0.00000					
		Layer 3: <2 mm		631.85	**Chrysotile (White Asbestos) Amosite (Brown Asbestos) Crocidolite (Blue Asbestos)** Organic Fibres	N/A	0.00000	0.05974					
		Layer 3 sub sampled weight:		50.24									
		Total sample weight:		677.58	Total Combined:	0.00000	0.46908	0.05974					

Method References and Disclaimers

Samples were analysed in accordance with:
AS4964-2004 Australian Standard - Method for Qualitative Identification of Asbestos in Bulk Samples
BRANZ - New Zealand Guidelines for Assessing and Managing Asbestos in Soil 2017

Disclaimers:
Samples are reported 'As Received'. Terra Scientific takes no responsibility for sampling processes, client sample descriptions and sample locations as these were provided by the client.
The results presented in this report relate specifically to the samples submitted for this job.
The detection limit is 0.1g/1kg (0.01% w/w) as stated in the AS4964-2004. Samples that contain asbestos less than this limit are outside the scope of accreditation.
Asbestos calculations are outside the scope of accreditation.
All opinions and interpretations are outside the scope of accreditation.
This report shall not be reproduced, except in full, without the written consent of the Key Technical Person assigned to this report.

For any queries regarding this report, please do not hesitate to contact the laboratory and speak with the Key Technical Person.

Jessica Campbell
Managing Director
Key Technical Person

Terra Scientific Ltd

TERRA SCIENTIFIC

43a Moorhouse Avenue,
Addington,
Christchurch, 8011

P: 03 928 2256
E: admin@terrascientific.co.nz
W: www.terrasci.co.nz

ACCREDITED
IANZ
TESTING LABORATORY
Nº 1334

Version Number: 10 | Date Issued: August 2020 | Authorised By: JC | Controlled Document

Client Name:	ENGEO Christchurch	**Job Number:**	T002772	**Total Samples Received:**	7
Client Address:	124 Montreal Street, Sydenham, Christchurch, 8023	**Site Reference / Address:**	597 EM	**Date Received:**	2/09/2020
Client Reference:	12903.000.005			**Date Analysed:**	3/09/2020
Client Contact:	Natale Flatman	**Analyst:**	Lisa Bullock	**Date Reported:**	3/09/2020

ASBESTOS IN SOIL ANALYSIS REPORT

Laboratory Sample Number	Client Sample Number	General Description	Received Weight (g)	Dry Weight (g)	Results	ACM Weight (g)	FA Weight (g)	AF Weight (g)	ACM w/w %	FA w/w %	AF w/w %	Combined AF/FA %	Comments
T002772.1	3	ASS04 @ 0.0, Soil											
		Layer 1: >10 mm	854.07	19.66	Organic Fibres	0.00000	0.00000	0.00000	0.00000%	0.00000%	0.00000%	0.00000%	No Asbestos Detected QA/QC Reviewed
		Layer 2: 10 - 2 mm		67.99	Organic Fibres	N/A	0.00000	0.00000					
		Layer 3: <2 mm		538.92	Organic Fibres	N/A	0.00000	0.00000					
		Layer 3 sub sampled weight:		53.71	Synthetic Mineral Fibres								
		Total sample weight:		626.57	Total Combined:	0.00000	0.00000	0.00000					
T002772.2	4	ASS05 @ 0.0, Soil											
		Layer 1: >10 mm	1065.38	120.68	**Chrysotile (White Asbestos) Amosite (Brown Asbestos) Crocidolite (Blue Asbestos)** Organic Fibres	1.05348	0.00000	0.00000	0.01884%	0.00000%	0.00000%	0.00000%	
		Layer 2: 10 - 2 mm		23.31	Organic Fibres Synthetic Mineral Fibres	N/A	0.00000	0.00000					
		Layer 3: <2 mm		694.81	Organic Fibres	N/A	0.00000	0.00000					
		Layer 3 sub sampled weight:		51.97	Synthetic Mineral Fibres								
		Total sample weight:		838.80	Total Combined:	1.05348	0.00000	0.00000					
T002772.3	5	ASS06 @ 0.0, Soil											
		Layer 1: >10 mm	1342.34	105.13	Organic Fibres	0.00000	0.00000	0.00000	0.00000%	0.00000%	0.00000%	0.00000%	No Asbestos Detected QA/QC Reviewed
		Layer 2: 10 - 2 mm		107.00		N/A	0.00000	0.00000					
		Layer 3: <2 mm		860.08		N/A	0.00000	0.00000					
		Layer 3 sub sampled weight:		50.08									
		Total sample weight:		1072.21	Total Combined:	0.00000	0.00000	0.00000					

Terra Scientific Ltd
43a Moorhouse Avenue,
Addington,
Christchurch, 8011
P: 03 928 2256
E: admin@terrascientific.co.nz
W: www.terrasci.co.nz

ACCREDITED TESTING LABORATORY Nº 1334

Version Number: 10 | Date Issued: August 2020 | Authorised By: JC | Controlled Document

Client Name:	ENGEO Christchurch	**Job Number:**	T002772	**Total Samples Received:**	7
Client Address:	124 Montreal Street, Sydenham, Christchurch, 8023	**Site Reference / Address:**	597 EM	**Date Received:**	2/09/2020
Client Reference:	12903.000.005			**Date Analysed:**	3/09/2020
Client Contact:	Natale Flatman	**Analyst:**	Lisa Bullock	**Date Reported:**	3/09/2020

ASBESTOS IN SOIL ANALYSIS REPORT

Laboratory Sample Number	Client Sample Number	General Description	Received Weight (g)	Dry Weight (g)	Results	ACM Weight (g)	FA Weight (g)	AF Weight (g)	ACM w/w %	FA w/w %	AF w/w %	Combined AF/FA %	Comments
T002772.4	6	ASS07 @ 0.0, Soil											
		Layer 1: >10 mm	741.38	54.82	Organic Fibres	0.00000	0.00000	0.00000	0.00000%	0.00083%	0.00000%	0.00083%	
		Layer 2: 10 - 2 mm		112.04	**Chrysotile (White Asbestos)** Organic Fibres Synthetic Mineral Fibres	N/A	0.00405	0.00000					
		Layer 3: <2 mm		321.09	Organic Fibres	N/A	0.00000	0.00000					
		Layer 3 sub sampled weight:		54.29	Synthetic Mineral Fibres								
		Total sample weight:		487.95	Total Combined:	0.00000	0.00405	0.00000					

Method References and Disclaimers

Samples were analysed in accordance with:
AS4964-2004 Australian Standard - Method for Qualitative Identification of Asbestos in Bulk Samples
BRANZ - New Zealand Guidelines for Assessing and Managing Asbestos in Soil 2017

Disclaimers:
Samples are reported 'As Received'. Terra Scientific takes no responsibility for sampling processes, client sample descriptions and sample locations as these were provided by the client.
The results presented in this report relate specifically to the samples submitted for this job.
The detection limit is 0.1g/1kg (0.01% w/w) as stated in the AS4964-2004. Samples that contain asbestos less than this limit are outside the scope of accreditation.
Asbestos calculations are outside the scope of accreditation.
All opinions and interpretations are outside the scope of accreditation.
This report shall not be reproduced, except in full, without the written consent of the Key Technical Person assigned to this report.

For any queries regarding this report, please do not hesitate to contact the laboratory and speak with the Key Technical Person.

Sarah Giles
Laboratory Analyst
Key Technical Person