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REZONING SUBMISSION - 46 OLD RENWICK ROAD, BLENHEIM

DETAILED SITE INVESTIGATION – CONTAMINATION

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REZONING SUBMISSION - 46 OLD RENWICK ROAD, BLENHEIM

DETAILED SITE INVESTIGATION – CONTAMINATION

Project No.	CH01154	Approved for Issue	
Version No.	1	Name	Sean Finnigan
Status	Final	Signature	
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Reviewer	S Finnigan	Date	3 October 2022

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REZONING SUBMISSION-
46 OLD RENWICK ROAD, BLENHEIM

DETAILED SITE INVESTIGATION REPORT – CONTAMINATION

KEREPI LTD

EXECUTIVE SUMMARY

In response to instructions from Kerepi Ltd, Fraser Thomas Limited (FTL) undertook a Detailed Site Investigation (DSI) for the proposed rezoning submission for the subject site located at 46 Old Renwick Road, Blenheim.

The subject site comprises three properties (Lot 1 DP 12092, Lot 1 DP 3536 and Lot 2 DP 3536), with a total area of approximately 13.2ha. However, it should be noted that land surrounding the existing dwelling and Caseys Drain has been subdivided from Lot 1 DP 12902, and that the land use in this part of the site will not change and therefore is excluded from the rezoning proposal.

Hence, for the purposes of this investigation reported herein, the subject site has an area totalling approximately 12 ha.

It is understood that it is proposed to request a plan change to the Marlborough District Plan seeking to rezone the above properties from "Rural" to "Residential", to enable subdivision of the site in order to create new residential lots.

The main rationale and objectives for this investigation were:

- To identify the main actual or potential contamination issues due to historic use of land within the property.
- To confirm that the site is suitable or can be made suitable for the proposed subdivision.
- To confirm whether excess excavated soil, if any, from any future site redevelopment can be retained on-site or has to be disposed of off-site to an approved disposal facility.

This investigation has been managed, reviewed and approved by a Suitably Qualified and Experienced Practitioner (SQEP), as defined in the National Environmental Standard (NESCS) for Assessing and Managing Contaminants in Soil to Protect Human Health.

Review of available historical aerial photographs shows that the subject site appears to have been used for agricultural purposes from at least the 1930s to the early 1980s. It appears a brief period of horticultural activity, was undertaken, primarily on land in the south-western corner of 44 Old Renwick Road in the late 1950s until at least the 1960s. This activity generally coincides with the ownership of the site by seed producers F Cooper Ltd. Beginning in the early

1980s, the site was progressively converted to vineyards. Residential activity comprising a dwelling and several detached garages/sheds has been present since the early 1990s.

Confirmed HAIL activities identified during the investigation were:

- *A10 - Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds*: This relates to the current viticultural activity occurring at the site.
- *A18 - Wood treatment or preservation including the commercial use of antisapstain chemicals during milling, or bulk storage of treated timber outside*: This relates to the stockpiled and insitu treated timber posts supporting the vines.

All composite samples taken within the vineyard sitelands, readily complied with applicable NESCS land use guidelines (Residential 10% produce consumption), with heavy metals being present below background levels and OCPs detected at low levels in six composite samples.

Contamination of the site soils via leaching of CCA treated timber, appears to have occurred in the vicinity of insitu timber poles supporting the existing vines. Based on the results of the XRF and laboratory sampling presented herein, arsenic concentrations exceeding NESCS guidelines for human health generally appears to extend up to a horizontal distance of 300mm from the base of the posts, and to a minimum depth of approximately 600mm below the existing ground surface.

In our opinion, the desktop study and sampling results mean that under Regulation 5 (7) the NESCS is considered to apply to the site because HAIL activities have been undertaken on it, with elevated contaminant levels confirmed. Furthermore, NESCS consent for a restricted discretionary activity will be required for subdivision, due to confirmed arsenic concentrations exceeding adopted NESCS guidelines.

In summary, based on the information presented in this report, the site is considered suitable for the proposed rezoning and future subdivision, provided the localised contamination issues identified in this report are addressed. The actual contamination issues identified can be managed, provided existing contaminated soils beneath the stockpiles of timber posts and any insitu timber posts associated with the vineyard are appropriately remediated.

We have performed our services for this project in accordance with current professional standards for an assessment of the nature and extent of any soil contamination on-site, based upon detailed site assessment investigations and current regulatory standards for site contamination. The scope of the site assessment activities was generally in accordance with the Ministry for Environment Contaminated Land Management Guideline's (Parts 1 (2021), 2 (2011) and 5 (2021) and the NES (2011). Conclusions on actual or potential contamination cannot be applied to areas outside of the site investigation.

Limited sampling was undertaken as part of this investigation. We do not assume any liability for misrepresentation or items not visible, accessible or present at the subject site during the time of the site inspection.

NATIONAL ENVIRONMENTAL STANDARD FOR ASSESSING AND MANAGING CONTAMINANTS IN SOIL TO PROTECT HUMAN HEALTH

REZONING SUBMISSION-
46 OLD RENWICK ROAD, BLENHEIM

DETAILED SITE INVESTIGATION - CERTIFYING STATEMENT

I, Dr Sean Matthew Finnigan of Fraser Thomas Ltd certify that:

This Detailed Site Investigation meets the requirements of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health, NESCS) Regulations 2011 because it has been:

a. done by suitably qualified and experienced practitioners, and
b. reported on in accordance with the current edition of Contaminated land Management Guidelines No 1 – Reporting on Contaminated Sites in New Zealand, and
c. the report is certified by a Suitably Qualified and Experienced Practitioner.

This Detailed Site Investigation has found:

a. The proposed rezoning and future development will trigger “change in land use”, “subdivision” and “soil disturbance” activities under the NESCS.
b. The NESCS is considered to apply to the site because HAIL activities have been undertaken on it.
c. Soil sampling found some localised contamination of the site soils associated with the insitu posts of treated timber supporting the vines that will require remediation.

This investigation has been undertaken by the following staff:

a. Dr Sean Finnigan, BE, MEnv.Sci, PhD; CPEng, M.ALGA, M.WasteMINZ, CEnvP-CL (21 yrs CL experience)
b. Sam Gladwin, BSc, M.ALGA, M.WasteMINZ (4 yrs CL experience)

Further evidence of these staff’ qualifications and experience can be provided on request.

Signed:  Date: 3 October 2022

REZONING SUBMISSION-
46 OLD RENWICK ROAD, BLENHEIM

DETAILED SITE INVESTIGATION REPORT – CONTAMINATION

KEREPI LTD

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46 OLD RENWICK ROAD,
BLENHEIM

DETAILED SITE INVESTIGATION REPORT – CONTAMINATION

KEREPI LTD

1.0 INTRODUCTION

In response to instructions from Kerepi Ltd, Fraser Thomas Limited (FTL) undertook a Detailed Site Investigation (DSI) for the proposed rezoning submission for the subject site located at 46 Old Renwick Road, Blenheim.

The subject site comprises three properties (Lot 1 DP 12092, Lot 1 DP 3536 and Lot 2 DP 3536), with a total area of approximately 13.2ha. However, it should be noted that land surrounding the existing dwelling and Caseys Drain has been subdivided from Lot 1 DP 12902, and that the land use in this part of the site will not change and therefore is excluded from the rezoning proposal.

Hence, for the purposes of this investigation reported herein, the subject site has an area totalling approximately 12 ha.

It is understood that it is proposed to request a plan change to the Marlborough District Plan seeking to rezone the above properties from "Rural" to "Residential", to enable subdivision of the site in order to create new residential lots.

This investigation has been managed, reviewed and approved by a Suitably Qualified and Experienced Practitioner (SQEP), as defined in the National Environmental Standard (NESCS) for Assessing and Managing Contaminants in Soil to Protect Human Health.

The format of this report is as follows:

- Rationale, objectives and scope of work.
- Previous Investigations
- Investigation methodology.
- Site details.
- Desktop study and site walkover results.
- Intrusive soil sampling.
- Discussion, conclusions and recommendations.
- Site plans, representative photographs and other relevant information in appendix form.

This investigation has been managed, reviewed and approved by a Suitably Qualified and Experienced Practitioner (SQEP), as defined in the National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS).

2.0 RATIONALE, OBJECTIVES AND SCOPE OF WORK

The main rationale and objectives for this investigation were:

- To identify the main actual or potential contamination issues due to historic use of land at the site.
- To confirm that the site is suitable or can be made suitable for the proposed rezoning and future subdivision.
- To confirm whether excess excavated soil, if any, from any future site redevelopment can be retained on-site or has to be disposed of off-site to an approved disposal facility.

3.0 PREVIOUS INVESTIGATIONS

Fraser Thomas prepared a Targeted Detailed Site investigation, dated December 2021 for 44 Old Renwick Road (Lot 1 DP 12092 and Lot 2 DP 3635), as part of a due diligence pre-purchase works.

The December 2021 DSI comprised a preliminary desktop study, site walkover involving a visual inspection of the site for any sources and/or signs of contamination, and collection of targeted soil samples at the same time. Soil sampling covered the area of the site that may have been subject to HAIL activities based on the desktop study involving review of historical aerials.

Forty shallow soil samples (OR1 to OR40 inclusive) were composited at 4:1 and tested for arsenic, copper, lead, mercury and organochlorine pesticides (OCPs), these being typical contaminants associated with the land use identified. These samples were generally collected from the sitelands within sandy silts (i.e. topsoil) at a depth of 0-250mm below existing ground level.

Eight individual samples shallow were also taken at the base of selected timber posts supporting the vines. 4 shallow samples (OR1, OR9, OR32 and OR39), taken at depths of between 0-250mm below existing ground level, were tested for chromium, copper and arsenic. Chromated copper arsenate (CCA) is a common wood preservative associated with timber posts which is a known contamination issue with vineyards.

Eight individual samples shallow were also taken around the perimeter of the existing dwelling (OR43, OR44, OR45, and OR46), at depths of between 0-250mm below existing ground level, and were tested for Lead due the dwelling having been constructed at a time when lead paint was commonly used in New Zealand.

The results of the laboratory testing indicated that:

- Heavy metals were below adopted background concentrations in the composite samples taken within the vineyard sitelands.
- OCPs were detected at low levels in 6 of the composite samples, but well below NESCS guidelines.
- Arsenic and Copper exceeded adopted background levels in all individual samples taken at the base of timber poles supporting the vines, with three samples (OR1 0-150, OR90-200, OR32 0-250 and OR39 0-250) exceeding the NESCS guidelines for Arsenic.
- Lead exceeding adopted background concentrations but below NESCS guidelines was detected in all samples taken next to the existing dwelling.

All vineyard siteland composite and individual dwelling samples readily complied with applicable NESCS land use guidelines (Residential 10% produce consumption), with heavy metals being present below background levels and OCPs detected at low levels in six composite samples.

Some contamination of the site soils via leaching of CCA treated timber, appears to have occurred in the vicinity of insitu timber poles supporting the existing vines.

The results of the December 2021 investigations indicate that the following HAIL (Hazardous Activities and Industries List) activities are likely to have been undertaken on the subject site:

- *Activity A10: Persistent pesticide bulk storage or use including sports turfs, market gardens, orchards, glass houses or spray sheds* – This relates to low levels of OCPs being detected in some of the composite samples.
- *Activity I: Land subject to intentional or accidental release of hazardous substances in sufficient quantity that it could be a risk to human health or the environment* – This relates to lab results indicating that the timber poles supporting the vines have been treated with CCA, which has subsequently leached into the soils surrounding the posts.

4.0 INVESTIGATION METHODOLOGY

The methodology used for this site assessment is summarised below:

1. Desktop study involving review of aerial photographs, certificates of title, Marlborough District Council (MDC) files (contaminated land and related information), previous reports and an interview with the current or former land owners.
2. Site walkover investigation of the subject site, with visual appraisal to identify any potentially contaminated areas.
3. Intrusive soil sampling with analysis for relevant parameters based on the results of the desktop study.
4. Preparation of a DSI report including the results of the desktop study, site walkover survey, laboratory testing, conclusions and recommendations.
5. Provision of site plans, relevant documentation and representative photographs as appendices to this report.

Fraser Thomas Limited Health and Safety Management Plan procedures were followed throughout the duration of the investigation.

5.0 SITE DETAILS

5.1 LOCATION, PROPERTY DETAILS AND LAND USE

The subject site is located on the northern side of Old Renwick Road.

Details of each of the individual properties making up the rezoning area are listed in Table 1, including the current land use.

Table 1: Property Details

Registered Owner	Address	Appellation Title	Area (ha)	Land Use
Murray Ian Locke, Carol Margaret Locke and Paul Edwin O'Donnell	44 Old Renwick Road, Blenheim	Lot 1 DP 12092	3.3671	Vineyard and rural residential
		Lot 2 DP 3536	5.1842	Vineyard
John Robert Kennard and Satu Maarit Lappalainen	46 Old Renwick Road, Blenheim	Lot 1 DP 3536	4.599	Vineyard and rural residential

The total area of the above properties is approximately 13.2ha. However, as discussed in Section 1.0, it should be noted that land surrounding the existing dwelling and Caseys Drain has been subdivided from Lot 1 DP 12902, and that the land use in this part of the site will not change and therefore is excluded from the rezoning proposal.

Hence, for the purposes of this investigation reported herein, the subject site has an area totalling approximately 12 ha.

The site is currently zoned "Rural Three Zone" under the Wairau Awatere Resource Management Plan.

The majority of the site is currently used as a vineyard.

Residential activity comprising an existing dwelling and two detached garages are also located at the site.

Existing residential subdivisions abut the western and southern site boundaries. Existing vineyards abut the northern and eastern boundaries.

5.2 TOPOGRAPHY, GEOLOGY AND SOILS

The topography within the subject site is generally flat, and covered with rows of grape vines.

An existing open channel, identified as the 'Casey's Creek' is located along the southern edge of the site, and generally runs in a west to east direction.

An existing open drain, identified as the 'Cooper and Morrison Drain' runs inside and parallel to the eastern boundary of the site.

In assessing the geology of the site, reference has been made to the Institute of Geological & Nuclear Sciences Geological Map, scale 1:250,000, "Wellington", Map 10.

This map indicates that the site is likely to be underlain by "Swamp deposits consisting of poorly consolidated silt, mud, peat and sand" of Holocene age.

The results of hand augered borehole and CPT investigations undertaken by Fraser Thomas within at the subject, in general, indicate that the surficial soils underlying the site are likely to comprise alluvial sediments of Holocene age.

5.3 PROPOSED DEVELOPMENT

As discussed in Section 1.0 of this report, the subject site has an area totalling approximately 12 ha.

It is understood that it is proposed to request a plan change to the Marlborough District Plan seeking to rezone the above properties from "Rural" to "Residential", to enable subdivision of the site in order to create new residential lots. It is also understood that is is proposed to construct a stormwater attenuation pond, in the southern part of the site.

6.0 DESKTOP STUDY AND WALKOVER SURVEY RESULTS

The results of the desktop study and site walkover survey are summarised in this section and illustrated in the attached site features plan (drawing CH01154-E-01), Council records (Appendix B), aerial photographs (Appendix C) and site photographs (Appendix D). Throughout the site walkover survey, a visual assessment was used to classify any foreign materials as particular contaminants, without any formal identification. Hence, reference to a specific contaminant in the survey results should essentially be read as "suspected contaminant", unless otherwise stated.

6.1 SITE IDENTIFICATION AND USE

Details of the properties making up the site are listed in Tables 2 to 4, including the current land use.

Table 2: Site Details and Ownership History Lot 1 DP 12092

Registered Owner	Murray Ian Locke, Carol Margaret Locke and Paul Edwin O'Donnell	
Street Address	44 Old Renwick Road, Blenheim	
Legal Description	Lot 1 DP 12092	
Title	43100	
Area (ha)	3.3671	
Zoning	Rural Three Zone	
Ownership History		
CTs	**From**	**Registered Owner**
43100	April 2004	Murray Ian Locke, Carol Margaret Locke and Paul Edwin O'Donnell.
MB6C/199	Jan 2001	Murray Ian Locke, Carol Margaret Locke
2A/268	Sep 1985 June 1972 Aug 1971 Nov 1969	Murray Ian Locke, Foreman and Carol Margaret Locke Allan Arrol Scott, Farmer Winifred Isabel Morrison Arthur Raphael John Morrison, Auctioneer

Table 3: Site Details and Ownership History Lot 2 DP 3536

Registered Owner	Murray Ian Locke, Carol Margaret Locke and Paul Edwin O'Donnell	
Street Address	44 Old Renwick Road, Blenheim	
Legal Description	Lot 2 DP 3536	
Title	MB2A/266	
Area (ha)	5.1842	
Zoning	Rural Three Zone	
Ownership History		
CTs	**From**	**Registered Owner**
MB2A/266	April 2004	Murray Ian Locke, Carol Margaret Locke and Paul Edwin O'Donnell.
MB23/24	Nov 1968 June 1955 Oct 1953 Dec 1917	Arthur Raphael John Morrison, Auctioneer F Cooper Limited George Enock Blick, Farmer Margaret Lauchlan, Spinster

F Cooper Limited is understood to have been a producer of seeds based out of Wellington. No information was found between 1968 and 2004.

Table 4: Site Details and Ownership History Lot 1 DP 3536

Registered Owner	John Robert Kennard and Satu Maarit Lappalainen	
Street Address	46 Old Renwick Road, Blenheim	
Legal Description	Lot 1 DP 3536	
Title	MB5D/1214	
Area (ha)	4.599	
Zoning	Rural Three Zone	
Ownership History		
CTs	**From**	**Registered Owner**
MB5D/1214	May 2018 July 1997	John Robert Kennard and Satu Maarit Lappalainen. Roger Brian Thompson, Retired Serviceman and Diane Mae Thompson, wife
MB2A/265	Mar 1989 Nov 1969	Roger Brian Thompson, Retired Serviceman and Diane Mae Thompson, wife Arthur Raphael John Morrison, Auctioneer

6.2 COUNCIL RECORDS

5.4.1 LISTED LAND USE REGISTER (LLUR)

The subject site is not currently identified on the LLUR layer on the MDC Smart Maps website. Internal MDC correspondence held on the property file for 44 Old Renwick Road, indicates that the Council consider that sufficient information exists (historical aerial photography showing horticultural activity) to classify the site as a HAIL on the LLUR.

The internal correspondence regarding the HAIL status for this site is included in Appendix B.

5.4.2 Marlborough District Council (MDC) Property Files

The Council property files were reviewed. The only relevant information found related to building permit/consent and resource consent applications submitted to Council:

44 Old Renwick Road, Blenheim

- 1972 – Building permit application for a new dwelling
- 1974 – Building permit application for a new garage
- 1981 – Building permit application for alterations to the dwelling
- 1985 – Building permit documents for alterations to the dwelling
- 2022 – Internal MDC correspondence (discussed in Section 5.4.1)

46 Old Renwick Road, Blenheim

- 1995 – Building consent application for a new temporary dwelling
- 1998 – Building consent application for a new garage
- 1999 – Building consent application for extensions to dwelling

6.3 AERIAL PHOTOGRAPHS

Publicly available aerial photography was sourced from MDCs Smart Maps GIS and Retrolens websites, and are provided in Appendix C.

1938, 1948, 1958, 1964 and 1973 Aerials

The site appears to be used for cropping (baleage) and pastoral purposes. A north-west/south-east trending feature, inferred to be a depression/ephemeral watercourse running in a north-west direction can be seen to extend approximately through the central part of the subject site.

In 1958, horticultural activity appears to be occurring to the south of Caseys Drain at 44 Old Renwick Road (Lot 1 DP 12092). The horticultural activity primarily appears to be occurring on land which in present day makes up the property directly to the south of the site. An implement shed has been constructed in this part of the site in 1964.

In 1973, a dwelling has been constructed at 44 Old Renwick Road and the previously identified horticultural activity has ceased.

1983, 1996, 1998, 2002, 2007, 2012, 2015 and 2018 Aerials

In 1983, a vineyard has been established in the southern part of 44 Old Renwick Road (Lot 1 DP 12092). Extensions to the dwelling are also visible.

By 1996, the remainder of the subject site has been converted to vineyard, and a dwelling has been constructed along the southern boundary of 46 Old Renwick Road.

The land use as the site generally remains unchanged from 1996 to the present day. The existing dwellings at the site appear to have additions and

6.4 APRIL 2022 INTERVIEWS

Mr Murray Locke – owner 44 Old Renwick Road

The following information was provided by Mr Locke during the site walkover for the December 2021 DSI report, with additional comments made during the August walkover:

- Mr Locke has owned the land for approximately 36 years.
- At the time of purchase, he does not remember there being any existing horticultural activity at the site.
- The timber fence posts stockpiled at the site are second hand and likely to be over 10 years old and have been sourced from offsite properties.
- Spraying of the vineyards is undertaken by external contractors.
- No above or below ground fuel storage tanks are located at the subject site.

- The southern part of 44 Old Renwick Road (Lot 1 DP 12092) was converted to vineyard around 1981. The vines and posts in this part of the site were removed and the soils cultivated around 2011. The vineyard was re-established in 2013.
- The remainder of 44 Old Renwick Road (Lot 2 DP 3536) and 46 Old Renwick Road (Lot 1 DP3536) was converted to vineyard around 1989.

Mr John Robert Kennard – owner 46 Old Renwick Road

- Mr Kennard purchased the site in 2018, and rents out the dwelling to others.
- The vineyard is sprayed by external contractors who undertake filling operations on the concrete pad located to the west of the garages. It is his understanding that the equipment is not actually washed down on site.
- The concrete pad drains to a soak pit.
- They have only replaced timber posts that have been broken.
- The glasshouse is used for storage by the tenants and does not currently appear to be used for growing produce.

6.5 CHEMICAL APPLICATION

A chemical risk assessment was undertaken for the December 2021 DSI, of the two known sprays used on the vineyard in 44 Old Renwick Road (Lot 1 DP 12092 and Lot 1 DP 3536). Two additional chemicals where observed being stored in the shed next to a concrete pad used to fill spray tanks located at 46 Old Renwick Road during the August 2022 site walkover.

The active ingredients, hazards and their environmental fate in soil are summarised in Table 5.

Risks deriving from agrichemicals are determined based on three factors: the toxicity of the chemical, its persistence in the environment and the application rate. Information on the application rates is often hard to obtain; therefore, the chemical risk is generally assessed based on the toxicity (LD_{50} in rats via oral or dermal exposure) and on the persistence in the environment.

The Stockholm Convention defines persistent organic pollutants (POPs) as organic chemical substances which:

- remain intact for exceptionally long periods of time (many years);
- become widely distributed throughout the environment as a result of natural processes involving soil, water and most notably, air;
- accumulate in the fatty tissue of living organisms including humans, and are found at higher concentrations at higher levels in the food chain; and
- are toxic to both humans and wildlife.

This definition has been adopted here for “persistent pesticides”, in the absence of a formal definition of such pesticides in New Zealand, this being consistent with the approach taken by Babbage in their 2013 report “Persistent Pesticide Use on Sports Fields on the North Shore, Auckland”. The two agrichemicals used on site are classified as non to moderately persistent under the International Union of Pure and Applied Chemistry (IUPAC) soil degradation criteria,

with half-life degradation times of 7 to 90 days and hence are not considered to be persistent pesticides, as defined under the Stockholm Convention. They would be expected to degrade to low or non-detectable concentrations within a few months after application. Hence no testing was undertaken for these chemicals.

Table 5: Chemical Risk Assessment

Name	Description	Active ingredient	IUPAC soil half-life degradation (DT50 field)	Human Health (MSDS)	Environmental Effects (MSDS)
Mortar	Insecticide	Buprofezin	45.6 days moderately persistent	Skin and respiratory tract irritant; may be harmful if swallowed, inhaled or absorbed through skin; possible organ damage through repeated oral exposure at high doses.	Harmful to fish/aquatic organisms with long lasting effects.
Impulse	Fungicide	Spiroxamine	52.4 days moderately persistent	Skin irritant; harmful if swallowed or inhaled; causes serious eye damage; organ damage to prolonged or repeated exposure	Very toxic to aquatic life with long lasting effects.
Vixen	Herbicide	Glufosinate Ammomium	7 days non-persistent.	Skin, and eye irritant; may be harmful if swallowed, inhaled or absorbed through skin; possible organ damage through prolonged exposure	Harmful to aquatic organisms, may cause long-term adverse effects in aquatic environment. Toxic to flora. Toxic to soil organisms
Topas 200EW	Fungicide	Penconazole	89.7 days moderately persistent	Skin, and eye irritant; may be harmful if swallowed, inhaled or absorbed through skin; possible organ damage through prolonged exposure	Toxic to aquatic life.

6.6 SITE WALKOVER RESULTS

A site walkover was undertaken by Sam Gladwin, Engineering Geologist of FTL experienced in contaminated site investigations on 9, 10, 11 and 12 August 2022, as part of the sampling fieldworks. Site investigation photographs are provided in Appendix D.

Vineyard 44 Old Renwick Road:

- The majority of the site is established vineyard with rows numbered 1 to 57 running in a north-south direction.
- A shallow open drain, identified as the 'Cooper and Morrison Drain' runs inside and parallel to the eastern boundary of the site. The banks of the drain are vegetated with grass.
- A small modern pump shed is located in Lot 2 DP 3536.
- A stockpile of timber posts, was observed along the northern boundary. The stockpile was stacked on two timber posts (i.e. the majority of the posts were not resting directly on the ground).

46 Old Renwick Road:

- The majority of the site is established vineyard with rows numbered 1 to 51 running in a north-south direction.
- A dwelling and two detached garages are located along the south boundary. The structures are generally in good condition and of timber frame construction with profiled metal cladding/roofing and supported on concrete slab-on-ground foundations.
- A concrete pad, understood to be used for filling spray tanks, is located next to one of the garages. The surface slopes to a drain in the middle of the pad, which empties in to a soak pit. The soils in the base of the soak pit could not be accessed at the time of the investigation as a metal grate within the pit was unable to be removed.
- A glasshouse and several raised garden beds are located to along the northern side of the garage. The glasshouse generally appears to be used for storage

6.7 SUMMARY – KEY FINDINGS

Review of available historical aerial photographs shows that the subject site appears to have been used for agricultural purposes from at least the 1930s to the early 1980s. It appears a brief period of horticultural activity, was undertaken, primarily on land in the south-western corner of 44 Old Renwick Road in the late 1950s until at least the 1960s. This activity generally coincides with the ownership of the site by seed producers F Cooper Ltd. Beginning in the early 1980s, the site was progressively converted to vineyards. Residential activity comprising a dwelling and several detached garages/sheds has been present since the early 1990s.

Other than the internal MDC email correspondence, dated April 2022, no documents referring to the inferred horticultural activity, in particular any spray records, were found in the property files.

The chemicals known to have been sprayed on the vineyard generally have moderate persistence in soil and water and therefore are not considered "persistent" (ranking = 1) and would be expected to degrade to non-detectable concentrations within a few months after application.

Potential/actual HAIL activities identified during the desktop study and site walkover were:

- *A10 - Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds*: This relates to the current viticultural activity occurring at the site.
- *A18 - Wood treatment or preservation including the commercial use of antisapstain chemicals during milling, or bulk storage of treated timber outside*: This relates to the stockpiled and insitu treated timber posts supporting the vines.

6.8 DATA QUALITY OBJECTIVES & CONCEPTUAL SITE MODEL

In accordance with MfE Contaminated Land Management Guidelines (CLMG) No 5 the Data Quality Objectives (DQOs) and Conceptual Site Model (CSM) for this investigation are summarized in Table 6 below.

Table 6: DQOs and CSM

Purpose of Investigation	Assess human health risks associated with proposed rezoning/change in land use and future subdivision.	
Define boundaries	The investigation focused on the actual/potential HAIL activities identified at the site during the desktop study and site walkover.	
Develop Conceptual Site Model	Known/possible HAIL land use	*A10 - Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds:* This relates to the current viticultural activity occurring at the site. *A18 - Wood treatment or preservation including the commercial use of antisapstain chemicals during milling, or bulk storage of treated timber outside*: This relates to the stockpiled and insitu treated timber posts supporting the vines.
	Contaminants of concern	Arsenic, Chromium, Copper, Lead, Mercury and Organochlorine pesticides (OCPs).
	Distribution of contaminants	Lateral – across the site Vertical – depending on the soil type
	Receptors	Construction workers, future site users
	Potential pathways	Dermal contact, ingestion, dust inhalation, produce consumption
	Applicable land use scenario	Residential 10% produce

Additional information required	Collection of the following soil samples: Collection of a minimum of 56 samples from 28 locations (1 x shallow, 1 x deeper) from within the sitelands of the vineyard in Lot 1 DP 3536, in order to assess the likelihood and extent of any soil contamination present. We have allowed for compositing the shallow samples at 4:1 and testing for arsenic, copper, lead, mercury and organochlorine pesticides (OCPs), these being typical contaminants associated with the land use identified. The deeper samples will be stored on hold cold at the laboratory, and might be tested if the initial round of results shows concentrations of contaminants exceeding the NESCS guidelines. The purpose of this testing is to confirm that the level of contaminants in the soils, if any, and their suitability for use as mixing soils for remediation purposes, and/or disposal requirements. Select 25 individual posts supporting the vines and undertake XRF testing at 3 locations horizontally out from the base of the post (0mm, 150mm and 300mm) and at a depth of 0-100mm, 300-400mm and 500-600mm below the existing ground surface. Collection of 1 laboratory sample a horizontal distance of 100mm and 0-100m depth per post (25 samples total) and testing of individual samples for chromium, copper and arsenic (CCA). The purpose of this testing is to determine the horizontal and vertical extent of soil contamination associated with CCA leaching around the posts Note: Composite sampling (40 shallow samples) of the sitelands in Lot 2 DP 12092 and Lot 2 DP 356 undertaken in November 2021.

7.0 INTRUSIVE SOIL SAMPLING

Soil sampling was undertaken to adequately characterise the nature and extent of soil contamination on the site if any.

7.1 RATIONALE

Intrusive soil sampling was conducted of the subject area based on the findings of the desktop study and the site walkover:

- Check the nature of the soils (visual observation, soil sampling) underneath the site.
- Confirm that HAIL activities were carried out on site.
- Determine the nature and severity of contamination (if any) in the soil.

7.2 EVALUATION BASIS

The sampling results have been compared with:

- Predicted background soil concentrations for the subject site, adopted from the Land Resource Information Systems (LRIS) GIS portal.
- NESCS Soil Contaminant Standards (SCS) for Residential (10% produce) land use.

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC) ISQG-low values with three times dilution in accordance with Environment Canterbury advice, as a proxy for potential environmental effects.

7.3 METHODOLOGY

On 30 November 2021 and 9 to 12 August 2022, samples were collected using a hand auger, from the subject site. These samples are considered to be representative of the soil that has been affected by potential HAIL activities and which will be disturbed as part of the development.

Soil samples were generally collected in accordance with the Ministry for the Environment Contaminated Land Management Guideline No. 5 as follows:

- Fresh gloves were used to collect soil samples.
- All samples were placed immediately in laboratory supplied sample containers.
- Equipment used to collect the samples was cleaned between sample locations.

The samples were chilled and transported to Hill Laboratories in Blenheim for analysis under chain of custody documentation.

7.3.1 Vineyard Sitelands and Headlands

68 shallow soil samples (OR1 to OR40 and OR47 to OR74 inclusive) were composited at 4:1 and tested for arsenic, copper, lead, mercury and organochlorine pesticides (OCPs), these being typical contaminants associated with the land use identified. These samples were generally collected from the sitelands within sandy silts (i.e. topsoil) at depths ranging between 0-150mm and 0-250mm below existing ground surface.

At the time of the sampling, no obvious fill material was observed in the deeper samples, in particular OR47 and OR57 which appear to be located within the ephemeral watercourse identified in aerial photography, and were generally taken from the soils underlying the topsoil comprising alluvial sandy silts.

7.3.2 Insitu Timber Posts

In November 2021, eight individual samples (1 x shallow, 1 x deeper) were taken at the base of selected timber posts supporting the vines. 4 shallow samples (OR1, OR9, OR32 and OR39), taken at depths of between 0-250mm below existing ground level, were tested for chromium, copper and arsenic.

For the August 2022 sampling, the vineyard was split into Area A and Area B, based on the inferred age of vine establishment from aerial photography.

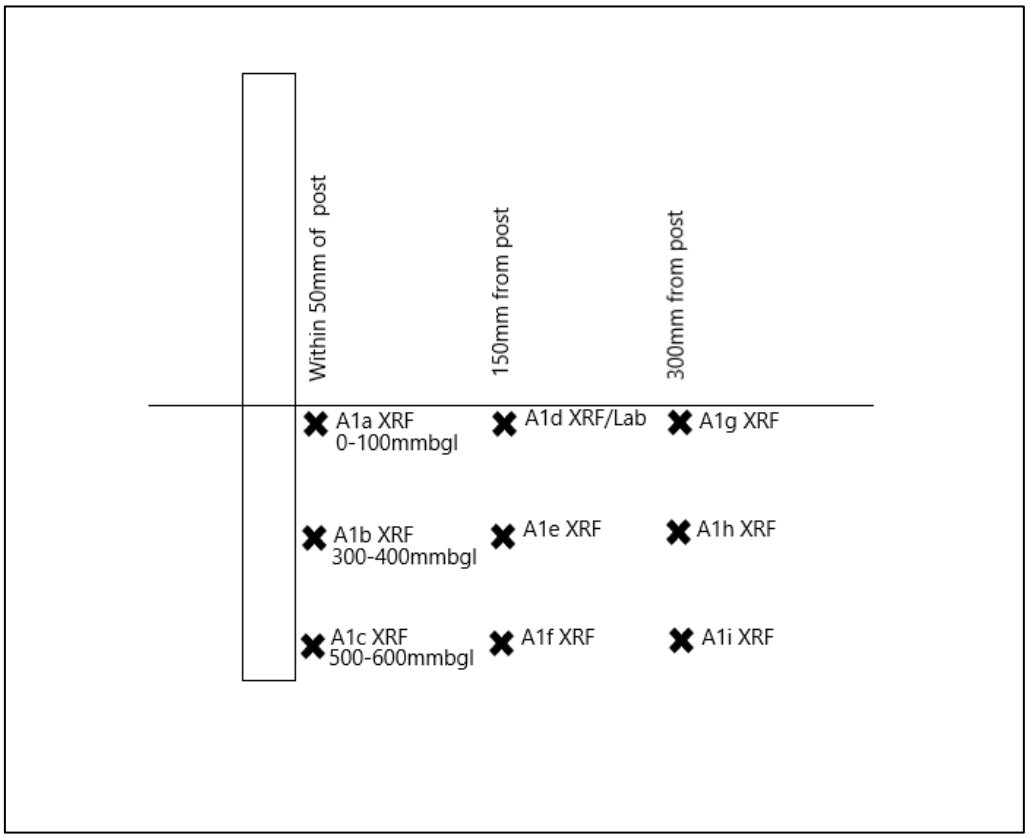
Area A comprised Lot 1 DP 12092, vines established in the early 1980s.

Area B comprised Lots 1 and 2 DP 3536, vines established in the late 1980s.

25 individual posts, consisting of a mix of end posts and intermediate posts supporting the vines were selected and sampled at 3 locations horizontally out from the base of the post (0mm, 150mm and 300mm) and at depths of 0-100mm, 300-400mm and 500-600mm below the existing ground surface for a total of 225 samples. All of the samples were field screened with an Olympus Vanta L Series handheld X-Ray Fluorescence (XRF) analyser.

One sample per post, collected a horizontal distance of 150mm and 0-100mm depth (25 samples total) was sent to the laboratory to be tested for chromium, copper and arsenic (CCA).

Figure 1: Schematic representation of timber post sample locations.



7.3.3 Timber Post stockpile

As discussed in Section 6.6, a stockpile of timber posts, was observed along the northern boundary. The stockpile was stacked on two timber posts (i.e. the majority of the posts were not resting directly on the ground).

The surface soils were analysed using the XRF at horizontal distances of approximately 0mm, 100mm and 200m from the stockpile

7.3.4 Sampling Summary

A summary of sampling and specified testing is presented in Table 7 below.

Table 7: Laboratory sampling and testing Summary

Sample ID	Sampling Depth (mmbgl)	Soil Type	Analysis
OR1 to OR40	0-250	SILT, sandy, brown, moist [TOPSOIL]	Comp 4:1 As, Cu, Pb, Hg and OCPs
OR47-74	0-150	SILT, sandy, brown, moist [TOPSOIL]	
A1a-g	0-150	0-100mmbgl SILT, sandy, dark brown, moist [TOPSOIL] 300-600mmbgl SILT, sandy, brown, moist [ALLUVIAL SEDIMENTS]	XRF field screening for As, Cr and Cu all samples Laboratory testing As, Cr and Cu samples A1d to B18d.
A2a-g	0-150		
A3a-g	0-150		
A4a-g	0-150		
A5a-g	0-150		
A6a-g	See Fig. 1		
A7a-g	See Fig. 1		
B1a-g	See Fig. 1		
B2a-g	See Fig. 1		
B3a-g	See Fig. 1		
B4a-g	See Fig. 1		
B5a-g	See Fig. 1		
B6a-g	See Fig. 1		
B7a-g	See Fig. 1		
B8a-g	See Fig. 1		
B9a-g	See Fig. 1		
B10a-g	See Fig. 1		
B11a-g	See Fig. 1		
B12a-g	See Fig. 1		
B13a-g	See Fig. 1		
B14a-g	See Fig. 1		
B15a-g	See Fig. 1		
B16a-g	See Fig. 1		
B17a-g	See Fig. 1		
B18a-g	See Fig. 1		

7.4 RESULTS SUMMARY

The soil sampling laboratory results are summarised in Tables 8, 9, 10, 11 and 12 below. The XRF results and laboratory certificates are included in Appendix E.

Table 8: Summary of November 2021 laboratory results 44 Old Renwick Road, Blenheim

Contaminants	Guidelines			Samples ID and depth												
				Timber posts holding up vines				Vineyard siteland composite samples								
	Background [1]	NES Residential 10% produce [2]	ISQG-Low x3 dilution factor [3]	OR1 0-150	OR9 0-200	OR32 0-250	OR39 0-250	OR1 0-150, OR2 0-150, OR3 0-150 and OR4 0-150	OR5 0-250, OR6 0-200, OR21 0-250 and OR22 0-250	OR23 0-250, OR24 0-250, OR39 0-250 and OR40 0-250	OR7 0-200, OR8 0-200, OR19 0-250 and OR20 0-250	OR9 0-200, OR10 0-200, OR17 0-250 and OR18 0-250	OR13 0-250, OR14 0-250, OR31 0-250 and OR32 0-250	OR29 0-250, OR30 0-250, OR33 0-250 and OR34 0-250	OR27 0-250, OR28 0-250, OR35 0-250 and OR36 0-250	OR25 0-250, OR26 0-250, OR37 0-250 and OR38 0-250	OR11 0-200, OR12 0-250, OR15 0-250 and OR16 0-250
Heavy Metals																	
Arsenic	9.97	20	60	**43**	**29**	**34**	**16**	8	6	6	6	6	6	6	6	6	5
Chromium	56.88	460	240	36	33	38	29	-	-	-	-	-	-	-	-	-	-
Copper	48.14	> 10,000	195	**57**	**55**	**86**	**52**	32	32	36	29	29	28	30	31	32	30
Lead	25.83	210	150	-	-	-	-	21	21	23	23	21	19.7	19.1	19.9	21	20
Mercury	-	310	0.45	-	-	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
OCPs																	
Total DDT Isomers	-	70	5	-	-	-	-	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08

Notes: Concentrations expressed in mg/kg

1. Land Resource Information Systems Portal - Predicted Background Soil Concentrations New Zealand - Predicted 95th quantile background concentration
2. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Table B2 Soil contaminant standards - SCSs(health) - Residential 10% produce
3. Australian and New Zealand Guidelines for Fresh and Marine Water Quality Volume 1 - Table 3.5.1 Recommended sediment quality guidelines

Exceeds background
Exceeds NESCS
Exceeds adjusted ISQG guidelines
Exceeds BRANZ
<LOR - Lower than limit of reporting

Table 9: Summary of August 2022 laboratory results 46 Old Renwick Road, Blenheim

Contaminants	Guidelines			Samples ID and depth						
				Vineyard siteland composite samples						
	Background [1]	NES Residential 10% produce [2]	ISQG-Low x3 dilution factor [3]	OR47 0-150, OR48 0-150, OR59 0-150 and OR60 0-150	OR49 0-150, OR50 0-150, OR57 0-150 and OR58 0-150	OR51 0-150, OR52 0-150, OR55 0-150 and OR56 0-150	OR53 0-150, OR54 0-150, OR67 0-150 and OR68 0-150	OR65 0-150, OR66 0-150, OR69 0-150 and OR70 0-150	OR63 0-150, OR64 0-150, OR71 0-150 and OR72 0-150	OR61 0-150, OR62 0-150, OR73 0-150 and OR74 0-150
Heavy Metals										
Arsenic	9.97	20	60	7	6	5	6	6	6	6
Copper	48.14	> 10,000	195	25	28	27	27	29	28	29
Lead	25.83	210	150	22	21	21	21	21	22	21
Mercury	-	310	0.45	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
OCPs										
Total DDT Isomers	-	70	5	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09

Notes: Concentrations expressed in mg/kg

1. Land Resource Information Systems Portal - Predicted Background Soil Concentrations New Zealand - Predicted 95th quantile background concentration
2. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Table B2 Soil contaminant standards - SCSs(health) - Residential 10% produce
3. Australian and New Zealand Guidelines for Fresh and Marine Water Quality Volume 1 - Table 3.5.1 Recommended sediment quality guidelines

Exceeds background

Exceeds NESCS

Exceeds adjusted ISQG guidelines

Exceeds BRANZ

<LOR - Lower than limit of reporting

Table 10: Summary of August 2022 Area A timber post XRF and laboratory results

Contaminants	Guidelines			Sample ID and depth													
				Timber posts holding up vines Area A													
	Background [1]	NES Residential 10% produce [2]	ISQG-Low x3 dilution factor [3]	A1d 0-100		A2d 0-100		A3d 0-100		A4d 0-100		A5d 0-100		A6d 0-100		A7d 0-100	
Heavy Metals				Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF
Arsenic	9.97	20	60	**39**	39	8	ND	**10**	18	**105**	**149**	7	ND	**10**	ND	8	ND
Chromium	56.88	460	240	24	ND	21	ND	21	ND	34	ND	21	ND	24	ND	24	ND
Copper	48.14	> 10,000	195	37	ND	34	ND	35	ND	**67**	**52**	35	ND	27	ND	37	ND

Notes: Concentrations expressed in mg/kg

1. Land Resource Information Systems Portal - Predicted Background Soil Concentrations New Zealand - Predicted 95th quantile background concentration
2. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Table B2 Soil contaminant standards - SCSs(health) - Residential 10% produce
3. Australian and New Zealand Guidelines for Fresh and Marine Water Quality Volume 1 - Table 3.5.1 Recommended sediment quality guidelines

Exceeds background

Exceeds NESCS

Exceeds adjusted ISQG guidelines

<LOR - Lower than limit of reporting (Lab)

ND - Lower than limit of detection (XRF)

Table 11: Summary of August 2022 Area B timber post XRF and laboratory results

Contaminants	Guidelines			Sample ID and depth															
				Timber posts holding up vines Area B															
	Background [1]	NES Residential 10% produce [2]	ISQG-Low x3 dilution factor [3]	B1d 0-100		B2d 0-100		B3d 0-100		B4d 0-100		B5d 0-100		B6d 0-100		B7d 0-100		B8d 0-100		B9d 0-100	
Heavy Metals				Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF
Arsenic	9.97	20	60	**12**	**22**	**10**	**24**	8	ND	9	13	**17**	ND	8	ND	**13**	**18**	**10**	**14**	**13**	**16**
Chromium	56.88	460	240	24	ND	23	ND	23	ND	24	ND	26	ND	22	ND	23	ND	21	ND	23	ND
Copper	48.14	> 10,000	195	39	76	26	ND	37	ND	24	ND	31	ND	27	ND	27	ND	27	53	31	ND

Notes: Concentrations expressed in mg/kg

1. Land Resource Information Systems Portal - Predicted Background Soil Concentrations New Zealand - Predicted 95th quantile background concentration
2. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Table B2 Soil contaminant standards - SCSs(health) - Residential 10% produce
3. Australian and New Zealand Guidelines for Fresh and Marine Water Quality Volume 1 - Table 3.5.1 Recommended sediment quality guidelines

Exceeds background

Exceeds NESCS

Exceeds adjusted ISQG guidelines

<LOR - Lower than limit of reporting (Lab)

ND - Lower than limit of detection (XRF)

Table 12: Summary of August 2022 Area B timber post XRF and laboratory results (cont.)

Contaminants	Guidelines			Sample ID and depth															
				Timber posts holding up vines Area B															
	Background [1]	NES Residential 10% produce [2]	ISQG-Low x3 dilution factor [3]	B10d 0-100		B11d 0-100		B12d 0-100		B13d 0-100		B14d 0-100		B15d 0-100		B16d 0-100		B17d 0-100		B18d 0-100	
Heavy Metals				Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF	Lab	XRF
Arsenic	9.97	20	60	8	ND	8	ND	**10**	ND	9	ND	**12**	ND	**11**	**16**	**10**	ND	**12**	ND	**17**	**22**
Chromium	56.88	460	240	22	ND	22	ND	25	ND	23	ND	25	ND	25	ND	24	ND	25	ND	28	ND
Copper	48.14	> 10,000	195	28	ND	33	ND	32	ND	30	**54**	34	ND	30	ND	30	**87**	34	ND	35	64

Notes: Concentrations expressed in mg/kg

1. Land Resource Information Systems Portal - Predicted Background Soil Concentrations New Zealand - Predicted 95th quantile background concentration
2. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Table B2 Soil contaminant standards - SCSs(health) - Residential 10% produce
3. Australian and New Zealand Guidelines for Fresh and Marine Water Quality Volume 1 - Table 3.5.1 Recommended sediment quality guidelines

Exceeds background

Exceeds NESCS

Exceeds adjusted ISQG guidelines

<LOR - Lower than limit of reporting (Lab)

ND - Lower than limit of detection (XRF)

8.0 DISCUSSION

8.1 XRF RESULTS

The XRF field screening around the selected timber posts holding up the vines generally found that:

- The controlling contaminant is arsenic, with results exceeding NESCS guidelines in 80% of the samples taken at approximately 0mm from the base of the posts to a depth of 600mm below ground level.
- At approximately 150mm from the base of the posts, arsenic exceeded NESCS guidelines in 17% of samples.
- At approximately 300mm from the base of the posts, arsenic exceeded NESCS guidelines in 10% of samples.
- Chromium was below the limit of detection in all samples with the exception of B2c, B4c, B7b and B15c which had elevated chromium exceeding NESCS guidelines. The samples with elevated levels of chromium were all taken next to the posts, and are inferred to be the result of wooden splinters scraped from the posts during sampling being observed in the sample.
- Copper exceeding adopted background concentration but below NESCS guidelines was detected in 24% of the samples. Elevated levels of copper exceeding ISQG guidelines were detected in samples A7c, B2c, B4c and B7b, thought to be the result of wooden splinters in the sample as discussed above.

At the location of the timber post stockpile, the surface soils were analysed using the XRF. Arsenic levels exceeding background, but below NESCS guidelines was detected at horizontal distances of approximately 0mm (15mg/kg), and 100mm (15mg/kg) from the stockpile. Arsenic was not detected at 200mm out from the stockpile.

As discussed in Section 7.3.2, one sample per post, collected a horizontal distance of 100mm and 0-150mm depth (25 samples total) was sent to the laboratory to be tested for chromium, copper and arsenic (CCA). The XRF arsenic results were assessed against the laboratory results by calculating their relative percentage difference (RPD). Approximately half of the XRF results showed Arsenic was not-detected (ND). For the purposes of calculating the RPD, all ND XRF results were excluded.

The results of the RPD analysis presented in Table 13 below appear to show that the XRF was generally over reading the levels of arsenic in comparison to the laboratory results by between 20 and 80%.

Table 13: RPD analysis results

Analyte	Sample ID	XRF result (mg/kg)	Lab result (mg/kg)	Mean	RPD (%)
Arsenic	A1d 0-100	39	39	39	0
Arsenic	A3d 0-100	18	10	14	57
Arsenic	A4d 0-100	149	105	127	35
Arsenic	B1d 0-100	22	12	17	59
Arsenic	B2d 0-100	24	10	17	82
Arsenic	B4d 0-100	13	9	11	36
Arsenic	B7d 0-100	18	13	15.5	32
Arsenic	B8d 0-100	14	10	12	33
Arsenic	B9d 0-100	16	13	14.5	21
Arsenic	B15d 0-100	16	11	13.5	37
Arsenic	B18d 0-100	22	17	19.5	26

8.2 LABORATORY RESULTS

The November 2021 soil sampling within the vineyard sitelands of 44 Old Renwick Road found that:

- Heavy metals were below adopted background concentrations in all siteland composite samples.
- OCPs were detected at low levels in 6 of the siteland composite samples, but well below NESCS guidelines.
- Arsenic and Copper exceed adopted background concentrations in all individual samples taken at the base of the timber poles supporting the vines, with three samples (OR1 0-150, OR90-200, OR32 0-250 and OR39 0-250) exceeding NESCS guidelines for Arsenic.
- Lead exceeding adopted background concentrations but below NESCS guidelines was detected in samples taken next to the existing dwelling (OR43 0-250, OR44 0-250, OR45 0-250, and OR46 0-250).

The April 2022 soil sampling within the vineyard area of 46 Old Renwick Road found that:

- Heavy metals were below adopted background concentrations in all siteland composite samples.
- OCPs were below detectable limits in all samples.
- Arsenic was below background concentrations in 9 samples collected a horizontal distance of 150mm and 0-100m depth from the insitu posts (A2d, A5d, A7d, B3d, B4d, B6d, B10d, B11d and B13d).
- Arsenic exceeded adopted background concentrations but below NESCS guidelines in 14 samples collected a horizontal distance of 150mm and 0-100m depth from the insitu posts (A3d, A6d, B1d, B2d, B5d, B7d, B8d, B9d, B12d, B14d, B15d, B16d, B17d and B18d).
- Arsenic exceeded NESCS guidelines in two samples collected a horizontal distance of 150mm and 0-100m depth from the insitu posts (A1d, A4d).
- Chromium and Copper were below adopted background concentrations in all samples except for A4d, which exceeded background but was below NESCS guidelines.

All composite samples taken within the vineyard sitelands and headlands, readily complied with applicable NESCS land use guidelines (Residential 10% produce consumption), with heavy metals being present below background levels and OCPs detected at low levels in six composite samples.

Contamination of the site soils via leaching of CCA treated timber, appears to have occurred in the vicinity of insitu timber poles supporting the existing vines. Based on the results of the XRF and laboratory presented herein, arsenic concentrations exceeding NESCS guidelines for human health generally appears to extend up to a horizontal distance of 300mm from the base of the posts, and to a minimum depth of approximately 600mm below the existing ground surface.

Waikato Regional Council (WRC) Technical Report 2018/11 "Making Good Decisions: Risk Characterisation and Management of CCA post hotspots at vineyards and kiwifruit orchards" indicates CCA contamination around insitu posts is typically localised, with arsenic being the main contaminant of concern and typically being in the range of 10-220mg/kg. Contamination typically extends 200mm laterally around posts, and up to 500mm deep. Studies have found most contamination is present in the upper 0-100/150mm, but this will depend on the nature and permeability of the soil. Typically, the contaminated soil associated with the timber posts makes up 1-2% of the total soil on a volume basis (area x uniform depth (say 200-500mm)).

The WRC Technical Report 2018/11 also refers to previous work done by others in the Marlborough region looking at soil contamination from bulk storage of treated timber posts. Key points are summarised below:

- Elevated concentrations of arsenic, chromium and copper beneath stockpiles of new CCA treated posts are generally present to depths of between 100mm to 150mm below existing ground level, in more organic soils.
- Below these depths, concentrations of arsenic, chromium and copper reduce to acceptable levels (i.e. "close to or below background concentrations").
- Laterally, concentrations appear to reduce to close to background levels ranging from approximately 50mm outside the edge of stockpiles for copper and chromium to approximately 500mm away for arsenic.

In relation to any soil disturbance and earthworks required for site development, these results mean that, subject to addressing the contamination issues related to localised contamination around the vineyard timber posts, the majority of soils can remain on-site.

For this purpose, the following remediation options are recommended:

(1) Stripping of CCA contaminated topsoil and thorough mixing with existing clean topsoil from the site.

and,

(a) Deep rip to 600mm in two directions north to south and east to west,
(b) Chisel plough to 400mm in both directions,
(c) Combine rotary hoe and cultivate.

Validation testing (XRF and supplementary lab testing) of mixed soils to confirm contaminant levels are below NESCS guideline values will then need to be undertaken.

or

(2) Undertake localised remediation, based on an estimated 300mm x 300mm wide x 500mm deep pit around all posts. The XRF sampling undertaken indicated arsenic contaminated exceeded NESCS guidelines in 10% of samples collected 300mm from the post, but comparative XRF versus lab testing indicated the XRF arsenic readings are typically on the high side. Hence, it is proposed to use the XRF to confirm sufficient soil has been removed based on a +10% adjusted guideline value (conservative), along with supplementary lab testing, involving the collection of validation lab samples every 10 XRF samples.

In our opinion, Option 1 is the most suitable for the subject site. Similar approaches are known to have been successful in achieving remediation goals at vineyard conversions in the vicinity of the subject site.

The XRF results detected arsenic exceeding background level but below NESCS guidelines at the location of the timber post stockpile. The concentrations of arsenic will likely reduce further with mixing of topsoil for Option 1, and therefore no specific remediation of this area is considered necessary.

Following addressing the identified contamination issues on-site, any excess soils from soil disturbance/earthworks activities can be disposed of off-site, to an appropriate disposal facility, subject to compliance with their waste disposal acceptance criteria.

8.3 CONSENTING REQUIREMENTS

7.2.1 NESCS

In our opinion, the desktop study and sampling results mean that under Regulation 5 (7) the NESCS is considered to apply to the site because an activity or industry described in the HAIL has been undertaken on it, based on the desktop study and soil sampling results. Furthermore, NESCS consent for a restricted discretionary activity will be required for subdivision, due to confirmed arsenic concentrations exceeding adopted NESCS guidelines.

Accordingly, a **Site Management Plan (SMP) or Remedial Action Plan (RAP)** will be required to support an associated resource consent application.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Overall, the site is considered suitable for the proposed rezoning and future subdivision, provided the localised contamination issues identified in this report are addressed. The contamination issues identified can be managed, provided existing contaminated soil around insitu timber posts associated with the vineyard is appropriately remediated.

The NESCS is considered to apply to the site based on the soil sampling results. Furthermore, NESCS consent for a restricted discretionary activity will be required for subdivision, due to confirmed arsenic concentrations exceeding adopted NESCS guidelines.

If the soils in the vicinity of any insitu timber posts are remediated and validation sampling confirms concentrations of arsenic have been reduced to below NESCS guidelines then residual soils, if disturbed in the future, can either be reused on-site or disposed of off-site to an approved waste disposal facility (likely clean fill or managed fill).

10.0 LIMITATIONS

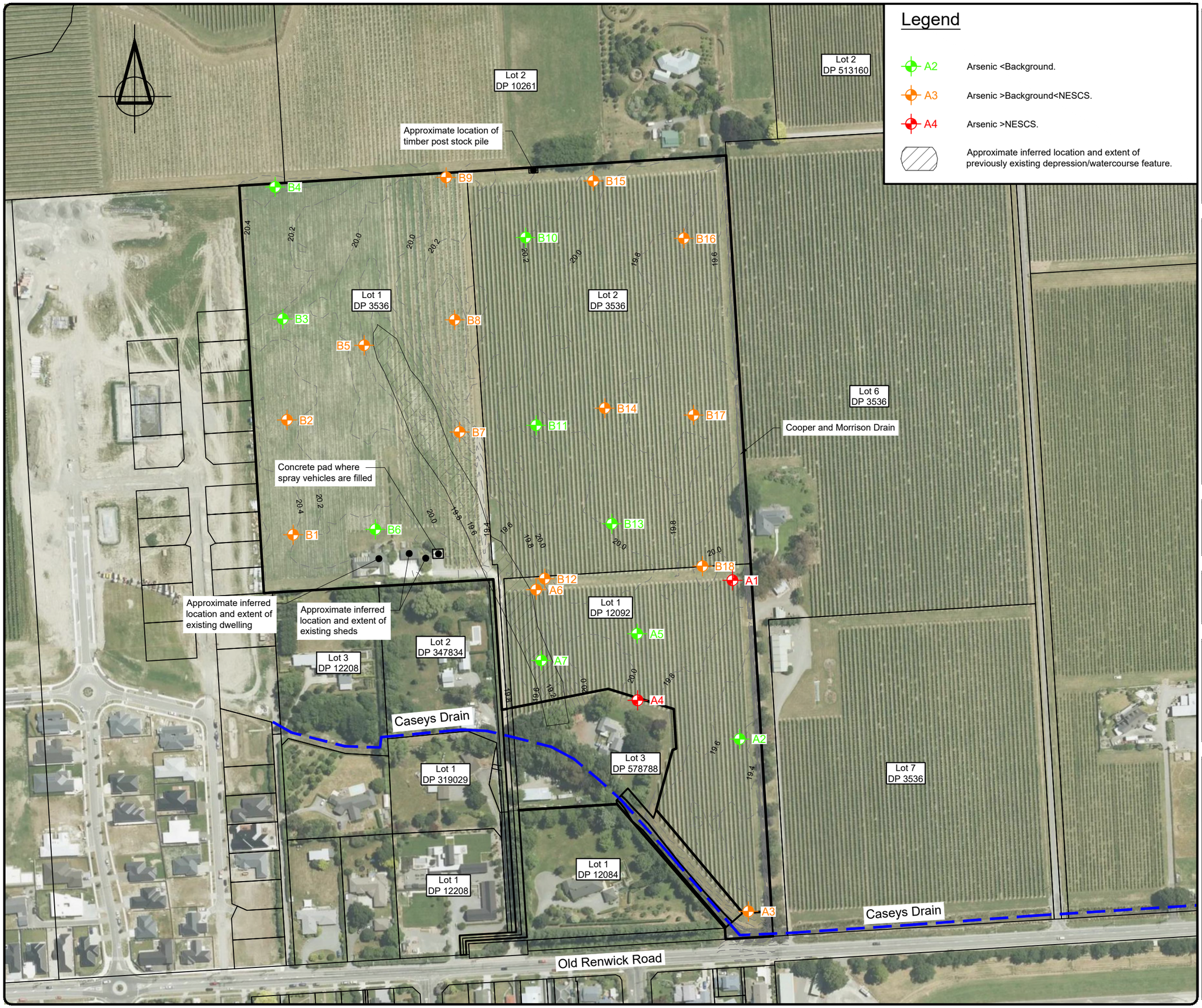
We have performed our services for this project in accordance with current professional standards for an assessment of the nature and extent of any soil contamination on-site, based upon detailed site assessment investigations and current regulatory standards for site contamination. The scope of the site assessment activities was generally in accordance with the Ministry for Environment Contaminated Land Management Guideline's (Parts 1 (2021), 2 (2011) and 5 (2021) and the NES (2011). Conclusions on actual or potential contamination cannot be applied to areas outside of the site investigation.

Limited sampling was undertaken as part of this investigation. We do not assume any liability for misrepresentation or items not visible, accessible or present at the subject site during the time of the site inspection.

 The professional opinion expressed herein has been prepared solely for, and is furnished to Marlborough District Council and our client, Kerepi Ltd, on the express condition that it will only be used for the works and the purpose for which it is intended.

No liability is accepted by this firm or by any principal, or director, or any servant or agent of this firm, in respect of its use by any other person, and any other person who relies upon any matter contained in this report does so entirely at its own risk. This disclaimer shall apply notwithstanding that this report may be made available to any person by any person in connection with any application for permission or approval, or pursuant to any requirement of law.

Figures and Drawings



Legend

- A2 — Arsenic <Background.
- A3 — Arsenic >Background<NESCS.
- A4 — Arsenic >NESCS.
- Approximate inferred location and extent of previously existing depression/watercourse feature.

SURVEYED			APPROVED DATE
DESIGNED			SF
DRAWN	SG	31/08/22	
CAD	GN	31/08/22	
CHECKED	SG	01/09/22	

REVISION	CHANGES	CHECKED	DATE

NOTES

1. This plan has been adopted from the Ayson Survey+ survey plan. Sheet TP01, dated 31-08-22.
2. Results shown are for samples collected at a horizontal distance of approximately 150mm out from base of post, and at a depth of approximately 0-100mm below the existing ground surface. The samples were tested at an IANZ accredited laboratory for chromium, copper, and arsenic.

KEREPI
Connecting Communities

CLIENT

KEREPI LTD

PROJECT

46 OLD RENWICK ROAD,
BLENHEIM

TITLE

TIMBER POST
SAMPLING AND SITE PLAN

Fraser Thomas

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

AUCKLAND 09 278 7078
HAWKE'S BAY 06 211 2766
CHRISTCHURCH 03 358 5936
BLENHEIM 03 428 3292
NELSON 03 222 1132

www.fraserthomas.co.nz

SCALE 1:2500 (A3)

DRAWING No CH01154-E-01 REVISION

SHEET 1 of 1

Legend

OR1 — HMs and OCPs <Background.

Approximate inferred location and extent of previously existing depression/watercourse feature.

			APPROVED	DATE
SURVEYED			SF	
DESIGNED				
DRAWN	SG	31/08/22		
CAD	GN	31/08/22		
CHECKED	SG	01/09/22		

REVISION	CHANGES	CHECKED	DATE

NOTES

1. This plan has been adopted from the Ayson Survey+ survey plan. Sheet TP01, dated 31-08-22.
2. Results shown are for samples collected within the sitelands at a depth of 0-150mm below the existing ground surface. The samples were composited at a ratio of 4:1 at an IANZ accredited laboratory and tested for chromium, copper, and arsenic.

KEREPI
Connecting Communities

CLIENT

KEREPI LTD

PROJECT

46 OLD RENWICK ROAD, BLENHEIM

TITLE

VINEYARD SITELAND COMPOSITE SAMPLING PLAN

Fraser Thomas

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

AUCKLAND 09 278 7078
HAWKE'S BAY 06 211 2766
CHRISTCHURCH 03 358 5936
BLENHEIM 03 428 3292
NELSON 03 222 1132

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SCALE 1:2500 (A3)

DRAWING No CH01154-E-02 REVISION

SHEET 1 of 1

Appendix A

Ministry for the Environment Contaminated Site Report Checklist

REZONING SUBMISSION-
46 OLD RENWICK ROAD, BLENHEIM

DETAILED SITE INVESTIGATION REPORT – CONTAMINATION

KEREPI LTD

Content	Required	Required if relied on	CLMG 5 section
1. Introduction			
• investigation objectives	☑		2.1
• site identification (site name, address, legal description; site boundaries; a map reference and geographic coordinates)	☑		3.3.1
• proposed site use		☑	3.3.2
2. Site description			
• environmental setting		☑	3.3.3
• site layout	☑		3.3.4
• current site uses	☑		3.3.5
• surrounding land uses	☑		3.3.6
• geophysical surveys		☐	5.1
• site inspection		☑	3.3.8
3. Historical site use			
• Summary of site history gained from:	☑		3.3.7
−review of existing investigation reports		☑	
−review of council information		☑	
−review of aerial photographs		☑	
−interviews		☑	
− review of other historical information		☑	
• preliminary sampling (if carried out) − description (including diagram) − justification for sample location and analyte selection − results − comparison of results to guidelines		☐	3.3.9
4. Sampling and analysis plan – controlled activities			4.2
• contaminants of potential concern and/or analyte selection	☑		4.2.1
• media to be sampled (link to CSM and objectives)	☑		3
• background concentration level (if relevant), contaminant standard and/or environmental guideline value calculation or selection	☑		4.2.2 & 4.2.7
• sampling design (eg, targeted or systematic sampling)	☑		4.2.3
• number of samples, including justification for number selected and potential limitations of methodology adopted in the context of investigation objectives		☑	4.2.4
• sample depth		☑	4.2.5

•	composite sampling including number of sub-samples per sample	☑		4.2.6
•	background sampling methodology		☐	4.2.7
•	field sampling techniques	☑		4.2.8
•	field screening techniques		☐	5.4
•	quality assurance and quality control	☑		4.3
5.	**Sampling results**			
•	summary of works undertaken with rationale for any departure from, or addition to, sampling and analysis plan	☑		6.2
•	field observations (eg, staining, odour, soil characteristics)	☑		5.2.1
•	evaluation of analytical laboratory results with comparison to background concentration levels (if relevant), contaminant standards and/or environmental guideline values	☑		7
•	evaluation of field screening results with comparison to background concentration levels (if relevant), contaminant standards and/or environmental guideline values		☑	7
•	results of field and laboratory sample quality assurance and/or quality control	☑		6.5 & 7.1
•	statistical analysis of results		☑	
6.	**Disposal of soil** transport, disposal, and tracking of soil and other materials taken away in the course of the activity		☑	
7.	**Risk assessment**			
•	conceptual site model	☑		3
•	evaluate the probability contamination exists on the site	☑		3.3.11
•	characterise the source through adequate delineation of contamination horizontally and vertically and assessment of contaminant concentrations		☑	
•	identify and characterise potential pathways and receptors for each exposure area through relevant site properties (eg, assessment of geology, hydrogeology, building construction, site use)	☑		
•	determine the likelihood the contamination poses a risk to identified receptors including potential receptors	☑		
•	evaluate the magnitude of that risk pursuant to regulation 10(2)(b): *– the report on the detailed site investigation must state that the soil contamination exceeds the applicable standard in regulation 7* pursuant to regulation 10(3)(b):	☑		

– recommendation on the suitability of the piece of land for the proposed activity, given the amount and kind of soil contamination • describe any requirements for management methods to mitigate identified risks (as necessary) • evaluate the magnitude of any identified risk to other receptors (eg, ecological) • describe the limitations of the data collected and the assumptions and uncertainties inherent in the data and models used. Note: If insufficient information exists to assess risk, then the DSI should not be accepted for the purposes of determining compliance with NESCS regulation 10(2). This would then result in the application defaulting to a discretionary consent.	☑	☑ ☑	
8. Discussion		☑	
9. Conclusions	☑		
10. Recommendations (if relevant to report purpose)		☑	
11. Report limitations	☑		
12. SQEP certification of report (refer appendix C)	☑		1.2
13. References	☐		
Appendices: relevant supporting information	☑		

Supporting information	Required	Required if relied on
Figures		☑
Conceptual site model (if not included in report body)	☐	
Land titles		☐
Historical site information relied upon	☑	
Previous reports (or relevant sections thereof)		☑
Site photographs		☑
Geological logs		☐
Field sheets		☐
Sampling and analysis plan (if not included in body)	☑	
Summary tables of sampling results		☑
Laboratory reports and chain of custody documentation	☑	
Calibration information for any field screening instruments used		☐
Statistical calculations eg, ProUCL inputs and outputs		☐
Soil cuttings and purge water disposal documentation		☐
Remedial action plan (refer appendix A7) – regulation 10(3)(c)		☐
Site validation report (refer appendix A8) – regulation 10(3)(d)		☐
Ongoing site management plan (refer appendix A9) – regulation 10(3)(c)		☐
Statement of qualification as an SQEP	☑	

Appendix B

Council Records

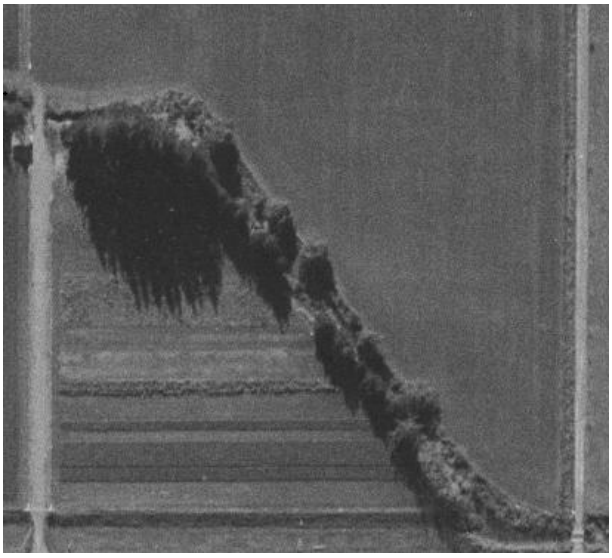
From: Sarah Brand-8469
Sent: 8 Apr 2022 18:21:39 +1200
To: Ian Sutherland-5181
Subject: RE: RCAPP - U220235 - Kerepi Limited

Hi Ian,

No worries, sorry for delayed reply but been a busy week.

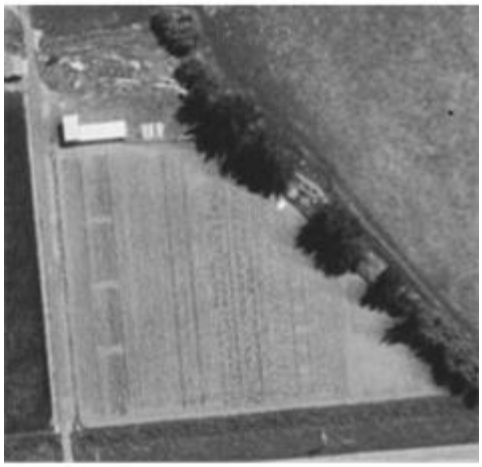
I have done a very quick look into this one and I agree that the 2012 aerial you have below clearly shows that the sheds and yard area are being used for servicing the vineyard operation (HAIL A1 and possibly A17). This is also suggested for 2015 and 2018 aerials. Also looks to be storage of treated timber posts behind the shed 2015 (HAIL A18).

I went back and had a bit if a look via Retrolens to the 1940's to 1960's and there looks to have been horticultural/market gardening activities potentially where the sheds are in the late 1950's and certainly in the 1960's the shed was likely to be servicing horticultural land to the south. Likely HAIL A1 and A10.



1958 – land to the south of the current shed location is clearly being used for horticultural purposes, the shadow from the trees along Cassey's Creek makes it difficult to determine the northern extent of the activities or if the shed is there.

The sheds are clearly present from 1964 aerial and in the 1965 aerial are likely to be servicing the horticultural area to the south in the 1965 shot.



1964 1965

The above gives enough evidence to assign a future HAIL to this area. LLUR Site 3014.

The proposed subdivision and creation of Lot 3 includes part of this HAIL area, as such a PSI will be needed.

Any queries let me know.
Thanks
Sarah

Sarah Brand Ph.D.
Strategic Planner

MARLBOROUGH DISTRICT COUNCIL

Phone: 03 520 7400 | Mobile: 027 214 0196 |15 Seymour Street | PO Box 443
Blenheim 7240 | New Zealand | www.marlborough.govt.nz
Sarah.Brand@marlborough.govt.nz

From: Ian Sutherland-5181 <Ian.Sutherland@marlborough.govt.nz>
Sent: Friday, 8 April 2022 8:08 AM
To: Sarah Brand-8469 <Sarah.Brand@marlborough.govt.nz>
Subject: FW: RCAPP - U220235 - Kerepi Limited

Hi Sarah,

Sorry to bother you. Just a quick question.
The agent tells me that contractors look after the vineyard, but I suspect that might only be more recently. It appears from the historic aerial photos that the sheds on Lot 3 where used as part of the farming operation.

2012 aerial photo

Do you think that this is sufficient evidence for me to say that the subdivision will result in a loss of production land with the creation of Lot 3 as a residential allotment and request a PSI, or do we give them the option to provide clarification of the previous use of this area?

Many thanks

Ian Sutherland
Lead Senior Environmental Planner

Phone: 03 520 7400
Cell: 027 261 6763
DDI: 03 520 7414

15 Seymour Street, PO Box 443
Blenheim 7240, New Zealand
ian.sutherland@marlborough.govt.nz
www.marlborough.govt.nz

From: Ian Sutherland-5181
Sent: Thursday, 7 April 2022 12:22 pm
To: ServicesRCAPP; Peter Davidson-8456; ReservesRCAPP; RiversRCAPP; Mike Aviss-5015; Peter Hamill-8634; Matt Oliver-8730; MDCAddressing
Subject: RCAPP - U220235 - Kerepi Limited

Applicant:	Kerepi Limited
Reference Number:	U220235
Proposal:	• To subdivide Lot 1 DP 12092, Lot 2 DP 310962, Lot 2 DP 3536, Lot 1 DP 3536 and Lot 2 DP 10261 to create three allotments (as a boundary adjustment between three existing titles MB 5D/1214, RT 43100 and MB 2A/266). • To authorise the existing dwelling on Lot 3 to be located within the 25m yard on a rural site over 4000sqm No additional titles will be created. The land is zoned Urban Environment (Wairau Plains). Other relevant overlays to this circulation are: • Caseys Drain - High Priority for Public Access • Drainage Channel Network - Caseys Drain and Cooper & Morrison Drain • Soil Sensitive Areas (Impeded Soils) • Wairau Plains • Threatened Environment <u>Dwellings</u> Lots 2 & 3 will contain existing dwellings. Lot 1 is vacant, but will have the right to build on. <u>Access</u> Access to Lot 1 will be via a ROW to Oakley Avenue. (The application incorrectly states that this need not be formed). Access to Lots 2 & 3 is to Old Renwick Road via ROW, although the current

	physical access appears to cross over Lot 1 DP 12084 (Broadbridge) and Pt Sec 67(MDC) without the benefit of a ROW easement. Roading confirmation has not been obtained, and they aren't proposing to use that option. <u>Water Supply</u> The houses on Lots 2 & 3 are to use existing wells. A new well is to be installed on Lot 1 at time of building. <u>Esplanade Strips.</u> 3m wide esplanade strips are proposed (without public access) along both sides of Caseys Drain within Lots 2 & 3. A list of reasons is provided under the AEE. The starting point is supposed to be 20m wide with public access on both sides through Lot 3, and similar with Lot 2 but as it is greater than 4ha we have a greater discretion and have to pay compensation. No details as to the proximity of buildings has been provided (will request via s92), but I have appended an old aerial photo that best shows building locations.  Most of the site is in vineyard, but the application claims the NESCS is not applicable as there is no HAIL in Councils LLUR, and because there is no loss of production land or change of land use.
Questions:	<u>Marl Roads</u> • Any comments or concerns with the access to each of the lots? • Any problems if they have to form a new entranceway to ORR as per the current ROW location?

	Services • Any comments? Peter D • In terms of water volume and quality, do we need to get them to install the new well on Lot 1 as part of the subdivision to prove these matters, or are we satisfied from information from adjacent wells that it will be okay to be left to time of building? Reserves/Rivers/Mike Aviss (& or Peter H) • Esplanade Strips - Can you please provide comments in relation to your field of expertise in relation to the purposes of the strip, and what relevant reasons you think there are for allowing for a reduction in width – *(these should be restricted to the matters listed in the PMEP Policies - see page 22 of application*) – ie what valid reasons can we use to authorise a reduction in width to that sought? Rivers • Any comments or concerns in relation to the Drainage Network Channels – these being Caseys Drain and Cooper & Morrison. Addressing • Your advice on the impacts to addresses please. Matt Oliver • Any comments or concerns about the subdivision, or the reduced yard setback of the new boundary to the dwelling on Lot 3?
Due Date:	15 April 2022 please

Thanks

Ian Sutherland
Lead Senior Environmental Planner

MARLBOROUGH DISTRICT COUNCIL

Phone: 03 520 7400
Cell: 027 261 6763
DDI: 03 520 7414

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www.marlborough.govt.nz

Appendix C

Aerial Photographs

1938

1:3.000 31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS

1948

1:3.000 31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS

1958

1964

1:3.000 31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS

1973

1:3.000 31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS

1983

1:3.000 31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS

1996

1:3.000

31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS

1998

1:3.000 31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS

2002

1:3.000 31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS

2007

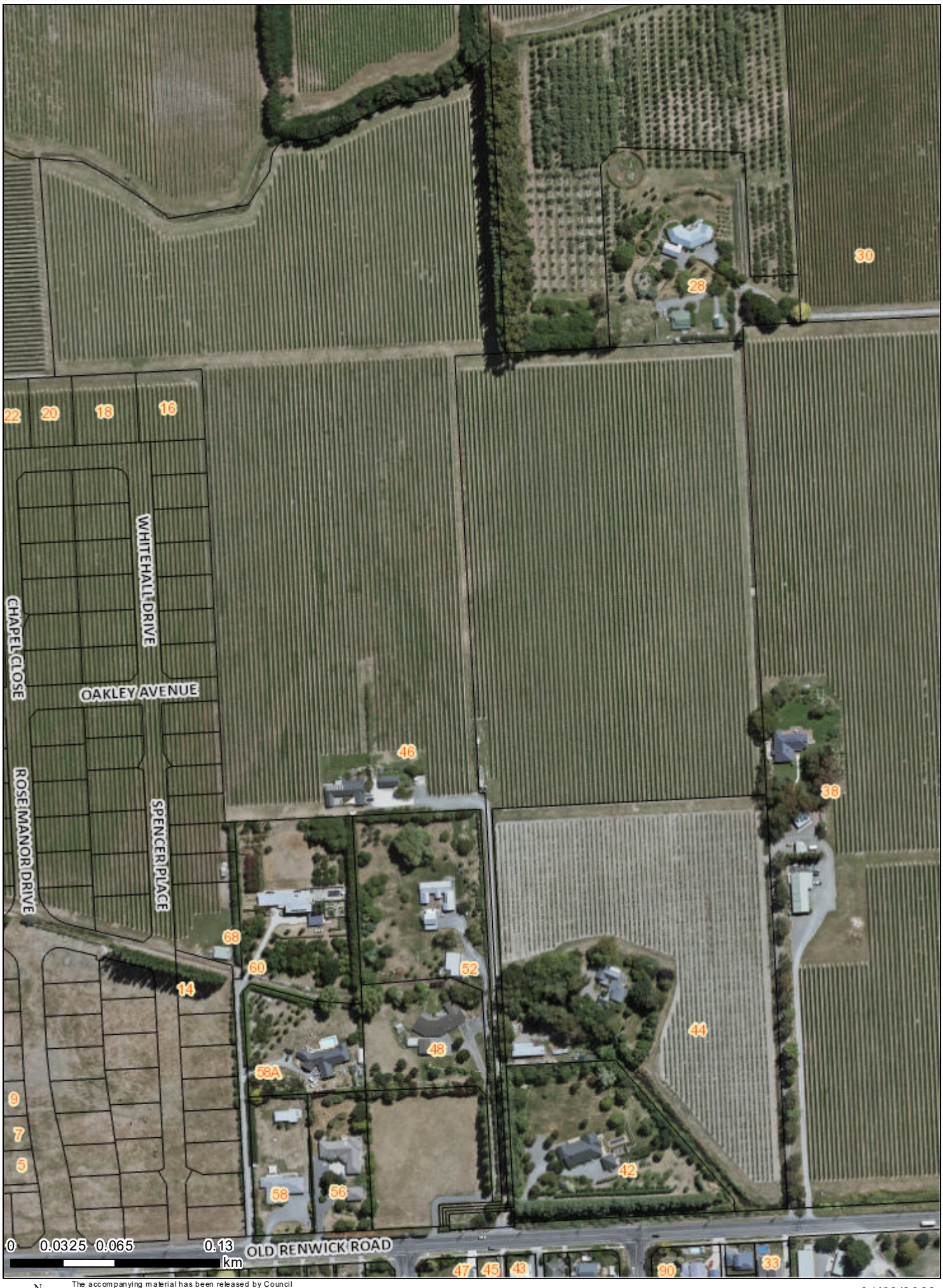
1:3.000 31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS

2012

1:3.000 31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS



2015

1:3.000

31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS

2018

1:3.000 31/08/2022

MARLBOROUGH DISTRICT COUNCIL SMART MAPS

Appendix D

Site Walkover Photographs

44 Old Renwick Road, Blenheim (Lot 1 DP 12092 and Lot 2 DP 3536)	
	
P1: View of vineyard from north-eastern corner of 44 Old Renwick Road.	**P2:** View of Copper and Morrison Drain running along eastern boundary of 44 Old Renwick Road.
	
P3: Stockpiled timber posts along northern boundary of 44 Old Renwick Road.	**P4:** Pump shed.

46 Old Renwick Road, Blenheim (Lot 1 DP 3536)	
	
P5: View of vineyard from north-western corner of 46 Old Renwick Road.	**P6:** View of dwelling and garage located along southern boundary.
	
P7: Concrete pad located to east of garage, understood to b used for filling spray equipment.	**P8:** Glasshouse and raised garden beds next to garage.

Appendix E

XRF Results & Laboratory Transcripts

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:	Fraser Thomas Limited	**Lab No:**	2785288	SPv2
Contact:	Sam Gladwin	**Date Received:**	01-Dec-2021	
	C/- Fraser Thomas Limited	**Date Reported:**	09-Dec-2021	
	PO Box 39154	**Quote No:**	92882	
	Harewood Post Centre	**Order No:**	PO000552	
	Christchurch 8545	**Client Reference:**	CH01154	
		Submitted By:	Sam Gladwin	

Sample Type: Soil

Sample Name:		OR1 0-150 30-Nov-2021	OR9 0-200 30-Nov-2021	OR32 0-250 30-Nov-2021	OR39 0-250 30-Nov-2021	OR43 0-250 30-Nov-2021
Lab Number:		2785288.40	2785288.41	2785288.42	2785288.43	2785288.46
Individual Tests						
Total Recoverable Lead	mg/kg dry wt	-	-	-	-	40
CCA by ICP-MS						
Total Recoverable Arsenic	mg/kg dry wt	43	29	34	16	-
Total Recoverable Chromium	mg/kg dry wt	36	33	38	29	-
Total Recoverable Copper	mg/kg dry wt	57	55	86	52	-

Sample Name:		OR44 0-250 30-Nov-2021	OR45 0-250 30-Nov-2021	OR46 0-250 30-Nov-2021	Composite of OR1 0-150, OR2 0-150, OR3 0-150 and OR4 0-150 30-Nov-2021	Composite of OR5 0-250, OR6 0-200, OR21 0-250 and OR22 0-250 30-Nov-2021
Lab Number:		2785288.47	2785288.48	2785288.49	2785288.103	2785288.104
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	-	82	81
Total Recoverable Arsenic	mg/kg dry wt	-	-	-	8	6
Total Recoverable Copper	mg/kg dry wt	-	-	-	32	32
Total Recoverable Lead	mg/kg dry wt	42	23	26	21	21
Total Recoverable Mercury	mg/kg dry wt	-	-	-	< 0.10	< 0.10
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	-	< 0.012	< 0.012
alpha-BHC	mg/kg dry wt	-	-	-	< 0.012	< 0.012
beta-BHC	mg/kg dry wt	-	-	-	< 0.012	< 0.012
delta-BHC	mg/kg dry wt	-	-	-	< 0.012	< 0.012
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.012	< 0.012
cis-Chlordane	mg/kg dry wt	-	-	-	< 0.012	< 0.012
trans-Chlordane	mg/kg dry wt	-	-	-	< 0.012	< 0.012
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.012	< 0.012
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.012	< 0.012
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.012	< 0.012
4,4'-DDE	mg/kg dry wt	-	-	-	0.024	< 0.012
2,4'-DDT	mg/kg dry wt	-	-	-	< 0.012	< 0.012
4,4'-DDT	mg/kg dry wt	-	-	-	< 0.012	< 0.012
Total DDT Isomers	mg/kg dry wt	-	-	-	< 0.08	< 0.08
Dieldrin	mg/kg dry wt	-	-	-	< 0.012	< 0.012
Endosulfan I	mg/kg dry wt	-	-	-	< 0.012	< 0.012
Endosulfan II	mg/kg dry wt	-	-	-	< 0.012	< 0.012
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.012	< 0.012
Endrin	mg/kg dry wt	-	-	-	< 0.012	< 0.012
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.012	< 0.012

Sample Type: Soil						
Sample Name:		OR44 0-250 30-Nov-2021	OR45 0-250 30-Nov-2021	OR46 0-250 30-Nov-2021	Composite of OR1 0-150, OR2 0-150, OR3 0-150 and OR4 0-150 30-Nov-2021	Composite of OR5 0-250, OR6 0-200, OR21 0-250 and OR22 0-250 30-Nov-2021
Lab Number:		2785288.47	2785288.48	2785288.49	2785288.103	2785288.104
Organochlorine Pesticides Screening in Soil						
Endrin ketone	mg/kg dry wt	-	-	-	< 0.012	< 0.012
Heptachlor	mg/kg dry wt	-	-	-	< 0.012	< 0.012
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.012	< 0.012
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.012	< 0.012
Methoxychlor	mg/kg dry wt	-	-	-	< 0.012	< 0.012

Sample Name:		Composite of OR23 0-250, OR24 0-250, OR39 0-250 and OR40 0-250 30-Nov-2021	Composite of OR7 0-200, OR8 0-200, OR19 0-250 and OR20 0-250 30-Nov-2021	Composite of OR9 0-200, OR10 0-200, OR17 0-250 and OR18 0-250 30-Nov-2021	Composite of OR13 0-250, OR14 0-250, OR31 0-250 and OR32 0-250 30-Nov-2021	Composite of OR29 0-250, OR30 0-250, OR33 0-250 and OR34 0-250 30-Nov-2021
Lab Number:		2785288.105	2785288.106	2785288.107	2785288.108	2785288.109
Individual Tests						
Dry Matter	g/100g as rcvd	80	81	81	81	82
Total Recoverable Arsenic	mg/kg dry wt	6	6	6	6	6
Total Recoverable Copper	mg/kg dry wt	36	29	29	28	30
Total Recoverable Lead	mg/kg dry wt	23	23	21	19.7	19.1
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
alpha-BHC	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
beta-BHC	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
delta-BHC	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
gamma-BHC (Lindane)	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
cis-Chlordane	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
trans-Chlordane	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
2,4'-DDD	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
4,4'-DDD	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
2,4'-DDE	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
4,4'-DDE	mg/kg dry wt	< 0.013	< 0.013	0.017	0.017	0.027
2,4'-DDT	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
4,4'-DDT	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
Total DDT Isomers	mg/kg dry wt	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
Dieldrin	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
Endosulfan I	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
Endosulfan II	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
Endosulfan sulphate	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
Endrin	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
Endrin aldehyde	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
Endrin ketone	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
Heptachlor	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
Heptachlor epoxide	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
Hexachlorobenzene	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013
Methoxychlor	mg/kg dry wt	< 0.013	< 0.013	< 0.012	< 0.013	< 0.013

Sample Name:		Composite of OR27 0-250, OR28 0-250, OR35 0-250 and OR36 0-250 30-Nov-2021	Composite of OR25 0-250, OR26 0-250, OR37 0-250 and OR38 0-250 30-Nov-2021	Composite of OR11 0-200, OR12 0-250, OR15 0-250 and OR16 0-250		
Lab Number:		2785288.110	2785288.111	2785288.112		
Individual Tests						
Dry Matter	g/100g as rcvd	81	82	80	-	-
Total Recoverable Arsenic	mg/kg dry wt	6	6	5	-	-

Sample Type: Soil						
Sample Name:		Composite of OR27 0-250, OR28 0-250, OR35 0-250 and OR36 0-250 30-Nov-2021	Composite of OR25 0-250, OR26 0-250, OR37 0-250 and OR38 0-250 30-Nov-2021	Composite of OR11 0-200, OR12 0-250, OR15 0-250 and OR16 0-250		
Lab Number:		2785288.110	2785288.111	2785288.112		
Individual Tests						
Total Recoverable Copper	mg/kg dry wt	31	32	30	-	-
Total Recoverable Lead	mg/kg dry wt	19.9	21	20	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
alpha-BHC	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
beta-BHC	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
delta-BHC	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
cis-Chlordane	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
trans-Chlordane	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
2,4'-DDD	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
4,4'-DDD	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
2,4'-DDE	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
4,4'-DDE	mg/kg dry wt	0.014	< 0.013	0.038	-	-
2,4'-DDT	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
4,4'-DDT	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
Total DDT Isomers	mg/kg dry wt	< 0.08	< 0.08	< 0.08	-	-
Dieldrin	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
Endosulfan I	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
Endosulfan II	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
Endrin	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
Endrin aldehyde	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
Endrin ketone	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
Heptachlor	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-
Methoxychlor	mg/kg dry wt	< 0.012	< 0.013	< 0.013	-	-

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%.	-	40-43, 46-49, 103-112
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%.	-	40-43, 46-49, 103-112
CCA by ICP-MS	Total recoverable digestion, ICP-MS, screen level.	2 mg/kg dry wt	40-43
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	103-112
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	103-112
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	40-43, 46-49, 103-112
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	103-112

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Recoverable Copper	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	103-112
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	46-49, 103-112
Total Recoverable Mercury	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	103-112

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

Testing was completed between 03-Dec-2021 and 09-Dec-2021. 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.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Fraser Thomas Limited	**Lab No:**	3051560 SPv1
Contact:	Sam Gladwin	**Date Received:**	10-Aug-2022
	C/- Fraser Thomas Limited	**Date Reported:**	15-Aug-2022
	PO Box 39154	**Quote No:**	92882
	Harewood Post Centre	**Order No:**	PO 000743
	Christchurch 8545	**Client Reference:**	CH001154
		Submitted By:	Sam Gladwin

Sample Type: Soil

Sample Name:		Composite of OR47 0-150, OR48 0-150, OR59 0-150 and OR60 0-150	Composite of OR49 0-150, OR50 0-150, OR57 0-150 and OR58 0-150	Composite of OR51 0-150, OR52 0-150, OR55 0-150 and OR56 0-150	Composite of OR53 0-150, OR54 0-150, OR67 0-150 and OR68 0-150	Composite of OR65 0-150, OR66 0-150, OR69 0-150 and OR70 0-150
Lab Number:		3051560.57	3051560.58	3051560.59	3051560.60	3051560.61
Individual Tests						
Dry Matter	g/100g as rcvd	70	70	71	69	67
Total Recoverable Arsenic	mg/kg dry wt	7	6	5	6	6
Total Recoverable Copper	mg/kg dry wt	25	28	27	27	29
Total Recoverable Lead	mg/kg dry wt	22	21	21	21	21
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
alpha-BHC	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
beta-BHC	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
delta-BHC	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
gamma-BHC (Lindane)	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
cis-Chlordane	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
trans-Chlordane	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
2,4'-DDD	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
4,4'-DDD	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
2,4'-DDE	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
4,4'-DDE	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
2,4'-DDT	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
4,4'-DDT	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
Total DDT Isomers	mg/kg dry wt	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Dieldrin	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
Endosulfan I	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
Endosulfan II	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
Endosulfan sulphate	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
Endrin	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
Endrin aldehyde	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
Endrin ketone	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
Heptachlor	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
Heptachlor epoxide	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
Hexachlorobenzene	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015
Methoxychlor	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.015

Sample Type: Soil			
	Sample Name:	Composite of OR63 0-150, OR64 0-150, OR71 0-150 and OR72 0-150	Composite of OR61 0-150, OR62 0-150, OR73 0-150 and OR74 0-150
	Lab Number:	3051560.62	3051560.63
Individual Tests			
Dry Matter	g/100g as rcvd	69	70
Total Recoverable Arsenic	mg/kg dry wt	6	6
Total Recoverable Copper	mg/kg dry wt	28	29
Total Recoverable Lead	mg/kg dry wt	22	21
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10
Organochlorine Pesticides Screening in Soil			
Aldrin	mg/kg dry wt	< 0.015	< 0.015
alpha-BHC	mg/kg dry wt	< 0.015	< 0.015
beta-BHC	mg/kg dry wt	< 0.015	< 0.015
delta-BHC	mg/kg dry wt	< 0.015	< 0.015
gamma-BHC (Lindane)	mg/kg dry wt	< 0.015	< 0.015
cis-Chlordane	mg/kg dry wt	< 0.015	< 0.015
trans-Chlordane	mg/kg dry wt	< 0.015	< 0.015
2,4'-DDD	mg/kg dry wt	< 0.015	< 0.015
4,4'-DDD	mg/kg dry wt	< 0.015	< 0.015
2,4'-DDE	mg/kg dry wt	< 0.015	< 0.015
4,4'-DDE	mg/kg dry wt	< 0.015	< 0.015
2,4'-DDT	mg/kg dry wt	< 0.015	< 0.015
4,4'-DDT	mg/kg dry wt	< 0.015	< 0.015
Total DDT Isomers	mg/kg dry wt	< 0.09	< 0.09
Dieldrin	mg/kg dry wt	< 0.015	< 0.015
Endosulfan I	mg/kg dry wt	< 0.015	< 0.015
Endosulfan II	mg/kg dry wt	< 0.015	< 0.015
Endosulfan sulphate	mg/kg dry wt	< 0.015	< 0.015
Endrin	mg/kg dry wt	< 0.015	< 0.015
Endrin aldehyde	mg/kg dry wt	< 0.015	< 0.015
Endrin ketone	mg/kg dry wt	< 0.015	< 0.015
Heptachlor	mg/kg dry wt	< 0.015	< 0.015
Heptachlor epoxide	mg/kg dry wt	< 0.015	< 0.015
Hexachlorobenzene	mg/kg dry wt	< 0.015	< 0.015
Methoxychlor	mg/kg dry wt	< 0.015	< 0.015

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%.	-	57-63
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%.	-	57-63
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	57-63
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	57-63
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	57-63
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	57-63
Total Recoverable Copper	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	57-63

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	57-63
Total Recoverable Mercury	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	57-63

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

Testing was completed between 12-Aug-2022 and 15-Aug-2022. 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.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Fraser Thomas Limited	**Lab No:**	3053619 SPv1
Contact:	Sam Gladwin	**Date Received:**	12-Aug-2022
	C/- Fraser Thomas Limited	**Date Reported:**	18-Aug-2022
	PO Box 39154	**Quote No:**	92882
	Harewood Post Centre	**Order No:**	PO 000743
	Christchurch 8545	**Client Reference:**	CHO1154
		Submitted By:	Sam Gladwin

Sample Type: Soil

Sample Name:		A1d 11-Aug-2022	A2d 12-Aug-2022	A3d 12-Aug-2022	A4d 12-Aug-2022	A5d 12-Aug-2022
Lab Number:		3053619.1	3053619.2	3053619.3	3053619.4	3053619.5
CCA by ICP-MS						
Total Recoverable Arsenic	mg/kg dry wt	39	8	10	105	7
Total Recoverable Chromium	mg/kg dry wt	24	21	21	34	21
Total Recoverable Copper	mg/kg dry wt	37	34	35	67	35

Sample Name:		A6d 12-Aug-2022	B1d 10-Aug-2022	B1p 10-Aug-2022	B2d 10-Aug-2022	B3d 10-Aug-2022
Lab Number:		3053619.6	3053619.7	3053619.8	3053619.9	3053619.10
CCA by ICP-MS						
Total Recoverable Arsenic	mg/kg dry wt	10	12	16	10	8
Total Recoverable Chromium	mg/kg dry wt	24	24	28	23	23
Total Recoverable Copper	mg/kg dry wt	27	39	38	26	37

Sample Name:		B4d 10-Aug-2022	B5d 10-Aug-2022	B6d 10-Aug-2022	B7d 10-Aug-2022	B8d 11-Aug-2022
Lab Number:		3053619.11	3053619.12	3053619.13	3053619.14	3053619.15
CCA by ICP-MS						
Total Recoverable Arsenic	mg/kg dry wt	9	17	8	13	10
Total Recoverable Chromium	mg/kg dry wt	24	26	22	23	21
Total Recoverable Copper	mg/kg dry wt	24	31	27	27	27

Sample Name:		B9d 11-Aug-2022	B10d 11-Aug-2022	B11d 11-Aug-2022	B12d 11-Aug-2022	B13d 11-Aug-2022
Lab Number:		3053619.16	3053619.17	3053619.18	3053619.19	3053619.20
CCA by ICP-MS						
Total Recoverable Arsenic	mg/kg dry wt	13	8	8	10	9
Total Recoverable Chromium	mg/kg dry wt	23	22	22	25	23
Total Recoverable Copper	mg/kg dry wt	31	28	33	32	30

Sample Name:		B14d 11-Aug-2022	B15d 11-Aug-2022	B16d 11-Aug-2022	B17d 11-Aug-2022	B18d 11-Aug-2022
Lab Number:		3053619.21	3053619.22	3053619.23	3053619.24	3053619.25
CCA by ICP-MS						
Total Recoverable Arsenic	mg/kg dry wt	12	11	10	12	17
Total Recoverable Chromium	mg/kg dry wt	25	25	24	25	28
Total Recoverable Copper	mg/kg dry wt	34	30	30	34	35

Sample Name:		A7d
Lab Number:		3053619.28
CCA by ICP-MS		
Total Recoverable Arsenic	mg/kg dry wt	8
Total Recoverable Chromium	mg/kg dry wt	24
Total Recoverable Copper	mg/kg dry wt	37

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%.	-	1-25, 28
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%.	-	1-25, 28
CCA by ICP-MS	Total recoverable digestion, ICP-MS, screen level.	2 mg/kg dry wt	1-25, 28
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-25, 28

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

Testing was completed between 17-Aug-2022 and 18-Aug-2022. 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.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Appendix F

QA/QC

Item	Description
Field Quality Assurance	
Sampling Team Details	Sam Gladwin, Engineering Geologist, FTL
Intended duplicate/blank frequency	None – due to small scale of investigation. Laboratory testing was done at appropriate frequency to check XRF versus lab results.
Sample Records	• FTL chain of custody forms. • Sample locations shown in drawing CH01154-E-01. • Site observations stated in main report.
Chain of Custody	• FTL/RJ Hill Laboratories standard forms. • Directly taken to lab by FTL
Other	• Cleaning of sampling equipment.
Laboratory QA/QC	
Chain of custody	• Returned to FTL for cross-checking.
Analytical methods and detection limits	• See Appendix E (RJ Hill Laboratories transcripts).
QA/QC Data evaluation	
General	Comparison of laboratory results with field observations and review of lab transcripts for any anomalies.