

69 Inland Kaikōura Road. Preliminary and Detailed Site Investigation

Drones at Work Limited

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CLS contaminated land solutions

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Executive Summary

Contaminated Land Solutions (CLS) was engaged by Drones at Work Limited to undertake a combined Preliminary and Detailed Site Investigation (PSI & DSI) at 69 Inland Kaikōura Road, Peketā, Kaikōura, Canterbury. The site is located in a rural area 4.5km west of Kaikōura town and has been used as a dairy farm until recently when this activity ceased.

The objectives of the PSI & DSI were to assist with the proposed redevelopment of the site for residential and commercial future use.

Overview of site conditions

A walkover, interview with the current occupier and phase 1 soil sampling investigation were conducted at the site on 4 and 5 January 2022.

Solid waste was observed at limited surface locations, particularly in the piggery/offal pit area of the site. No other evidence of contamination, such as staining, or odours were identified, but bulk asbestos was noted as described below. The presence of a potential landfill located close to Stoney Creek was not substantiated through written/verbal records or visual indicators, nor was the presence of a potential livestock dip located close to the railway line (with a limited sampling programme failing to identify chemicals associated with dip/spray treatments).

A total of thirty-nine soil samples and four samples of bulk material were collected in the phase 1 investigation and analysed from locations across the site. Based on the phase 1 investigation results, solid waste was removed from the 'piggery/offal pit' area by Mr Watherston, an asbestos removal programme was conducted at the site by Agon Solutions Ltd, and a phase 2 investigation was undertaken by CLS.

The phase 2 investigation fieldwork was conducted on 24 February 2022 and included the collection of surface and subsurface samples from eleven locations in the 'incinerator' area and surface and subsurface samples from eleven locations in the 'piggery/offal pit' area.

Collectively, the following issues are identified based on the results:

Contaminant	Area	Issues
Asbestos	Kowhai Downs Lot 14 'piggery/offal pit' area	<ul style="list-style-type: none"> Asbestos, as ACM, was confirmed during the phase 1 investigation in the 'piggery/offal pit' area, but results of the phase 2 investigation indicate that it has been successfully removed.
	Lot 20 'incinerator' area	<ul style="list-style-type: none"> Asbestos, as ACM, was confirmed during the phase 1 investigation in the 'incinerator' area and results of the phase 2 investigation indicate that it has not been successfully removed. Areas of residual health significant contamination are shown in Figure 9. The presence of above ground structures and solid waste prevented full investigation/ACM removal in the 'incinerator' area.
Heavy metals	Kowhai Downs Lot 14 'piggery/offal pit' area	<ul style="list-style-type: none"> This area has heavy metal contamination above background with health significant results identified at five surface locations.
	Lot 20 'incinerator' area	<ul style="list-style-type: none"> This area has heavy metal contamination above background but below commercial/industrial human health SCSs.
OCPs and heavy metals	Railway Block stockyard	<ul style="list-style-type: none"> This area has heavy metal contamination in surface samples above background but below rural residential human health SCSs.
Offal	Kowhai Downs Lot 14 'piggery/offal pit' area	<ul style="list-style-type: none"> Excavation of a 20m long trench failed to identify the location of the offal pit
Lead based paint	Kowhai Downs Lot 18 dwelling	<ul style="list-style-type: none"> Lead is likely to be present in surface soils around the 69 Inland Kaikōura Road dwelling. This area has not been investigated
Hazardous substances	House Block	<ul style="list-style-type: none"> A hazardous goods store is present adjacent to the dwelling at 392 SH1

ECan s92 request for further information

This report meets ECan's requirement for production of a preliminary site investigation (PSI). Soil sampling of the partially excavated soak pits returned results indicative of an absence of contamination from these structures. Soil sampling from locations within the fields provides further data indicative of a general lack of contamination at the site. Slightly elevated cadmium concentrations were found, but the concentrations are low and assumed to be associated with superphosphate fertiliser applications to the land.

The localised contamination in the piggery/offal pit and incinerator areas can be addressed through the recommendations in this report. This report meets item one of the ECan request for further information.

Suitability of site for proposed development

Once the recommendations in this report have been completed, from a contaminated soil perspective the site will be suitable for the development as indicated in the Outline Plan (**Appendix 2**).

Waste disposal

Solid waste requires management, for example by removal from site to an appropriate location.

Soil/offal/ACM from the piggery/offal pit area and from surface soil surrounding the incinerator will need to be handled and disposed of using procedures defined in a site-specific contaminated site management plan (CSMP). Retention on site, subject to its appropriate management and the use of an appropriately engineered on-site containment facility is theoretically possible.

Recommendations

- The solid waste present on the site (including shipping containers and material in the hazardous goods store at 392 SH1) should be removed and taken to appropriate alternative locations.
- A contaminated site management plan should be produced to manage the identified contamination.
- Prior to development of the area north of the railway land ('Railway Block') supplementary investigation of soil, for example using a portable XRF instrument in addition to laboratory analysis, should be considered due to the limited nature of the sampling undertaken in this investigation.
- If either dwelling, associated septic tanks or the hazardous goods store are to be removed, investigation of soil for contamination would be required.
- To comply with ECan's Rule 5.185, and to meet the ECan requirement 1 in their S92 request for further information (copy in **Appendix 2**), a copy of this report should be supplied to them.
- A copy of this report should be supplied to Kaikoura District Council to assist them in meeting their administrative requirements with respect to the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

Certifying Statement

I, Helen Davies of Contaminated Land Solutions Limited (CLS), certify that:

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

- a. done by a suitably qualified and experienced practitioner, and
- b. done in accordance with the current edition of Contaminated Land Management Guidelines No 5 - Site Investigation and Analysis of Soils, and
- c. reported on in accordance with the current edition of Contaminated Land Management Guidelines No 1 - Reporting on Contaminated Sites in New Zealand, and
- d. the report is certified by a suitably qualified and experienced practitioner.

Evidence of my qualifications and experience as a suitably qualified and experienced practitioner is shown through current CEnvP certification as a Site Contamination Specialist. Further details, if required, are available at [Helen Davies CEnvP SC | LinkedIn](#).



Helen Davies
Director



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1 Introduction

1.1 Background

Drones at Work Limited engaged Contaminated Land Solutions Ltd (CLS) to undertake a combined Preliminary and Detailed Site Investigation (PSI & DSI) at 69 Inland Kaikōura Road, Peketā, Kaikōura, Canterbury. This report presents the findings of these investigations.

Appendix 1 details the limitations associated with this report.

The site location is shown in **Figure 1**.

CLS understands that the site is proposed to be subdivided for future residential and commercial land uses.

The site was, until recently, used as a dairy farm and the proposal will result in a change of land use.

Figure 1 Site Location. Source: Canterbury Maps. NZ LINZ Topographic Layer



1.2 Development Proposal

CLS was provided with an Outline Plan, dated 24 May 2021, which is provided in **Appendix 2**. This shows the proposed layout of the subdivided site. On the Outline Plan, the proposed subdivisions are described as:

- Railway Block
- Lifestyle block
- House block
- Possible future commercial development
- Proposed commercial development

Of the above, the lifestyle block lots will be the most sensitive in terms of assessment of any contamination identified across the site. The lifestyle block development is currently underway and is known as the Kowhai Downs subdivision. The plan showing this part of the total subdivision is also provided in **Appendix 2**.

On 2 December 2021, Kaikōura District Council issued Kaikōura Business Park Limited a consent (SU-2021-1765-00) for the following activities: 'Creation of 19 new residential lots (ranging in size between 2.0 - 2.31ha) with two associated access lots; and 2 vacant lots (one being an amalgamation of 8 existing titles and the second a balance lot of 10.53ha for a potential future commercial development)'. The consent covers the land currently described as LOT 2 DP 527436 LOT 1 DP 9266 SEC 10 SO 3911 SECS 1-5 7 SO 7129 LOT 2 DP 501321. This land is shown in **Figure 1** and **Figure 2**.

Three consent applications have been submitted to Environment Canterbury (ECan) and are currently on hold. These are:

- CRC221483 (to discharge stormwater to land),
- CRC221484 (to discharge domestic wastewater to land), and
- CRC221712 (to use land for excavation).

A request for further information in accordance with section 92 of the Resource Management Act has been issued by ECan, and a copy is provided in **Appendix 2**.

1.3 Objectives

The objectives of this contamination assessment are to:

- Identify current and historical activities with the potential to have caused contamination across the entire site.
- Conduct an intrusive investigation at the site to gather data on the ground conditions and presence or absence of contamination including within proposed swales and soakage pits for the Kowhai Downs residential subdivision; and
- Inform implications for the proposed development with regard to these activities.

1.4 Scope

The following scope of works was undertaken:

- Conduct a desk study review of the use of the site through inspection of historical aerials, council records and (if possible) an interview with the most recent owner of the site.
- Obtain environmental data for the site to determine its sensitivity.
- Conduct a site walkover, focusing on areas of interest, for the purpose of finalising the sampling plan and providing added clarity to the desk-based information.
- Landfill area: Visual inspection to aid understanding of whether waste is present in the area.

- Soakpits and swales: Collection of soil samples from the base of the partially excavated soak pits to determine the presence/absence of contamination.
- Wastewater pond in milking shed area: Collection of soil samples to investigate potential contamination impact should the pond liner have leaked.
- Effluent discharge area: According to existing consent documents the dairy operation involved the discharge of milking shed effluent across the entire site. Collection of soil samples to investigate any contamination impact from this discharge.
- Milking sheds: Collection of soil samples from a limited number of locations to investigate any contamination impact.
- Possible livestock dip area: An area of land visible in the 1950 aerial image to the north of the railway line shows a possible livestock corral. Visual inspection for evidence of any dip or spray race structure and collection of soil samples from a limited number of locations will be conducted to investigate any contamination impact.
- Conduct a phase 2 investigation in the 'piggery area' and 'incinerator area' (see **Figure 5**) due to identification of elevated concentrations of contaminants in the initial investigation.

1.5 Site Identification

Site identification details are presented in **Table 1**.

Table 1 Site Identification

Site Name	69 Inland Kaikōura Road, Peketā, Kaikōura
Site Location	69 Inland Kaikōura Road, Peketā, Kaikōura
Legal Description/s	LOT 2 DP 527436 LOT 1 DP 9266 SEC 10 SO 3911 SECS 1-5 7 SO 7129 LOT 2 DP 501321
Site Area (ha)	82
Site Coordinates	Approximate centre: S 42°24.45.46" E 173°37.44.78"
Site Zoning	Rural
Current Site Use	Farming
Proposed Site Use	Residential and commercial per plans in Appendix 2

2 Site Description

2.1 Site Layout

The site is located in a rural area approximately 4.5km west of Kaikōura town.

The latest aerial imagery available from Canterbury Maps is dated 15 December 2016. A more recent but lower quality image (October 2021) sourced from Google Earth is presented in **Figure 2** due to the recent changes at the site caused by initiation of bulk earthworks which make the Canterbury Maps image out of date.

The site is located on a relatively flat coastal plain. The site lies in an area between Stoney Creek, at the site's western boundary and the Kowhai River located beyond the eastern boundary. The site has a gradual decline in elevation from north to south (towards the Pacific Ocean).

KiwiRail's Coastal Pacific railway runs in a north eastly direction, transecting the site.

In the most recent (Google Earth) image the following recent activity is visually apparent:

- Earthworks occurring at multiple locations across the site with soil stockpiles evident within 60m of Stoney Creek.
- The milking shed area is largely open ground with few structures remaining.
- The milking shed wastewater pond has been removed.
- The dwelling at 69 Inland Kaikoura Road is still present but the trees surrounding its southwest and south-eastern sides have been removed.
- The new subdivision roads (Lots 100, 101 and 102) have been formed (currently unsealed).

Figure 2 Site Layout Plan. Source: Google Earth Pro, October 2021. Site boundaries are approximate



2.2 Surrounding Land Use

The observed surrounding land uses are recorded in Table 2.

Table 2 Surrounding Land Use

Direction from the site	Observations
North	Farmland
East	Inland Kaikōura Road, with Kowhai River further east
South	State Highway (SH) 1 with paddock and the Pacific Ocean beyond
West	Stoney Creek with farmland beyond

2.3 Site Environment

2.3.1 Topography

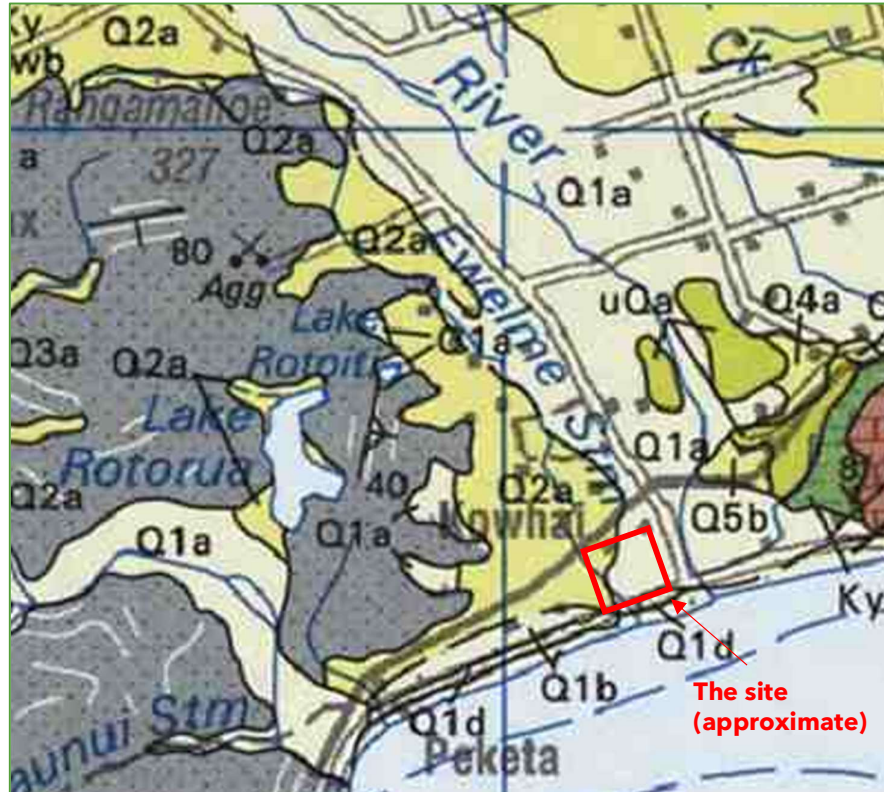
The site is generally flat with a shallow gradient to the south towards the Pacific Ocean.

2.3.2 Geology

Inspection of the 1:250,000 geological map (Rattenbury *et al.* 2006) indicates that the geology across the site varies according to proximity to Ewelme Stream, Kowhai River and Stoney Creek. The site is located on postglacial deposits including river gravel and sand (coloured yellow in **Figure 3**, Q1a and Q2a), with Torlesse composite terrane (coloured grey in **Figure 3**) found west of the site.

The site is classified by Environment Canterbury (ECan 2007) as within the Recent soil group and background trace element concentrations for this soil group are therefore applicable.

Figure 3 Surface Geology at the Site (Source: Rattenbury *et al.* 2006)



2.3.3 Hydrology

The majority of the site is unsealed, and stormwater can percolate directly into ground at the site.

Surface water is present to the west (Stoney Creek) and east (Ewelme Stream and Kowhai River) of the site, with the Kowhai River being the dominant surface water feature in the area. Stoney Creek (**Photos 1 and 2**) abuts the south-western boundary of the site.



Photo 1 Stoney Creek looking northwest



Photo 2 Stoney Creek at the railway bridge

2.3.4 Hydrogeology and Well Details

Well records for on-site wells O31/0155 and O31/0323 (**Photo 3**) indicate that the depth to groundwater ranges between approximately 3.5m and 10m below ground level.

The shallow ground conditions recorded on ECan’s bore logs for these wells detail gravel and claybound gravel.

Piezometric contours are provided on Canterbury Maps and suggest that groundwater flow is to the south-south-east, consistent with a flow direction towards the Pacific Ocean.

Using Canterbury Maps, a search of registered wells was performed on 29 December 2021 and wells identified within 150m of the site are detailed in **Table 3**.

Table 3 Wells within 150m of the Site. Source: Canterbury Maps Wells Layer

Well ID	Distance from site (m)	Well owner	Direction	Downgradient?	Well depth highest water level	Use
O31/0155	On site	Hamish Bruce	-	N/A	18.6m 3.88m	Irrigation
O31/0323	On site	Hamish Bruce	-	N/A	15.0m 4.20m	Domestic and Stockwater, Dairy Use
O31/0084	130m	Kaikoura District Council	West	Partially	13.70m Not Recorded	Casing retrieved/abandoned
O31/0328	85m	FORD, B R & M M	North	No	17.5m 10.56m	Domestic and Stockwater,



Photo 3 Well O31/0323 and pump house



Photo 4 Well O31/0323

2.3.5 Sensitive Aquifer Assessment

An assessment to establish whether the shallow groundwater beneath the site is a 'sensitive aquifer' is presented in **Table 4**.

Table 4 Sensitive Aquifer Assessment per MfE 2011a

Criteria	Assessment
The aquifer is not artesian or confined; and	Correct
The aquifer is expected to be less than 10 metres below the source or suspected source of contamination; and	Correct
The aquifer is of a quality appropriate for use, can yield water at a useful rate and is in an area where extraction and use of groundwater may be reasonably foreseen; or	Correct
The source of potential contamination is less than 100 metres from a sensitive surface water body.	Correct - Stoney Creek

Based on the use of shallow groundwater within and in the immediate vicinity of the site, and the distance to the nearest surface water body, the shallow aquifer beneath the site **is sensitive**.

2.3.6 Ecology

Under the Resource Management Act (Section 30), regional councils and unitary authorities have responsibilities to safeguard the life-supporting capacity of soil and ecosystems, and to ensure any adverse effects on the environment are avoided or mitigated.

The presence of potential on and off-site ecological receptors was investigated, and the results are presented in **Table 5**.

Table 5 Ecological assessment checklist¹

Ecological receptor	On site	Off site	Comments
Marshes, swamps, tidal flats or other ecologically sensitive wetlands near ² the site?	N	Y	Tidal flats on southern side of State Highway 1, approximately 300m south of the site
Are other aquatic habitats such as rivers, lakes or streams near the site?	N	Y	Stoney Creek and Kowhai River. Kowhai River is a braided river bird habitat (Source: Canterbury Maps)
Are ecologically important marine or estuarine environments near the site?	N	Y	Kowhai River is a braided river bird habitat and MPI - NZFFD Fish Spawning Habitat (<i>Galaxias vulgaris</i>) (Source: Canterbury Maps)
Are ecologically important or sensitive environments such as national parks or nature reserves located near the site?	N	N	
Are habitats for rare, threatened or endangered species near the site?	N	Y	<i>Galaxias vulgaris</i> is a rare species found only in Canterbury
Are culturally important ecological receptors located near the site (including areas identified on regional council GIS mapping)?	N	N	
Are commercially or recreationally important ecological receptors located near the site?	N	N	
Are forested, grassland or other habitats of significance located near the site	N	N	
Is the site used for food production (arable or livestock)?	Y	Y	Dairy farming (until recently)
Summary: Based on the information collected, the site is considered ecologically sensitive, and data should include assessment using guidelines relevant to the assessment of ecological impact in Stoney Creek			

1: Table adapted from Appendix 4I, MfE 2011

2: Near is judged on a site-specific basis given the contaminant's potential for transport by wind, surface run-off, groundwater transport or preferential pathways from service lines etc and should include positive factors such as reticulation of stormwater away from the site

2.4 Summary of Environmental Conditions

The site is located in a rural area 4.5km west of Kaikōura town. It is largely unpaved, allowing stormwater to drain directly into ground.

Based on desk study information, the expected near surface ground conditions at the site are gravel and clay bound gravel with groundwater at approximately 3.5 to 10m below ground level (the depth depending on season and location across the site - likely to decrease in depth southwards).

The nearest surface water body is Stoney Creek located directly west of the site. Ewelme Stream and the Kowhai River are located approximately 150m east of the site and the Pacific Ocean is across State Highway 1 approximately 300m south of the site.

The site is generally topographically flat with a slight decline from north to south (towards the Pacific Ocean).

The Kowhai River has identified sensitive ecological receptors within it.

Groundwater is considered sensitive using the MfE 2011 definition due to its utilisation, shallow depth and likely hydrological connectivity with the adjacent Stoney Creek.

3 Site Conditions

3.1 Introduction

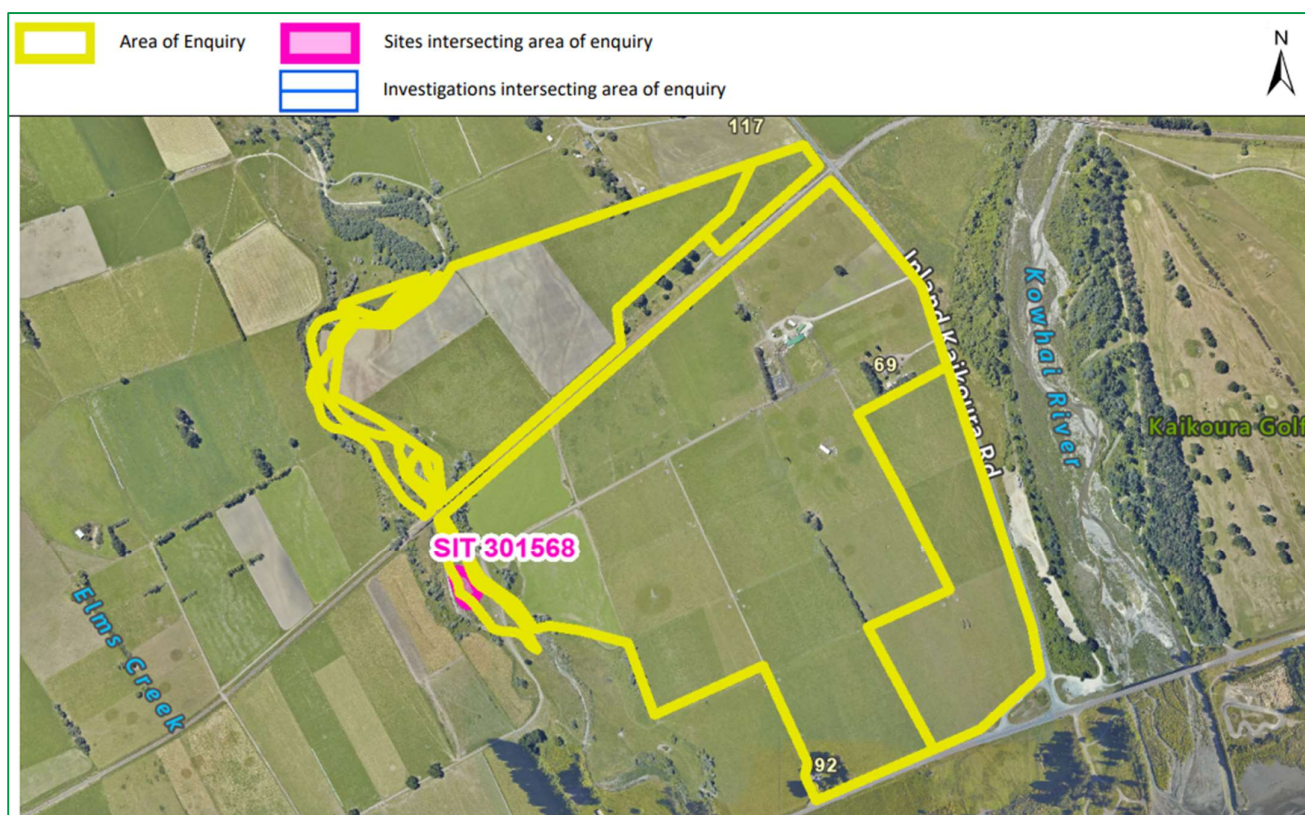
A search of readily available information sources was conducted with the objective of identification of past or present activities with the potential to contaminate land or other media such as sediment and groundwater. The nature and extent of any identified activities has also been assessed, where information was available.

3.2 Regional Council Register of HAIL Sites

Environment Canterbury (ECan) holds a database (the Listed Land Use Register, LLUR) of sites that have, or have had in the past, an activity or industry that is detailed in the Hazardous Activities and Industries List (HAIL) (MFE 2012).

A landfill site (HAIL G3) is documented by ECan as present on the site at the location shown in **Figure 4**. The ECan Property Statement indicates that the landfill site has not been investigated and dates from 2010.

Figure 4. LLUR Image showing HAIL Activity (G3 - Landfill) on the Site



The Property Statement from the LLUR is provided in **Appendix 3**.

Note that the LLUR is incomplete as not all HAIL activities in the region have been identified.

3.3 Regional Council Consents

Using the Canterbury Maps, a search of active regional consents on site was performed on 29 December 2021 and consents identified are detailed in **Table 6**.

Table 6 Active Consents

Consent type	Consent number	Consent holder	Summarised details from regional council	Relevance
Land Use Consent (s9)	CRC221712	Kaikōura Business Park 2021 Limited		Application on Hold
To use land for farming activity	CRC203545	Richard John Scott Watherston		Application in Process
Take Groundwater, Use Groundwater	CRC183916	Ms G K Watherston & Okarahia Downs Limited	Water shall be used only for irrigation of crops and pasture for grazing sheep, beef cattle, deer or non-milking dairy cows as described in the application, on the area of land shown in attached plan CRC021087.	This consent replaced the one held by JNW Property Ltd & Okarahia Downs Ltd.
Discharge Contaminant into Land to Water, Discharge Contaminant into Air	CRC183914	Ms G K Watherston & Okarahia Downs Limited	<p>The discharges shall only be:</p> <ul style="list-style-type: none"> ■ diluted dairy effluent originating from a dairy shed and associated yard located as shown on Plan CRC121350, which forms part of this consent; and ■ odour arising from diluted dairy effluent and solid dairy cow waste stored as shown on Plan CRC121350 	This discharge relates to the dairy shed and yard, which have now been removed
Take Groundwater, Use Groundwater	CRC183918	Ms G K Watherston & Okarahia Downs Limited	To take groundwater at or about map reference O31:6160-6578 for irrigation of up to 65 hectares	

3.4 Ngāi Tahu

Canterbury Maps Ngāi Tahu layer indicates that the southern third (approximate) of the site is within a Rūnanga Sensitive Area: Wāhi Tapu.

3.5 LINZ NZ Orchard Polygons

The Land Information New Zealand (LINZ) NZ Orchard Polygons layer was inspected, and the site was not included in a polygon indicating that LINZ is not aware of the current or historical use of the site for that purpose.

3.6 Review of Historical Aerial Photography

A review of readily available historical aerials was conducted to identify and date visual details of historical and current land uses. The review is provided in **Table 7**.

Table 7 Summary of Historical Aerial Imagery

Year and source	Site	Adjacent land
1942 - Retrolens	Farmland with no permanent structures	Farmland with few trees or structures
1950 - Retrolens	Railway is present, transecting the site. There is a works area associated with the railway line, located adjacent to the northern side. The livestock yard area next to the railway line is also present. Dwelling at 69 Inland Kaikoura Road is present	A dwelling is present to the north of the site. The adjacent land is still open farmland with a few exotic trees
1960-1964 - Canterbury Maps	Little change observed	Little change observed
1965-1969 - Canterbury Maps	Exotic trees surround the dwelling at 69 Inland Kaikoura Road. The dwelling at 392 SH 1 is being constructed/is constructed	Little change observed
1980 - 1984 - Canterbury Maps	Farm tracks have been installed across the site - visible as white lines. The milking shed area is being established at this time. There is little evidence remaining of the yards next to the railway, but the use of the railway land for storage is evident.	There appears to be ground disturbance in the land to the west of the site (opposite side of Stoney Creek)
1985-1989 - Canterbury Maps	Little change visible (low resolution image)	The golf course located east of the site on the opposite side of the Kowhai River is being established
1990-1994 - Canterbury Maps	Little change observed	Golf course is completed
1995-1999 - Canterbury Maps	Little change observed	Little change observed
2000-2004 - Canterbury Maps	An additional structure is present in the milking shed area	Little change observed
2004-2010 - Canterbury Maps	The milking shed has been established in the milking shed area. Cows can be seen standing next to the shed	Little change observed
2010-2014 - Canterbury Maps	White stockpiles located adjacent to Stoney Creek. Elsewhere there is little change	Ocean Ridge Subdivision (east of the site) works have commenced.
2015-2019 - Canterbury Maps	The wastewater pond has been constructed (approximately 2015). The stockpiles adjacent to Stoney Creek can no longer be seen	Further work at Ocean Ridge Subdivision has occurred
Google Earth Pro Historical Imagery	Bulk earthworks observed in the most recent image (10/21)	

Summary: The site has been used for farming purposes since the earliest available image. Between the 1942 image and the 1950 image the KiwiRail Pacific Ocean railway line was established, transecting the site. The dwelling at 69 Inland Kaikoura Road also appears at this time. A livestock yard area is visible directly north of the railway corridor in the 1950 image. A dwelling at 392 SH1 was constructed in approximately the 1960s. The milking shed was constructed in the mid-2000s and the wastewater treatment pond was installed by the 2015-2019 image. Recently (within the last year) earthworks have commenced including removal of the wastewater treatment pond, milk shed buildings and installation of new roads associated with the new subdivision. Bulk earthworks are visible across the site. The immediately surrounding land has been used for farming purposes in all images inspected.

Historical aerial images are provided in **Appendix 2**.

3.7 Site Features

The property owner (Mr Richard Watherston) has lived in the Kaikōura area all his life and has owned the property for 13 years. Mr Watherston indicated the following:

- Mr Watherston currently lives in the dwelling at 382 SH1 and the dwelling at 69 Inland Kaikōura Road is leased. Mr Watherston indicated that both of these dwellings will be retained on their respective subdivided land parcels.
- The land has been used for dairying since the 1930s. At that time, it was part of the Elms Farm (which still exists and is located immediately southwest of the site). Cows were milked all year to provide an uninterrupted supply of milk to Kaikōura. The use of the land for dairying ceased in March 2021.
- The milking shed and associated structures have now been removed as has the wastewater pond and its liner.

- Waste/Offal pit: This was removed approximately 10 years ago, with no waste buried or stored on site after that time. Waste has been taken to the Kaikōura Resource Recovery Centre since the pit was removed.
- Consent SU1765 for the proposed subdivision has been granted by Kaikōura District Council (KDC) and work associated with subdividing the land is underway.
- A topsoil stockpile was observed during the site walkover. Mr Watherston indicated that this had been formed during the bulk earthworks underway on the site. The topsoil is being retained for reuse.

The primary features relevant to potential land contamination are detailed in **Tables 8 - 17** and their locations within the 82-hectare site are shown in **Figure 5**.

Figure 5. Primary Features Relevant to Land Contamination (✚ = location of proposed soakpit or wastewater treatment plant (WWTP))

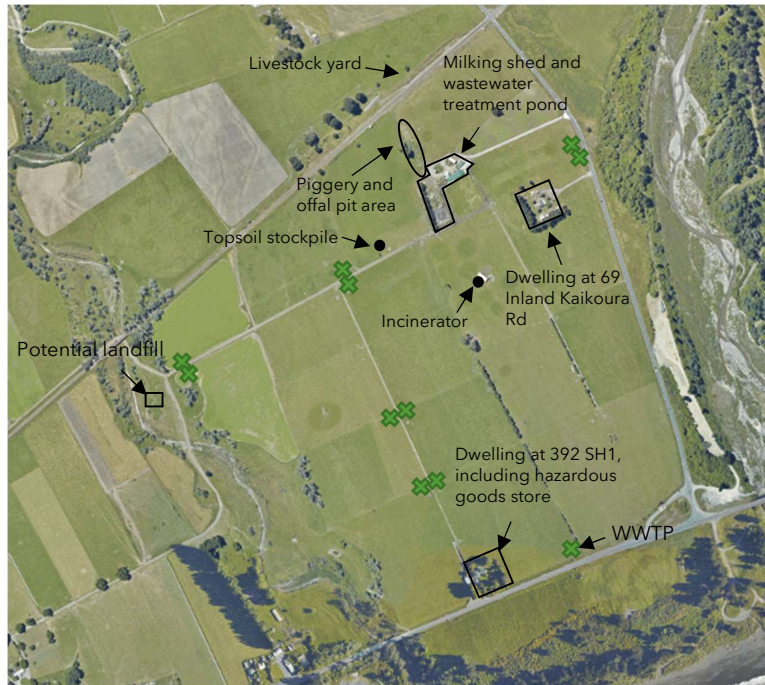



Table 8 Stockyards

Aspect	Description
Image sourced from Retrolens (1950)	
Location	<p>The stockyards (with potential for a livestock dip/spray area) are located directly to the north of the railway. On the Outline Plan (Appendix 2) this is referred to as 'Railway Block'. It is not part of the Kowhai Downs subdivision.</p>
Detail	<p>This area appears to have been used for gathering livestock in a series of corrals. Mr Watherston indicated that this area was historically used as a cattle yard. The yard was used to assist with the historical transport of cattle in wagons by railway.</p> <p>Mr Watherston indicated that there has never been a livestock dip on the site. The property was originally part of the Elms Station and there was a livestock dip associated with that station, located approximately 4km away from the site.</p> <p>The area was inspected by a site walkover and no structures associated with the corrals were evident. MfE's report entitled <i>Identifying and Managing Risks Associated with Former Sheep-dip Sites</i> (MfE 2006) indicates chemicals as detailed below (note that any dip/spray race/foot rot trough is more likely to have been used for cattle rather than sheep given the use of the farm for dairying).</p>

Chemical*	Period of usage**
Arsenic	1840s–1980
Nicotine	1840s–mid-1900s
Carbolic acid and potash	1880s
Derris	1910–~1952
Lime sulphur	1849–1891
Zinc	1950s–present
Copper	1950s–present
Organochlorines:	
• DDT	1945–1961
• lindane	1947–1961
• dieldrin	1955–1961
• aldrin	1955–1961
Organophosphates	1960s–present
Synthetic pyrethroids	1970s–present
Insect growth regulators	Present

* Persistent chemicals of principal concern are highlighted.

** Years for organochlorines are based on Ministry for the Environment, 1998.



Quantities of railway related material were observed in the abutting railway land (not on the site) directly west of the potential livestock dip area (see image from site walkover below).



Proposed approach

Limited soil samples will be collected and analysed for heavy metals and OCPs.

Table 9 Historical Piggery and Farm Offal Pit

Aspect	Description
<p>Image sourced from Canterbury Maps (2016)</p> <p>Various waste items are visible at surface, but the exact footprint of the farm offal pit is unclear in all aerial images</p>	
<p>Images sourced from site walkover</p> <ul style="list-style-type: none"> ■ 44 Gallon drum - molasses ■ Farm related waste ■ ACM ■ Intermediate Bulk Container (IBC) 	



Location	This area is within Lots 14 and 15 in the Outline Plan (Appendix 2).
Details	Mr Watherston indicated the farm offal pit was in this area but had been removed before he owned the farm. No evidence of removal was readily available. Mr Watherston indicated that the offal pit had been used for disposal of general waste as well as offal.
Proposed approach	Hand tools and a lack of information on the exact footprint of the offal pit prevent further investigation of this feature. Opportunistic sampling of PACM and soil to be undertaken in the area.

Table 80 Topsoil Stockpile




Aspect	Description
Image sourced from site walkover	
Location	The stockpile is located at the south-eastern end of Lot 12
Details	The stockpile was noted during the site walkover. Mr Watherston indicated that it originated from topsoil stripped during bulk earthworks and would be placed back on to lots when contouring was complete.
Proposed approach	Two grab samples collected for heavy metals and OCPs analysis.

Table 11 Incinerator

Aspect	Description
Image sourced from site walkover	
Location	<p>The incinerator is located on the southwest (closed) side of the hay barn. The Outline Plan (Appendix 2) indicates the location to be close to the boundary between proposed Lot 11 (Kowhai Downs) and Lot 20 (possible future commercial development).</p>
Details	<p>Mr. Watherston indicated that the incinerator had been recently installed. He also indicated that the previous owner had used the area between the open barn (north-east) and concrete wall (south-west) for storage of silage and other items.</p> 
Proposed approach	<p>Opportunistic soil and PACM¹ samples collected from adjacent to the door of the incinerator.</p>

¹ PACM: Potential asbestos containing material
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Table 12 Milking Shed and Wastewater Pond


Aspect	Description
Image sourced from Canterbury Maps (2016)	
Location	<p>This facility, and the associated milking shed infrastructure were located within future Lots 14 and 15 in the Outline Plan (Appendix 2).</p>
Detail	<p>Inspection of Google Earth historical imagery indicates that the wastewater pond was installed at some time between January 2014 and February 2015. It was removed sometime between November 2019 and October 2021, i.e., it was present on site for approximately five years. Mr Watherston confirmed removal of the pond and liner and the liner was observed during the site walkover (see below).</p>  <p>At the time of the site visit on 4 and 5 January 2022, the milking shed structures had recently been removed with the exception of the concrete pad at the entrance to the shed, which was being used for soil storage.</p> <p>Mr Watherston confirmed that the shed's power supply was electricity and there had not been above or below ground storage tanks for storage of fuel. The larger shed was used for milking and the shed at the northern end was used for calves.</p>
Proposed approach	<p>Collection of soil samples in the footprint of the wastewater pond and from the surrounding milking shed area. Samples will be collected from four locations and analysed for heavy metals. A laboratory composited sample will be analysed for OCPs.</p>


Table 93 Fields/Effluent Discharge Area

Aspect	Description
	In accordance with ECan consent CRC183914, dairy effluent has been discharged across the entire site.
Detail	Dairy effluent disposal to land may lead to metals accumulating in soil (as well as nutrient loading).
Proposed approach	Elevated nitrogen, phosphorus, organic matter, pathogens and heavy metals may be expected. Of these, heavy metals will be investigated for the purpose of this contamination assessment. Approximately ten samples will be collected and analysed for heavy metals, with composite samples analysed for organochlorine pesticides (OCPs).

Table 14 Soakpits, Swales and Proposed Wastewater Treatment Area

Aspect	Description
Locations	Ten soak pits will be located within the Kowhai Downs subdivision (see Figure 5). Swales will run alongside the new roads and direct excess water into the soak pits. A proposed wastewater treatment area located at the southern end of the subdivision (see Figure 5) will treat human wastewater from the dwellings on the subdivided land and discharge it within a disposal field.
Detail	With respect to these proposed new stormwater treatment facilities, Environment Canterbury requested further information for consent applications CRC221483, CRC221484 & CRC221712. They requested: <i>"Please confirm that there are (sic) no contaminated or potentially contaminated material in the vicinity of the base and sides of the soakage pits, and the base of the swales."</i>
Interview information	Mr Watherston confirmed the proposed location of the swales, soak pits and wastewater treatment area.
Proposed approach	Collection of soil samples from the base of the soak pits and from the wastewater treatment area to determine the presence/absence of contamination. Approximately ten samples to be collected and analysed for heavy metals. In addition to heavy metals, samples will be composited in the laboratory and analysed for organochlorine pesticides (OCPs).

Table 15 Suspected Landfill

Aspect	Description
Image sourced from Canterbury Maps (2012)	 <p>Aerial images confirm the short-lived timespan of visually evident material at surface (first seen in image dated 1/2012 and gone by 1/2013).</p>
Location	Adjacent to Stoney Creek and west of the Kowhai Downs subdivision. Also see ECan image reproduced in Figure 4 .
Detail	The suspected landfill is located adjacent to Stoney Creek, which forms the western boundary of the site. This area is not proposed to be developed. A site walkover on 5 January 2022 did not identify evidence of landfilling in the suspect footprint. However, the area was overgrown making identification of visual evidence of landfilling difficult. At the time of the walkover, the area directly east of the potential landfill is being used for soil stockpiling.

The white coloured area observed by ECan is consistent with the local limestone geology, and the white material could be natural ground rather than anthropogenic waste. The latest aerial image sourced from Google Earth (October 2021) is shown below. The discoloured areas (similar to those in the 2012 image) are soil stockpiles.



During the walkover in the potential landfill and wider area, ground disturbance and stockpiling was observed. A mechanical excavator was also present in the area. A photo taken during the site walkover is presented below. In summary, the riverbed area is highly modified and contains soil from other areas. There was no visual evidence of anthropogenic waste at the time of the walkover.



Interview information

The potential landfill area identified by ECan and visible in the 2012 aerial image is thought by Mr Watherston to be in the location where several one tonne concrete blocks were used with screens for sieving gravel extracted from the riverbed. This activity occurred in 2012 to provide gravel for the formation of gravel roads to the 69 Inland Kaikōura Road property. This process occurred on and off for a period of 3 - 4 months after which the concrete blocks were removed. Mr Watherston indicated that ECan staff (Kaikōura Office) have routinely re-benched the area adjacent to Stoney Creek as part of flood protection works.


Proposed approach

As the investigation will use hand tools only and this area is not being developed, aside from the site walkover, no soil sampling or excavation will be conducted.

Table 16 Dwellings

Aspect	Description
<p>Images sourced from Canterbury Maps 69 Inland Kaikoura Road (top) and 392 State Highway One (below)</p>	
<p>Locations and detail</p>	<p>The dwelling at 69 Inland Kaikoura Road is understood to have been relocated to its current position in 1917 (Source: Mr Watherston). However, aerial images indicate the house was relocated some time between 1942 and 1950 (see section 3.6).</p> <p>A dwelling at 392 SH1 is present in historic aerial images dating back to 1960s. Both dwellings may contain asbestos and may have been painted with lead-based paint (this is likely for the 69 Inland Kaikoura Road dwelling which is clad with painted weatherboards).</p> <p>Both dwellings have their own septic tanks and disposal fields.</p>
<p>Proposed approach</p>	<p>It is understood from Mr Waterston that neither dwelling is being removed and no action to assess contamination will be undertaken. Lead contamination around the 69 Inland Kaikoura Road dwelling associated with the historical use of lead-based paint can be expected.</p>

Table 17 Hazardous Goods Storage Shed

Aspect	Description
Image sourced from site walkover	
Location	The hazardous goods store is located directly west of the dwelling at 392 SH1. The store was viewed during the site walkover on 4 January 2022. The store is lockable and has a concrete floor.
Proposed approach	The store is not being removed and no action to address soil contamination is required at this stage.

3.8 Existing Report

An existing report entitled *Environmental Assessment - Preliminary Site Assessment* (Drones at Work, 2021) was obtained and reviewed. This assessment included the collection of soil samples and analysis as described in **Table 18**. All samples were collected from surface, and some were composited in the field (*Pers. Comm. A. Ryumin 2022*). With the limitations on sample collection and compositing noted, the results obtained are suitable for use as additional indicative data to supplement the results generated in the January 2022 investigation conducted by CLS.

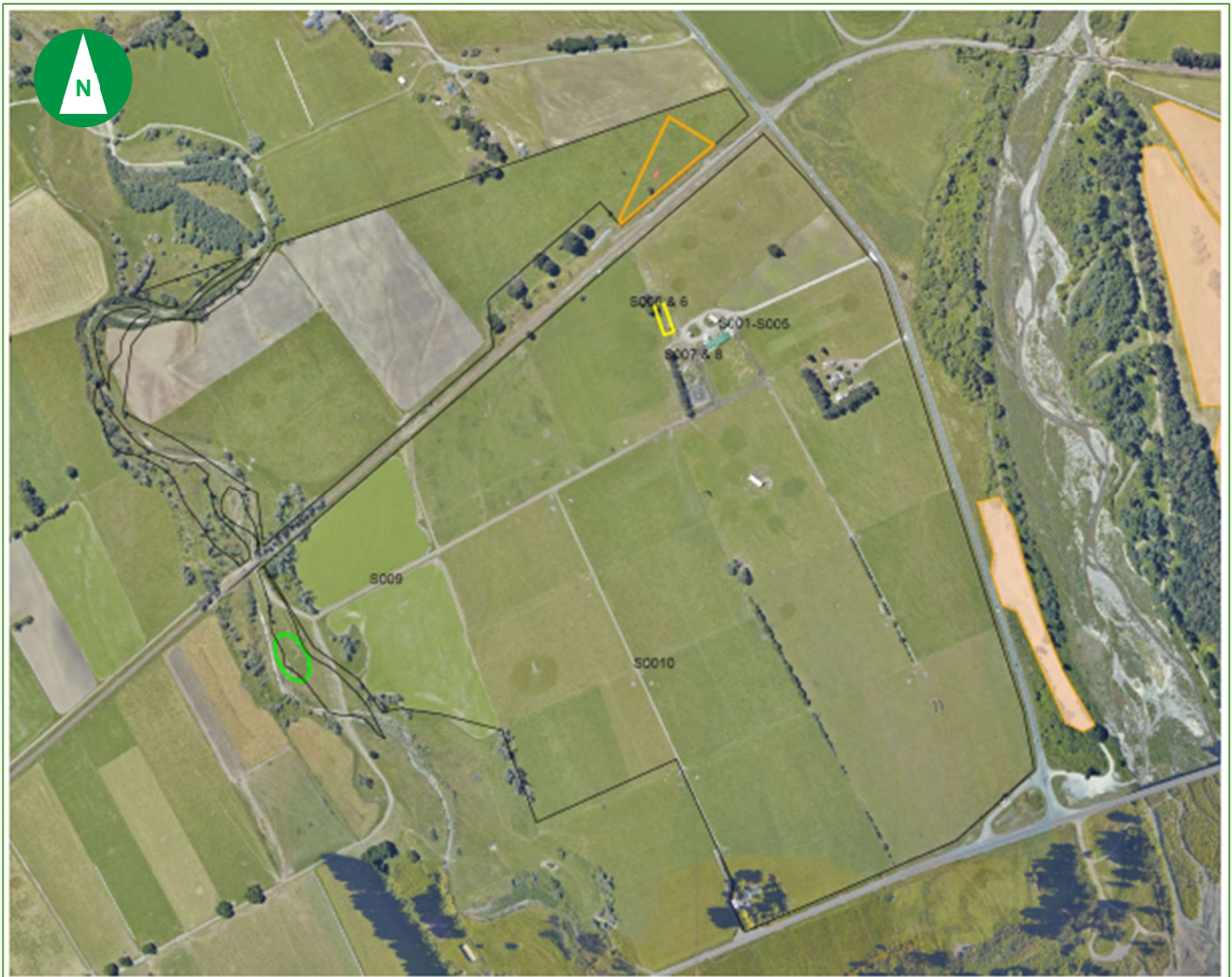
None of the Drones at Work, 2021 results were health significant when compared to Soil Contaminant Standards applicable for a residential end use with 25% home grown produce consumption.

Table 18 Drones at Work, 2021 Soil Sampling and Analysis

Sample ID	Location	Analytes	Results
S001	Milking area	Presence/Absence Asbestos	Asbestos NOT detected
S002	Milking area	Presence/Absence Asbestos	Asbestos NOT detected
S003	Milking area	Heavy metals	Arsenic: Below background Cadmium: Below background Chromium: Below background Copper: S003 above background Lead: S003 above background Mercury: Below background Nickel: Below background Zinc: S003 above background
S004	Milking area	Heavy metals	
S005	Soak pits	Heavy metals	
S006	Soak pits	Heavy metals	
S007	Milking area	OCPs	
			Minor detection of DDE (0.017mg/kg)

The soil sampling locations, as documented in the Drones at Work 2021 report, are provided in **Figure 6**.

Figure 6. Drones at Work 2021 Soil Sampling Locations



3.9 HAIL Activities

Using the information collected, identified HAIL activities are summarised in **Table 19**.

Table 19 Identified HAIL Activities at the Site

Year from	Year to	Activity (from HAIL*)	Detail	More likely than not to have occurred?	Contaminants of Potential Concern (from HAIL*)
2010	Present	G3: Landfill sites	Identified by ECan close to Stoney Creek. Will not be disturbed by the subdivision	No	N/A
Approx. 1930	2021	G5: Waste disposal to land (excluding where biosolids have been used as soil conditioners)	<ol style="list-style-type: none"> 1. Effluent discharge onto the fields. Technically this meets the HAIL definition. 2. Incinerator 3. Waste in piggery/offal pit area 	Yes	<ol style="list-style-type: none"> 1. Dairy effluent: biological hazards (bacteria, viruses), metals 2. Incinerator ash: PAHs, heavy metals 3. Waste in piggery/offal pit area: PAHs, heavy metals, asbestos, offal
1950	Approx. 1970s	A8: Livestock dip or spray race operations	Yards observed in the Retrolens 1950 image	No, but should be confirmed by sufficient sampling	Arsenic, zinc, organochlorines (e.g., aldrin, dieldrin, DDT, lindane) and organophosphates, carbamates, and synthetic pyrethroids
1960s	Present	E1: Asbestos products manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition	Both dwellings	Yes	Asbestos from ACM used in building materials
1960s	Present	I: Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment	69 Inland Kaikoura Road dwelling - relocated prior to 1950	Yes	Lead from lead-based paint
?	Present	A1: Agrichemicals including commercial premises used by spray contractors for filling, storing or washing out tanks for agrichemical application	Hazardous goods store at 392 SH1 dwelling	Yes	Agrichemicals, oil, solvents

* HAIL: Ministry for the Environment’s Hazardous Activities and Industries List (MfE 2012)

4 Preliminary Risk Assessment

4.1 Introduction

The risk assessment comprises the production of a theoretical conceptual site model (CSM) of how all identified sources of contamination in ground could impact on all identified receptors. The CSM is then assessed to determine the magnitude of risk presented by each of the complete pathways from contaminant source to receptors under the proposed development scenario on the piece of land.

4.2 Preliminary Conceptual Site Model (CSM)

The conceptual site model (CSM) outlines the potential source-pathway-receptor linkages that may be present. The CSM defines what contamination could be present at a site, how they may travel and what receptors they could affect by doing so. Establishing these factors is essential to guide the preparation of an investigation plan.

The preliminary CSMs for human health and ecology based on the desk-based study are presented in **Appendix 4**. The models indicate that potentially complete exposure pathways exist between contaminants in the piggery/offal pit area, incinerator entrance area and milking shed via dust/fibre emissions, volatile emissions, infiltration into groundwater and subsequent abstraction or migration into the rivers and direct contact with soil.

The following receptors have been identified:

- Construction workers
- Future occupants
- Fauna and flora in Stoney Creek

The dwellings may also be impacted by lead and asbestos contaminants that could place a risk to human health for residents.

4.3 Assessment Criteria for Sampling

For the Kowhai Downs subdivision, the large size of the proposed lots (approximately 2 hectares) indicates that Soil Contaminant Standards (SCSs) associated with a rural residential lifestyle block with 25% home grown produce consumption are appropriate for Tier 1 assessment purposes.

For other areas within the subdivision, unpaved commercial industrial SCSs are considered appropriate.

For soak pits and the wastewater treatment plant disposal area, it has been assumed that ECan will require a demonstrable absence of contamination, i.e., no sample results above published background levels. Background levels have been sourced from ECan 2007a, and the 'Recent' soil group selected based on the location of the site.

4.4 Assessment Summary

The information gathered in this PSI including the CSM indicate that there is potentially a risk to human health if the land is subdivided and used for rural residential and commercial purposes from the identified HAIL activities. This potential risk is associated with contamination from the piggery/offal pit area, incinerator area and milking shed. The dwellings (including hazardous goods store) also potentially present a risk associated with asbestos and lead based paint, agrichemicals and waste oil. Should the contamination be significant, the flora and fauna of Stoney Creek could be impacted if contaminants migrate into it via erosion or groundwater flow.

The risk was evaluated by an intrusive site investigation which addressed the piggery/offal pit area, incinerator area and milking shed. For completeness the livestock yards were also investigated. To meet ECan's requirements in their S92 letter requesting further information (copy in **Appendix 2**), the investigation will also include sampling of:

- Fields to address the potential impact of effluent discharge on soil; and
- Soak pits and the proposed wastewater treatment plant to address the condition of soil in the areas that stormwater/wastewater will be directed to for infiltration into ground.

4.5 Summary and Data Quality Objectives

Data which will help to refine this CSM and better define potentially complete source-pathway-receptor linkages with respect to the proposed development include the following:

- Chemical analysis of surface soil samples from within the livestock yards area, historical piggery and offal pit area, milk shed/wastewater disposal area and next to the incinerator. Chemical analysis of representative soil samples from the fields.
- Observe ground conditions and sample accordingly, for example, collect PACM samples if encountered.
- Chemical analysis of soils samples from the base of the soak pits and proposed wastewater treatment disposal area to identify any contamination.

The data generated from analysis of these soil samples has been used to assess the contamination risk at the site.

5 Site Investigation

5.1 Site Works Undertaken

The site was visited on 4 and 5 January 2022 and the following fieldwork was completed:

- Site walkover with Mr Watherston (site occupier) to identify, visually review and discuss site features. Sampling strategy amended in accordance with site walkover findings.
- Soil sampling from within the livestock yards area, historical piggery and offal pit area, milk shed/wastewater disposal area, next to the incinerator, from the topsoil stockpile, and from the fields. Observe and record ground conditions at all locations.
- PACM sampling from historical piggery and incinerator areas.
- Soil sampling from the base of the soak pits and proposed wastewater treatment disposal area.

Following receipt of sample results from the laboratory, and including visual observations recorded during the investigation, four samples held cold were analysed and a phase 2 investigation of the 'piggery and offal pit area' and 'incinerator area' (see **Figure 5** for locations) was undertaken. This consisted of:

- Drones at Work Ltd engaged an asbestos removalist to remove visible ACM fragments from the 'piggery and offal pit area' and 'incinerator area' on 23 February 2022
- CLS attended site on 24 February 2022 to conduct additional soil sampling and inspection of ground conditions in these areas, following the ACM removal.

5.2 Asbestos Removal

Prior to undertaking the phase 2 investigation, Drones at Work Limited commissioned an asbestos removalist (Agon Solutions Limited) to remove visible ACM from the 'piggery/offal pit' area and the 'incinerator' area. Matthew Garrett of Agon Solutions Limited (Agon) is a Class A Licensed Asbestos Removalist (WorkSafe Licence Number RA17090133).

Mr Garrett attended site on 23 February 2022 and removed visible non-friable ACM. The quantity of ACM removed was less than 10m² and therefore classified as unlicensed asbestos removal. Agon Solutions Limited's report is provided in **Appendix 7**.

The end condition of both areas with respect to visible ACM is not explicitly stated in the report. However, Agon reported that:

"The areas beneath the containers, timber pile, farm equipment and boulders could not be visually investigated. The piggery area revealed only a small amount of ACM, mainly in a line at the southern boundary suggesting the existence of an historic structure".

5.3 Sampling Methodology

Soil and ACM samples were collected into laboratory supplied containers using decontaminated hand tools (spade, trowel, pickaxe).

Phase 1 investigation

In the phase 1 investigation samples were collected from surface only (generally 0.0 - 0.1m below ground level, bgl). However, four sub-surface samples were also collected from 0.2m bgl from locations in the stockyards area and held cold at the laboratory.

The ten proposed soak-pits had been partially excavated at the time of the phase 1 investigation, to enable infiltration testing. Soak-pit samples were collected from the base of these excavations, which ranged from 0.4m - 1.25m bgl.

Two grab samples were collected from a topsoil stockpile.

In the phase 1 investigation, all surface samples were analysed for the identified potential contaminants of concern, namely total recoverable heavy metals and OCPs, with polycyclic aromatic hydrocarbons (PAHs) and semi-quantitative asbestos also included in two samples collected from the piggery/offal pit area, and the one samples from adjacent to the incinerator. Where potential asbestos containing material (PACM) was observed (piggery/offal pit area and incinerator), selected samples were collected for bulk analysis.

Phase 2 investigation

In the phase 2 investigation, the four samples held cold from phase 1 were analysed along with all 25 surface samples were analysed for heavy metals, with all these samples except SS202 also analysed for asbestos (presence/absence). The surface sample at SS202 was not analysed due to visual evidence of ACM being observed as the sample was collected (meaning the sample would have returned a positive result). Instead, a sample from 0.1m from this location was analysed for asbestos (presence/absence). Two samples from 0.15m bgl (SS208 and SS211) were analysed for asbestos (presence/absence). Five surface samples were analysed for PAHs.

The schedule of sampling and analysis is provided in **Table 18**.

All sampling locations are shown in **Appendix 5**.

5.4 Sample Analysis

Soil samples were collected on 4 and 5 January 2022 (phase 1 investigation) and 24 February 2022 (phase 2 investigation). All samples were submitted to Hill Laboratories for analysis as detailed in **Table 18**. Except for samples from the stockyards, all OCP analysis was of laboratory composited samples (between two and four sub-samples). The stockyard samples were discrete, rather than composite samples. Details of subsamples used in each composite can be found in the results assessment tables (**Appendix 6**).

Table 10 Sampling and Analysis

Location ID	Depth below ground level (m)	Asbestos: Presence/Absence	Analytes				
			Asbestos: Semi-quantitative	Asbestos bulk sample	Heavy Metals	OCPs	PAHs
Stockyards							
SY01	0.0 - 0.1	-	-	-	✓	✓	-
SY02	0.0 - 0.1	-	-	-	✓	✓	-
SY03	0.0 - 0.1	-	-	-	✓	✓	-
SY04	0.0 - 0.1	-	-	-	✓	✓	-
SY01	0.2	-	-	-	✓	-	-
SY02	0.2	-	-	-	✓	-	-
SY03	0.2	-	-	-	✓	-	-
SY04	0.2	-	-	-	✓	-	-
Piggery/offal pit							
P01	0.0 - 0.1	-	✓	-	✓	-	-
P02	0.0 - 0.1	-	✓	-	✓	-	-
P03	0.0 - 0.1	-	-	-	✓	-	✓
P04	0.0 - 0.1	-	-	-	✓	-	✓
PPACM1	N/A	-	-	✓	-	-	-
PPACM2	N/A	-	-	✓	-	-	-
PPACM3	N/A	-	-	✓	-	-	-
SS215	0.0	✓	-	-	✓	-	-
SS216	0.0	✓	-	-	✓	-	-
SS217	0.0	✓	-	-	✓	-	-
SS218	0.0	✓	-	-	✓	-	-
SS219	0.0	✓	-	-	✓	-	-

SS220	0.0	✓	-	-	✓	-	-
SS221	0.0	✓	-	-	✓	-	-
SS222	0.0	✓	-	-	✓	-	-
SS223	0.0	✓	-	-	✓	-	-
SS223a	0.0	✓	-	-	✓	-	-
SS224	0.0	✓	-	-	✓	-	-
Topsoil stockpile							
TS01	0.0 - 0.1	-	-	-	✓	✓	-
TS02	0.0 - 0.1	-	-	-	✓	✓	-
Incinerator							
I01	0.0 - 0.1	-	✓	-	✓	-	✓
IPACM1	N/A	-	-	✓	-	-	-
SS201	0.0	✓	-	-	✓	-	-
SS202	0.0	-	-	-	✓	-	-
SS202	0.1	✓	-	-	-	-	-
SS203	0.0	✓	-	-	✓	-	-
SS204	0.0	✓	-	-	✓	-	-
SS205	0.0	✓	-	-	✓	-	-
SS206	0.0	✓	-	-	✓	-	-
SS207	0.0	✓	-	-	✓	-	-
SS208	0.0	✓	-	-	✓	-	-
SS208	0.15	✓	-	-	-	-	-
SS209	0.0	✓	-	-	✓	-	-
SS210	0.0	✓	-	-	✓	-	-
SS211	0.0	✓	-	-	✓	-	-
SS211	0.15	✓	-	-	-	-	-
Milking Shed/historic wastewater treatment pad							
M01	0.0 - 0.1	-	-	-	✓	✓	-
M02	0.0 - 0.1	-	-	-	✓	✓	-
M03	0.0 - 0.1	-	-	-	✓	✓	-
M05	0.0 - 0.1	-	-	-	✓	✓	-
M06	0.0 - 0.1	-	-	-	✓	✓	-
M07	0.0 - 0.1	-	-	-	✓	✓	-
M08	0.0 - 0.1	-	-	-	✓	✓	-
Fields							
F01	0.0 - 0.1	-	-	-	✓	✓	-
F02	0.0 - 0.1	-	-	-	✓	✓	-
F03	0.0 - 0.1	-	-	-	✓	✓	-
F04	0.0 - 0.1	-	-	-	✓	✓	-
F05	0.0 - 0.1	-	-	-	✓	✓	-
F06	0.0 - 0.1	-	-	-	✓	✓	-
F07	0.0 - 0.1	-	-	-	✓	✓	-
F08	0.0 - 0.1	-	-	-	✓	✓	-
Proposed wastewater discharge area							
WWTP01	0.0 - 0.1	-	-	-	✓	✓	-
WWTP02	0.0 - 0.1	-	-	-	✓	✓	-

Soak pits								
SP01	1.0	-	-	-	✓	✓	-	-
SP02	1.0	-	-	-	✓	✓	-	-
SP03	0.9	-	-	-	✓	✓	-	-
SP04	0.9	-	-	-	✓	✓	-	-
SP05	1.2	-	-	-	✓	✓	-	-
SP06	1.25	-	-	-	✓	✓	-	-
SP07	0.7	-	-	-	✓	✓	-	-
SP08	0.4	-	-	-	✓	✓	-	-
SP09	1.0	-	-	-	✓	✓	-	-
SP10	1.0	-	-	-	✓	✓	-	-

5.5 Quality Assurance / Quality Control

Quality assurance / quality control (QA/QC) procedures are described in **Appendix 1**.

The Hill Laboratories analyst made the following comment with respect to the lead result for SS208 - 0.0m:

"It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample. Replicate 1 = 44mg/kg, replicate 2 = 90mg/kg"

SS208 was taken from the incinerator area, and the potential for heterogeneous conditions is noted.

5.6 Field Observations

The weather was warm, dry and calm on both occasions that the site was visited.

5.6.1 Stratigraphy

The site is generally flat with some minor natural undulations (see **Figure 7**). The railway runs along a (presumably) man-made embankment.

Figure 7. Profile of the site, viewed from SH1



Near surface ground conditions nearer the Kowhai River, i.e., on the east/north-east side of the site is more gravelly than that to the west which has more silt.

Surface soil sampled during the investigation included topsoil comprising a thin layer of brown silt with gravel underlain by brown/grey subangular gravel in a sandy silt matrix. The amount of sandy silt increased on the western side of the site. Hard ground prevented sub-surface sampling, and only four sub-surface samples were collected (stockyard area).

Groundwater was not encountered at any location (including within the soak-pit excavations, maximum depth of 1.25m bgl).

5.6.2 Sensory Observations including Offal Pit Investigation

Aside from the solid waste and ACM, no visually stained or discoloured ground was identified. There were no olfactory indicators of contamination within the soil at any location. All soil observed appeared to be natural ground or re-worked natural ground. There was evidence of importation of minor amounts of limestone gravel - visually apparent by its white colour.

Waste at surface was observed in several locations, most notably in the piggery/farm offal pit area during the initial phase 1 investigation. See section 3.7 for further details. The majority of waste in that area had been removed when the phase 2 investigation was conducted on 24 February 2022.

During the phase 2 investigation a mechanical excavator was used to excavate a 20m long 750mm deep trench in the 'piggery/offal pit' area (location shown in Figure A5-8 in **Appendix 5**, and image presented in **Figure 8**). The objective was to identify the offal pit thought to be in this area. No evidence of an offal pit was identified.

Figure 8. Trench in 'Piggery/Offal Pit' Area



6 Tier 1 Risk Screening Assessment

6.1 Introduction

The analytical results were assessed against three categories of Tier 1 acceptance criteria / guideline values, as summarized below. These criteria, and the results are discussed in further detail in the following sub-sections.

- National criteria: To provide an assessment of potential adverse effects on all identified receptors based on generic, conservative exposure scenarios.
- Background concentrations: To determine the applicability of the NES and other legislation to the redevelopment, and to assess cleanfill disposal options.
- Disposal criteria: To determine potential re-use of material on site, or off-site disposal options should results be above background/cleanfill criteria.

Tables displaying results assessed against these criteria is provided in **Appendix 6**, and summarised details are provided below.

6.2 Results

Table 11. Results Summary

Area	Number of samples analysed	Exceedances of National Criteria	Exceedances of Background	Disposal Implications	Comments
Railway Block: Stockyards	8	None	Cadmium (all four surface samples) Lead (all four surface samples) Zinc (one of the four surface samples)	Surface soil should not be disposed of to a cleanfill	The exceedances of background do not generally suggest the presence of a dip or spray race, although zinc is detailed in the MfE 2006 sheep dip guideline as used in dips from the 1950s (which is when the corral structures are visible). Zinc is not very toxic to humans and has a high Soil Contaminant Standard, but it can be toxic to ecosystems at much lower concentrations. All samples collected from 0.2m bgl returned results consistent with background. The limited sampling is relevant, and further sampling may be warranted depending on the future use of this area.
Kowhai Downs, Lot 14: Piggery/offal pit	13 plus 3 x PACM	Asbestos as ACM Arsenic and lead in sample P04	Asbestos as ACM Arsenic in sample P04 Cadmium in all samples, copper in all except two samples, lead in four samples and zinc in all except one sample Low level detections of PAHs in four of the seven samples	Off-site disposal will require a management plan	The asbestos removal conducted after the Phase 1 investigation and subsequent asbestos sampling (phase 2 investigation) indicates that asbestos contamination has been successfully removed. This area has heavy metal contamination above background with five locations also returning results above rural residential human health SCSs.
Kowhai Downs, Lot 12: Topsoil stockpile	2	None	Cadmium in both samples	Topsoil should not be disposed of to a cleanfill	
Lot 20: Incinerator	11 surface and 3 sub-surface	Asbestos as ACM Cadmium	Asbestos as ACM Cadmium and Zinc in most samples, arsenic, copper and lead in some samples	On and off-site disposal will require a management plan	The asbestos removal conducted after the Phase 1 investigation has not been successful and ACM remains in this area of the site. The presence of ACM is health significant. The area has heavy metal contamination above background but below commercial/industrial SCSs. The incinerator is located at the northern end of Lot 20 which is indicated in the Outline Plan (Appendix 2) to be 'possible future commercial development'. Results indicate that the area shown in Figure 9 is health significant to a depth of approximately 0.15m bgl and requires management. Due to the presence of solid waste and two shipping containers, some parts of this area were not able to be investigated or to have ACM removed
Kowhai Downs, Lot 14: Milking shed/historic	8	None	Cadmium and zinc in samples M01 (zinc only), M02, M03 and M08	Surface soil should not be	

wastewater treatment pad				disposed of to a cleanfill	
Across the site: Fields	8	None	Cadmium in all samples Copper in sample F05	Surface soil should not be disposed of to a cleanfill	
House Block: Proposed treated wastewater discharge area	2	None	Cadmium in sample WWTP01	Surface soil should not be disposed of to a cleanfill	If required by ECan, the topsoil, which may contain slightly elevated cadmium (approximately 0.3mg/kg), could be removed from the disposal field area prior to commissioning.
Kowhai Downs: Soakpits	10	None	None	N/A	
House Block and Kowhai Downs Lot 18: Dwellings	0	N/A	N/A	To be determined	It was indicated during the site walkover that neither dwelling was being removed and as such they were not investigated. Potential contamination issues exist associated with the septic tank systems, hazardous goods store, asbestos and lead.

When considering disposal options for excess material generated during the project, it is recommended that environmental sustainability be considered. There are opportunities for on-site management of waste soil at this site.

Figure 9. Area with Health Significant Asbestos Present to a Depth of Approximately 0.15m



Agon Solutions Ltd 2022: "The areas beneath the containers, timber pile, farm equipment and boulders could not be visually investigated."

7 Revised Conceptual Site Model (CSM)

The CSM for this site has been updated based on the findings from the DSI. Because the offal pit has not been identified, potentially complete exposure pathways associated with that area have not been able to be refined.

The results of the investigation indicates complete exposure pathways as presented in **Table 20**.

Table 12 Revised Complete Exposure Pathways

Source	Pathway	Receptor	Location
Offal pit	Groundwater, direct contact and ground gas	Construction workers, future occupants	Lot 13/14
Asbestos	Fibre emissions	Construction workers, future occupants	Lot 20 (incinerator) - see Figure 9
Heavy Metals	Direct contact, ingestion, inhalation	Construction workers, future occupants	Lot 14

8 Conclusions and Recommendations

8.1 Conclusions

8.1.1 Overview of site conditions

A walkover, interview with the current occupier and phase 1 soil sampling investigation were conducted at the site on 4 and 5 January 2022.

Solid waste was observed at limited surface locations, particularly in the piggery/offal pit area of the site. No other evidence of contamination, such as staining, or odours were identified, but bulk asbestos was noted as described below. The presence of a potential landfill located close to Stoney Creek was not substantiated through written/verbal records or visual indicators, nor was the presence of a potential livestock dip located close to the railway line (with a limited sampling programme failing to identify chemicals associated with dip/spray treatments).

A total of thirty-nine soil samples and four samples of bulk material were collected in the phase 1 investigation and analysed from locations across the site. Based on the phase 1 investigation results, solid waste was removed from the 'piggery/offal pit' area by Mr Watherston, an asbestos removal programme was conducted at the site by Agon Solutions Ltd, and a phase 2 investigation was undertaken by CLS.

The phase 2 investigation fieldwork was conducted on 24 February 2022 and included the collection of surface and subsurface samples from eleven locations in the 'incinerator' area and surface and subsurface samples from eleven locations in the 'piggery/offal pit' area.

Collectively, the following issues are identified based on the results:

Contaminant	Area	Issues
Asbestos	Kowhai Downs Lot 14 'piggery/offal pit' area	<ul style="list-style-type: none"> Asbestos, as ACM, was confirmed during the phase 1 investigation in the 'piggery/offal pit' area, but results of the phase 2 investigation indicate that it has been successfully removed.
	Lot 20 'incinerator' area	<ul style="list-style-type: none"> Asbestos, as ACM, was confirmed during the phase 1 investigation in the 'incinerator' area and results of the phase 2 investigation indicate that it has not been successfully removed. Areas of residual health significant contamination are shown in Figure 9. The presence of above ground structures and solid waste prevented full investigation/ACM removal in the 'incinerator' area.
Heavy metals	Kowhai Downs Lot 14 'piggery/offal pit' area	<ul style="list-style-type: none"> This area has heavy metal contamination above background with health significant results identified at five surface locations.
	Lot 20 'incinerator' area	<ul style="list-style-type: none"> This area has heavy metal contamination above background but below commercial/industrial human health SCSs.
OCPs and heavy metals	Railway Block stockyard	<ul style="list-style-type: none"> This area has heavy metal contamination in surface samples above background but below rural residential human health SCSs.
Offal	Kowhai Downs Lot 14 'piggery/offal pit' area	<ul style="list-style-type: none"> Excavation of a 20m long trench failed to identify the location of the offal pit
Lead based paint	Kowhai Downs Lot 18 dwelling	<ul style="list-style-type: none"> Lead is likely to be present in surface soils around the 69 Inland Kaikōura Road dwelling. This area has not been investigated
Hazardous substances	House Block	<ul style="list-style-type: none"> A hazardous goods store is present adjacent to the dwelling at 392 SH1

8.1.2 ECan s92 request for further information

This report meets ECan's requirement for production of a preliminary site investigation (PSI). Soil sampling of the partially excavated soak pits returned results indicative of an absence of contamination from these structures. Soil sampling from locations within the fields provides further data indicative of a general lack of contamination at the site. Slightly elevated cadmium concentrations were found, but the concentrations are low and assumed to be associated with superphosphate fertiliser applications to the land.

The localised contamination in the piggery/offal pit and incinerator areas can be addressed through the recommendations in this report. This report meets item one of the ECan request for further information.

8.1.3 Suitability of site for proposed development

Once the recommendations in this report have been completed, from a contaminated soil perspective the site will be suitable for the development as indicated in the Outline Plan (**Appendix 2**).

8.1.4 Waste disposal

Remaining solid waste and shipping containers require management, for example by removal from site to an appropriate location.

The offal pit (if it exists) and remaining contamination at the site will need to be handled and disposed of using procedures defined in a site-specific contaminated site management plan (CSMP). Retention on site, subject to its appropriate management and the use of an appropriately engineered on-site containment facility is theoretically possible.

8.2 Recommendations

- The solid waste present on the site (including shipping containers and material in the hazardous goods store at 392 SH1) should be removed and taken to appropriate alternative locations.
- A contaminated site management plan should be produced to manage the identified contamination.
- Prior to development of the area north of the railway land ('Railway Block') supplementary investigation of soil, for example using a portable XRF instrument in addition to laboratory analysis, should be considered due to the limited nature of the sampling undertaken in this investigation.
- If either dwelling, associated septic tanks or the hazardous goods store are to be removed, investigation of soil for contamination would be required.
- To comply with ECan's Rule 5.185, and to meet the ECan requirement 1 in their S92 request for further information (copy in **Appendix 2**), a copy of this report should be supplied to them.
- A copy of this report should be supplied to Kaikoura District Council to assist them in meeting their administrative requirements with respect to the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

9 Reference List

Agon Solutions Ltd 2022, 69 Inland Kaikoura Road, Asbestos Removal Report.

BRANZ 2017, *New Zealand Guidelines for Assessing and Managing Asbestos in Soil*, BRANZ, Wellington.

Environment Canterbury (ECan) 2007a, *Background Concentrations of Trace Elements in Canterbury Soil. Addendum 1: Additional Samples and Timaru Specific Background Levels*, Environment Canterbury, Christchurch.

Environment Canterbury (ECan) 2007b, *Background Concentrations of Polycyclic Aromatic Hydrocarbons in Christchurch Urban Soils*, Environment Canterbury, Christchurch.

Ministry for the Environment (MfE) 1997, *Guidelines for Assessing Gasworks Sites in New Zealand*, Ministry for the Environment, Wellington.

Ministry for the Environment (MfE) 1998, *Ambient Concentrations of Selected Organochlorines in Soils*, Ministry for the Environment, Wellington.

Ministry for the Environment (MfE) 2004, *Module 2 - Hazardous waste guidelines: Landfill waste acceptance criteria and landfill classification*, Ministry for the Environment, Wellington.

Ministry for the Environment (MfE) 2006, *Identifying, Investigating and Managing Risks Associated with Former Sheep-dip Sites*, Ministry for the Environment, Wellington

Ministry for the Environment (MfE) 2011, *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand*, Ministry for the Environment.

Ministry for the Environment (MfE) 2012, *Users' Guide. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*, Ministry for the Environment.

Ministry for the Environment 2021, *Contaminated Land Management Guidelines No 1: Reporting on Contaminated Sites in New Zealand (Revised 2021)*. Wellington: Ministry for the Environment.

Ministry for the Environment 2021, *Contaminated Land Management Guidelines No 5: Site Investigation and Analysis of Soils (Revised 2021)*. Wellington: Ministry for the Environment.

National Environment Protection (Assessment of Site Contamination) Measure 2013. *Schedule B1. Guideline on Investigation Levels for Soil and Groundwater*. NEPC, Australia.

Parliamentary Counsel Office 2011, *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011*, Parliamentary Counsel Office, Wellington.

Rattenbury M.S., Townsend D.B., Johnston, M.R., (compilers) 2006. *Geology of the Kaikoura area*. Institute of Geological and Nuclear Sciences 1:250,000 geological map 13. 1 sheet + 70p. Lower Hutt, New Zealand: GNS Science. ISBN 0-478-09925-8

Appendix 1

About Your Report

Important Information About Your Report



Contaminated Land Solutions (CLS) is an independent, New Zealand owned company (NZBN: 9429049086843).

1 Limitations

1.1 Use of this Report

- CLS has prepared this report for Drones at Work Limited, exclusively for its use. It has been prepared in accordance with our scope of services and the instructions given by or on behalf of Drones at Work Limited. Data or opinions contained within the report may not be used in other contexts or for any other purposes without CLS's prior review and agreement.
- CLS accepts no responsibility or liability to any third party for the use of, or reliance on, the report by any third party and the use of, or reliance on, the report by any third party is at the risk of that party.

1.2 Project Specific Limitations

- In preparing the report, CLS has relied upon plans and other information ('Client Data') provided by or on behalf of the Client. Except as otherwise stated in the report, CLS has not verified the accuracy, currency or completeness of the Client Data.
- The fieldwork was conducted using hand tools only and samples were not able to be obtained from depth.
- The presence of an offal pit has not been able to be determined and any riverbank contamination has not been assessed.
- This report has not specifically promoted the involvement of tangata whenua. The involvement of Māori stakeholders in the issues raised by the report should be considered by the client. Likewise, mātauranga Māori may be relevant when considering the findings of the report and this knowledge has not been sought during the production of this report. The southern third (approximate) of the site is within a Rūnanga Sensitive Area: Wāhi Tapu.

1.3 Limits on Investigation and Information

- This investigation is based on information collected at the times indicated in the report. This information will become outdated with time.
- Soil and rock formations are often variable, and this along with use, storage or disposal of hazardous substances on a site can result in heterogeneous distribution of contaminants. Contaminant concentrations may be evaluated at chosen sample locations - however, conditions between sample sites can only be inferred based on geological and hydrological conditions and the nature and the extent of identified contamination. Boundaries between zones of contamination are often indistinct, and therefore interpretation is based on available information and the application of professional judgement.
- Only a finite amount of information has been collected to meet the specific technical requirements of Drones at Work Limited's brief and this report does not purport to completely describe all the site's characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it must be appreciated that actual conditions could vary from the assumed model.
- This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should further information become available regarding the conditions at the site, including previously unknown likely sources of contamination, CLS reserves the right to review the report in the context of the additional information.
- This report has been prepared for Drones at Work Limited for its own use and is based on information provided. CLS takes no responsibility and disclaims all liability whatsoever for any loss or damage that Drones at Work Limited may suffer as a result of using or relying on any such information or recommendations contained in this report, except to the extent CLS expressly indicates in this report that it has verified the information to its satisfaction. This report is not to be reproduced either wholly or in part without our prior written permission.

1.4 Reporting Standard

This report meets the requirements of the Ministry for the Environment *Contaminated Land Management Guidelines No 1: Reporting on Contaminated Sites in New Zealand (Revised 2021)* (MfE 2021) and is certified by a practitioner meeting the requirements to be classified as a Suitably Qualified and Experienced Practitioner (SQEP).

1.5 Fieldwork Standards

Sampling of soil is a permitted activity in Regulation 8 of the NES Soil provided defined requirements are met. The sampling conducted for this investigation complied with the NES Soil requirements.

Rule 5.185 in Environment Canterbury's CL&WRP relates to the use of land for a site investigation to assess concentrations of hazardous substances that may be present in the soil. This is a permitted activity provided the conditions are met, and these are:

- '1. The site investigation is conducted in accordance with Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils (MfE, 2011) and reported in accordance with Section 4 of the Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand (MfE, 2011); and*
- 2. The person or organisation initiating the site investigation provides a copy of the report of the site investigation to the ECan within two months of the completion of the investigation. Condition (1) has been met as detailed in this report. Condition (2) has been included as a recommendation at the end of this report.'*

The sampling conducted for this investigation complied with the regional requirements detailed above (noting that the most recent versions of the MfE guidelines have been used) and providing a copy of this report to Environment Canterbury is included as a recommendation.

2 Quality Assurance / Quality Control

Quality assurance / quality control (QA/QC) procedures were implemented during field investigation works. All samples were collected using chain of custody (COC) documentation procedures.

2.1 Sample Integrity

Prior to sampling, and between sample locations, equipment used (i.e. hand trowel/hand auger) was cleaned by wiping with a cloth, washing with decontamination solution (Decon 90), and rinsing with potable water. Soil samples were collected using a clean pair of nitrile gloves for each sample and then placed into laboratory supplied sample containers. Each sample was given a unique sample identification number and the location the sample was collected from was recorded at the time of sampling.

Following collection, all samples were placed directly into chilled storage and transported, under standard chain of custody procedures, to an International Accreditation New Zealand (IANZ) laboratory for analysis. The remaining material was placed back into its original location, ensuring each area was returned to a flat condition following completion of the sampling and in compliance with Regulation 8 of the NES (soil sampling).

2.2 Laboratory

Hill Laboratories was selected to perform analysis of all samples. This laboratory is IANZ accredited and each of the test methods used are also IANZ accredited. All samples were analysed within the appropriate holding times for each analyte.

3 Results Interpretation

3.1 Background

The analytical results were assessed against three categories of Tier 1 acceptance criteria / guideline values, as summarized below.

- National criteria: To provide a Tier 1 assessment of potential adverse effects on all identified receptors based on generic, conservative exposure scenarios.
- Published background concentrations: To assist with determining the applicability of the NES and other legislation to the redevelopment, and to assess cleanfill disposal options.
- Disposal criteria: To determine potential off-site disposal options or material that needs to be taken off-site and which has contaminant concentrations above background.

3.2 Tier 1 Assessment Criteria for Soil

3.2.1 National Criteria

The national criteria referenced in this report have been selected using the receptors identified in the conceptual site model and the hierarchy defined in the Ministry for the Environment's *Contaminated Land Management Guideline No. 2 - Hierarchy and Application in New Zealand of Environmental Guideline Values*. For human health values, the Ministry for the Environment's *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health* has been used.

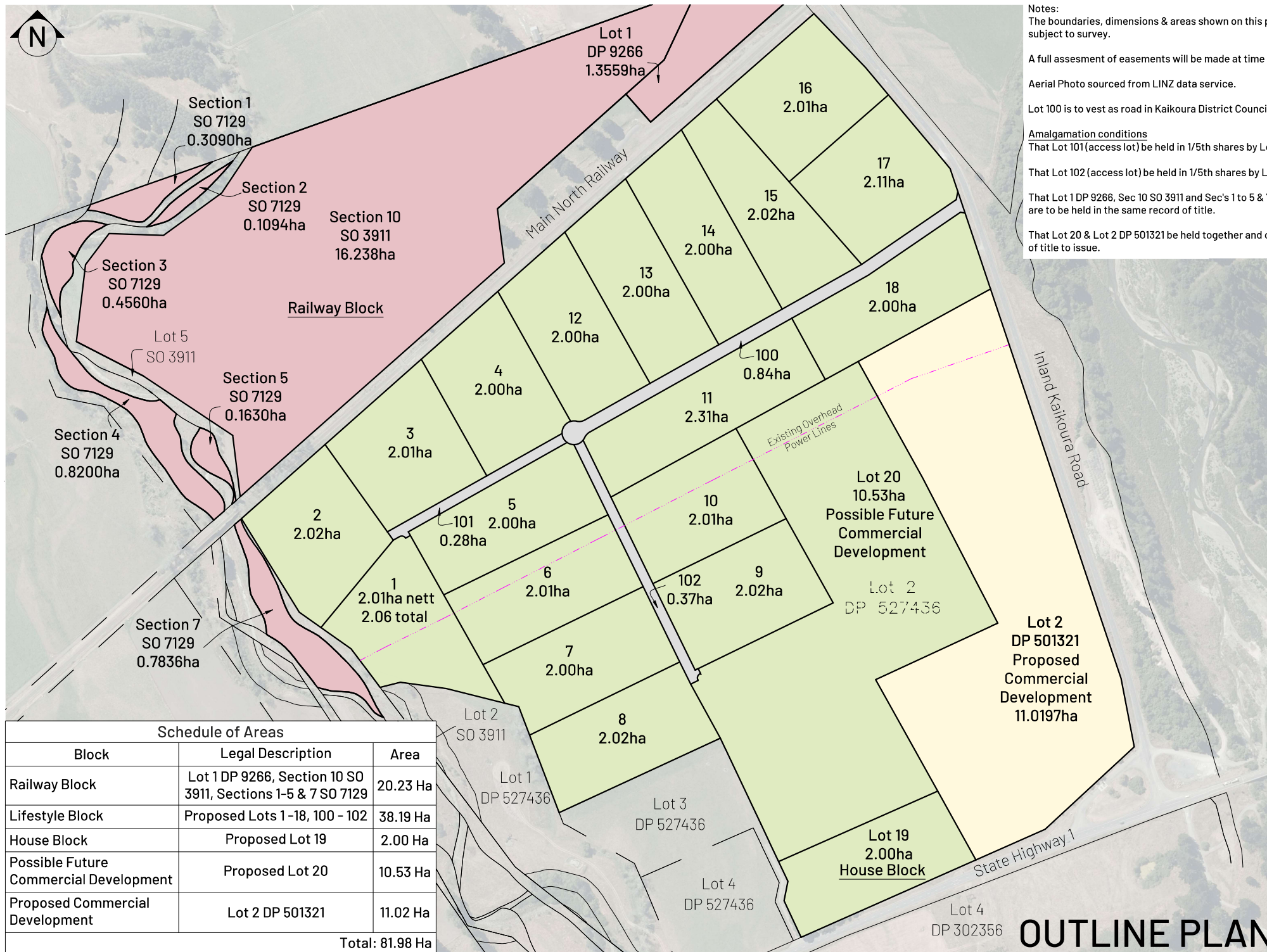
3.2.2 Assessment Against Expected Background Concentrations

Background concentrations of heavy metals/metalloids, PAHs and OCPs in the locality were identified using:

- *Background Concentrations of Trace Elements in Canterbury Soil. Addendum 1: Additional Samples and Timaru Specific Background Levels (ECan, 2007a).*
- *Background Concentrations of Polycyclic Aromatic Hydrocarbons in Christchurch Urban Soils (ECan, 2007b).*
- *Ambient Concentrations of Selected Organochlorines in Soils (MfE 1998).*

Appendix 2

Outline Plans and
ECan Request



Notes:
 The boundaries, dimensions & areas shown on this plan are subject to survey.

A full assesment of easements will be made at time of survey.

Aerial Photo sourced from LINZ data service.

Lot 100 is to vest as road in Kaikoura District Council.

Amalgamation conditions
 That Lot 101 (access lot) be held in 1/5th shares by Lots 1-5.
 That Lot 102 (access lot) be held in 1/5th shares by Lots 6-10.
 That Lot 1 DP 9266, Sec 10 SO 3911 and Sec's 1 to 5 & 7 SO 7129 are to be held in the same record of title.
 That Lot 20 & Lot 2 DP 501321 be held together and one record of title to issue.

Schedule of Areas		
Block	Legal Description	Area
Railway Block	Lot 1 DP 9266, Section 10 SO 3911, Sections 1-5 & 7 SO 7129	20.23 Ha
Lifestyle Block	Proposed Lots 1-18, 100 - 102	38.19 Ha
House Block	Proposed Lot 19	2.00 Ha
Possible Future Commercial Development	Proposed Lot 20	10.53 Ha
Proposed Commercial Development	Lot 2 DP 501321	11.02 Ha
Total:		81.98 Ha

Schedule of Block Areas		
Scale	1:4000 at A3	
Date	6/5/2021	
Client	Kaikoura Business Park 2021 Ltd	
Drawn	AM	
Review	CT	
Rev.	Date	Amendment
A	20/5/21	client issue
B	24/5/21	title block text size changed
C	24/5/21	commercial block areas separated schedule of areas table amended
Revision	C	
Sheet	1 of 1	



KOWHAI DOWNS



69 Inland Kaikoura Rd

Scale 1:1500 @A1
 Date 20 May 2021
 Design EL
 Drawn EL
 Review EL

Rev.	Date	Amendment

Sheet 1

10 November 2021



Baseline Group Limited
Attn To: Thomas Holmes
PO Box 8177
Christchurch 8440

58 Kilmore Street
PO Box 345
Christchurch 8140
P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz
Customer Services
P. 03 353 9007 or 0800 324 636
www.ecan.govt.nz

Kia ora Thomas

Request for Further Information

Response required by: 30 November 2021
Record Number/s: CRC221483, CRC221484 & CRC221712
Applicant Name: Kaikoura Business Park Limited
Activity Description: To discharge stormwater and domestic wastewater to land and for earthworks over an aquifer system

As you are aware, I (Stephanie Williams) have been processing the above resource consent application.

The information listed in Attachment 1 to this letter is hereby requested under Section 92 of the Resource Management Act 1991 (the RMA). As this information is required in order to fully understand the potential effects of the proposal, we are unable to further process the application until it has been supplied.

The options available to you under Section 92A(1) of the RMA are summarised below. A response is required by 30 November 2021. You must choose one of these options.

A. Supply the requested information by 30 November 2021

If the information can be easily collated and supplied by this date, please provide it in writing (via email is fine) to Stephanie Williams.

B. Agree in a written notice by 30 November 2021 to supply the information requested

Sometimes technical information will take some time to collate or key contacts may not be immediately available. If you need more time to supply the information requested, please advise me in writing when you can provide the information. You can do this via email or letter.

C. Refuse in a written notice by 30 November 2021 to supply the requested information

If you choose not to provide the requested information by the above date, or any date subsequently agreed to by the Canterbury Regional Council, then your application must be publicly notified and may be declined.

Public notification enables any member of the public, including potentially affected parties, to submit on your proposal. If submission/s are received on your application, then you can expect a hearing to be held. Information on [the notification process](#) and on the [likely costs](#) for notification and a hearing can be found on our website.

Please contact me via email (Stephanie.Williams@pdp.co.nz) or phone (021 039 0537) if you have any questions.

Ngā mihi



Christine Butler
Team Leader Consents Planning

cc:
Kaikoura Business Park 2021 Limited
Attn To: Dennis Thompson
PO Box 8177
Riccarton
Christchurch 8440

ATTACHMENT 1

Information Requested under Section 92 of the Resource Management Act 1991

Application Number/s: CRC221483, CRC221484 & CRC221712

Date: 04
November 2021

1. Effects of Human Health and the Environment

The Environment Canterbury Regional Council Contaminated Land Team reviewed the location of the proposed site to confirm the presence of any potentially contaminated soils and/or Hazardous Activities and Industries List (HAIL) activities. Their review noted concerns of a potential HAIL site (Category A8) due to aerial imagery of land use observed in 1970s that illustrates agriculture, and the presence of sheds and yards on the site to be developed. These buildings may have been painted with lead-based paint and appear to have been constructed when asbestos was prevalently used. Sheds should also be investigated for potential storage of pesticides and hazardous substances. As there is the potential for some of these sites to be considered HAIL activities due to the presence of sheds and yards, further investigation is required to assure that earthworks do not disturb or redistribute contaminated soil across the site.

- a. Please provide a preliminary site investigation report (PSI) by a suitably qualified and experienced practitioner (SQEP) on contaminated land matters.
- b. Based on the findings of the PSI report, please confirm that there are no contaminated or potentially contaminated material in the vicinity of the base and sides of the soakage pits, and the base of the swales.

Please note, depending on the conclusion and recommendations of the PSI report, further investigation, remediation and site validation may be required. In addition, depending on the results of the PSI, an additional resource consent may be required for the construction phase stormwater discharge if it is found that the stormwater discharge will be non-compliant with Condition (4) of Rule 5.94A.

2. Effects on Water Quality from Proposed Wastewater Discharge

The maximum Total Nitrate (TN) concentration in the treated effluent is expected to be 30 mg/L. However, the Assessment of Environmental Effects (AEE) provides only a qualitative description on how passage through the land application system and soil will reduce this concentration. There is no quantitative assessment included to support this statement. Therefore:

- a. Please provide an assessment supported with quantitative data which supports the conclusion that the maximum TN concentration exiting the onsite wastewater treatment system is expected to be 30 mg/L.

3. Mounding Assessment of Effects

A qualitative assessment has been provided in section 7.2 of the AEE which infers that mounding is unlikely. The groundwater technical review has assessed the groundwater separation distance between the bottom of the soak pits (2.5 m bgl) and the highest groundwater level (2.6 m bgl) to be only 0.1 m. Accordingly, mounding could occur under wet weather conditions. The AEE has not assessed the potential risks of this occurring or the expected related effects. It is noted that a site-specific infiltration test has not been undertaken to date. Therefore:

- a. Please provide an assessment that is supported with quantitative data of the expected risks and effects of mounding based on the expected groundwater separation distance of 0.1 m. Please note this should be supported by soil infiltration tests.

4. Potential Effects on Surface Water Bodies due to the Migration of Contaminants and Characterisation of Surface Water Bodies

A description of the nature and current ecological and cultural values of the adjacent surface waterways has not been provided. Section 7.4 of the AEE also describes the effects on surface water qualitatively and does not reference technical information to support the assessment that there is a 'moderate' degree of hydraulic connection, except the reference to groundwater flow direction. The potential resulting effects of contaminants migrating through groundwater to surface water bodies has also not been quantitatively assessed. Therefore:

- a. Please provide a description of the adjacent waterways, their values and any known or likely sensitivities.
- b. Please provide an assessment that is supported with quantitative data and demonstrates:
 - i. The degree of hydraulic groundwater connection to surface water bodies; and
 - ii. The likelihood of contaminants (from stormwater and wastewater discharges) migrating to surface water bodies including coastal waters; and
 - iii. The potential effects on the water quality and aquatic ecology of surface water bodies namely, the Kowhai River and Stony Creek), as a result of migrating contaminants.

5. Cumulative Effects on Groundwater

The AEE states that there is no groundwater quality data available for any bores within 2 km of the application site. However, the groundwater technical review noted the following bores and existing resource consents which can be used to assess the cumulative effects of the proposal on groundwater:

- i. Bore O31/0280, which is located 1 km west of the site. This bore is part of the CRC Groundwater Quality Runs and has a long-term recent data set.
 - ii. Bore O31/0219, which is located 1.3 km east of the site. Similar to bore O31/0280, this bore is also part of the CRC Groundwater Quality Runs and has a long-term recent data set.
 - iii. There is also data available for other bores within 2 km via the CRC GIS layer 'Water Quality – Groundwater Sites'.
 - iv. There is an existing human effluent discharge consented under CRC211930 at Lot 3 DP 5277436, 392b State Highway 1, owned by MGP Contracting LTD, which is located adjacent to the applicant's property.
- a. Therefore, please provide a revised cumulative effects assessment on groundwater that is supported with quantitative data.

6. Stormwater System Design and Secondary Flows

Pattle Delamore Partners Limited (PDP) undertook a technical review of the proposed stormwater treatment system. Based on the outcome of the review the following further information is required:

- a. Please provide further information on the management of construction phase stormwater for the entire site including the residential sections and any proposed staging of earthworks.
- b. Please provide additional information (i.e. location) and calculations on the above-ground channel and the secondary system, including further clarifications of the systems in place to accommodate the 1% AEP (1 in 100 year) storm event and the flood overland flows from Kowhai River.
- c. Please provide additional calculations to confirm that the soakage pits have been designed to the rainfall intensities of all storm events up to the 24 hour period, and confirm the critical event has been used to design the soakage pits.
- d. Please elaborate on the design implications and inclusion of the slope factor for the soak pit capacity calculations.
- e. Please provide additional information for the roadside swale design to confirm the design storm event, the function of the roadside swales i.e., for treatment or for conveyance, and the expected removal rate of contaminants.
- f. Please provide further information (supported by quantitative data) on the discharge stormwater quality such as the expected loading for each contaminant prior to the discharge into the stormwater system. Please include in your response further information on how the expected contaminant concentrations present in stormwater from the site are anticipated to be lower than typical urban concentrations.
- g. Please confirm who will be responsible for the maintenance of the stormwater system for the duration of the consent and provide a maintenance schedule for the stormwater system.
- h. Please provide an illustration of the expected secondary stormwater flow paths and confirm whether any secondary stormwater discharge will flow directly to the Stony Creek (or any other surface waterway). It is noted that the AEE states that secondary flow paths are likely to flow adjacent to the paddocks south to southwest of the property. This indicates it flows towards Stony Creek and may be an indirect discharge.
- i. Please provide further assessment of the flooding effects for residential properties within the flowpaths of the secondary flows, and any mitigations measures considered.
- j. Please supply the appendices provided by Environment Canterbury as part of their Flood Hazard Assessment.

Appendix 3

LLUR Statement and
aerial images

Appendix 3



Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

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

www.ecan.govt.nz

Dear Sir/Madam

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

The LLUR statement shows the land parcel(s) you enquired about and provides information regarding any potential LLUR sites within a specified radius.

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

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

Please contact Environment Canterbury if you wish to discuss the contents of this property statement.

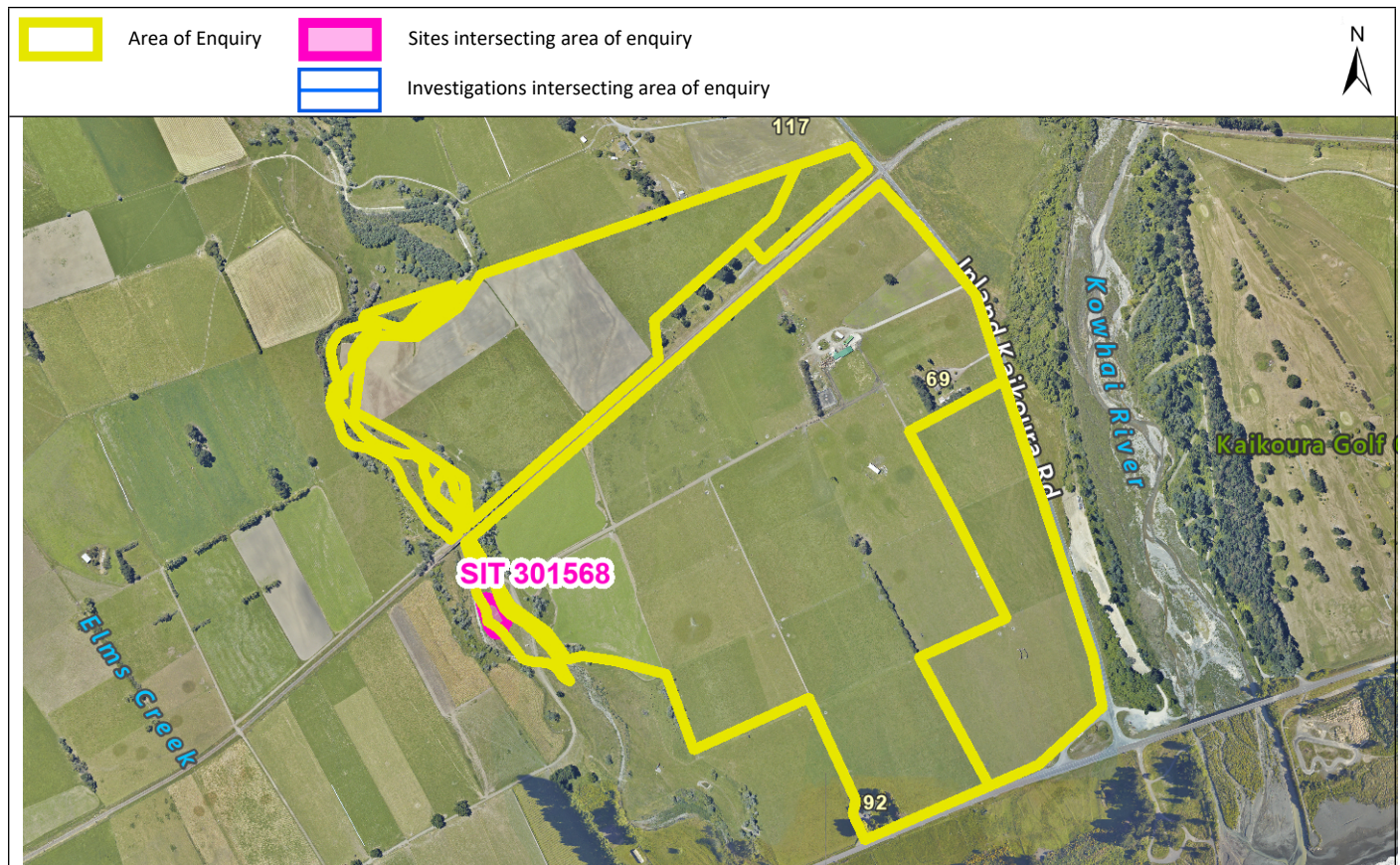
Yours sincerely

Contaminated Sites Team

Property Statement from the Listed Land Use Register

Visit ecan.govt.nz/HAIL for more information or contact Customer Services at ecan.govt.nz/contact/ and quote ENQ302848

Date generated: 09 December 2021
Land parcels: Section 4 SO 7129
 Lot 2 DP 501321
 Lot 1 DP 9266
 Section 7 SO 7129
 Section 3 SO 7129
 Lot 2 DP 527436
 Section 10 SO 3911
 Section 2 SO 7129
 Section 5 SO 7129
 Section 1 SO 7129



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

Sites at a glance

 Sites within enquiry area

Site number	Name	Location	HAIL activity(s)	Category
301568	392 STATE HIGHWAY 1	392 STATE HIGHWAY 1	G3 - Landfill sites;	Not Investigated

More detail about the sites

Site 301568: 392 STATE HIGHWAY 1 (Intersects enquiry area.)

Category: Not Investigated
Definition: Verified HAIL has not been investigated.

Location: 392 STATE HIGHWAY 1
Legal description(s): Section 3 SO 3911,Section 7 SO 7129

HAIL activity(s):

Period from	Period to	HAIL activity
2010	Present	Landfill sites

Notes:

 **Investigations:**

There are no investigations associated with this site.

Disclaimer

The enclosed information is derived from Environment Canterbury’s Listed Land Use Register and is made available to you under the Local Government Official Information and Meetings Act 1987.

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

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





Drones at Work	CLIENT	NOT FOR CONSTRUCTION	SCALE	TITLE	69 Inland Kaikoura Road, 1942 image (Source: Retrolens)
	FIGURE	FIGURE A1	NTS	REFERENCE	J2021031 DWG001
			HMD		
	PROJECT	PSI&DSI	CHECKED	PROJECT	J2021031
			NRP	FIGURE NO	A1
			DATE		
			29/12/2021		

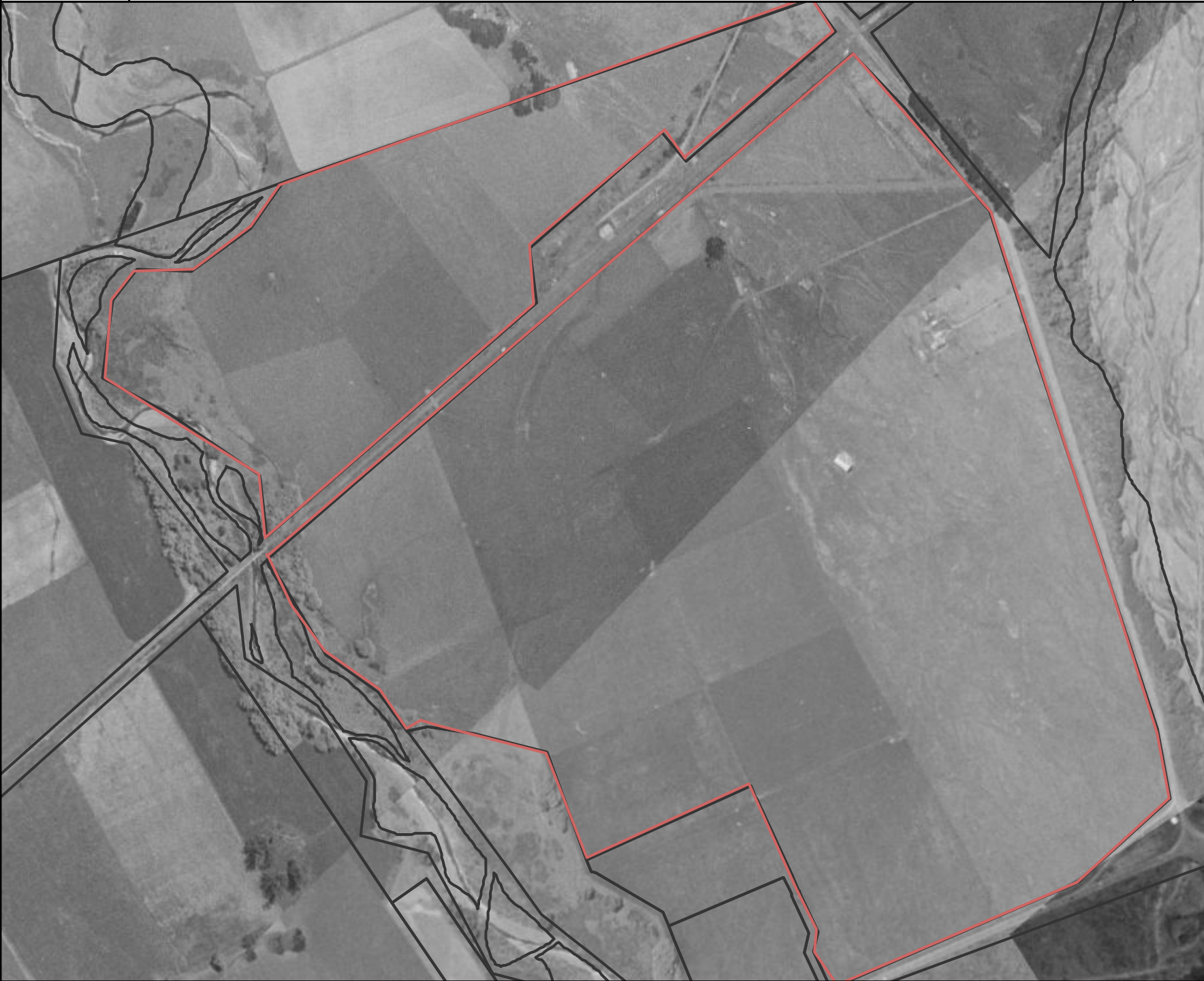


CLS contaminated land solutions
 RONGOĀ WHENUA POKE

CLIENT	NOT FOR CONSTRUCTION		SCALE	TITLE	69 Inland Kaikoura Road, 1950 image (Source: Retrolens)
	Drones at Work	FIGURE	FIGURE A2	BY	REFERENCE
PROJECT		PSI&DSI	CHECKED	PROJECT	J2021031
	DATE		FIGURE NO	A2	
			29/12/2021		



-  My drawing
-  Rating Units



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-  My drawing
-  Rating Units

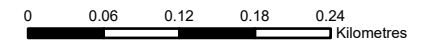


Legend note: if you have a large number of layers on the map, they may not all be visible in the legend.

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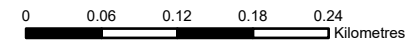


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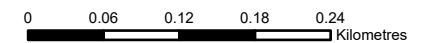


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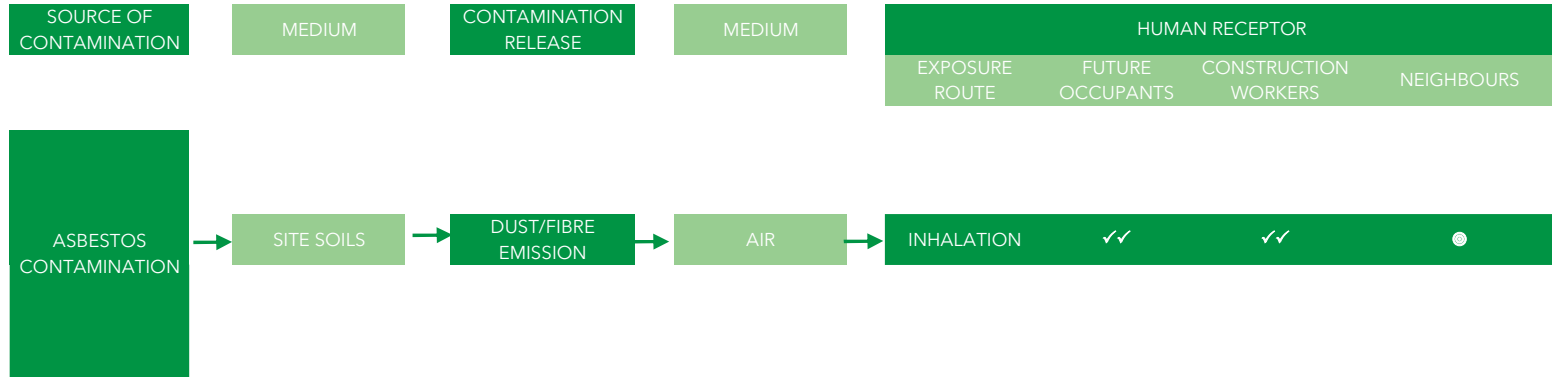
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Environment Canterbury 2021

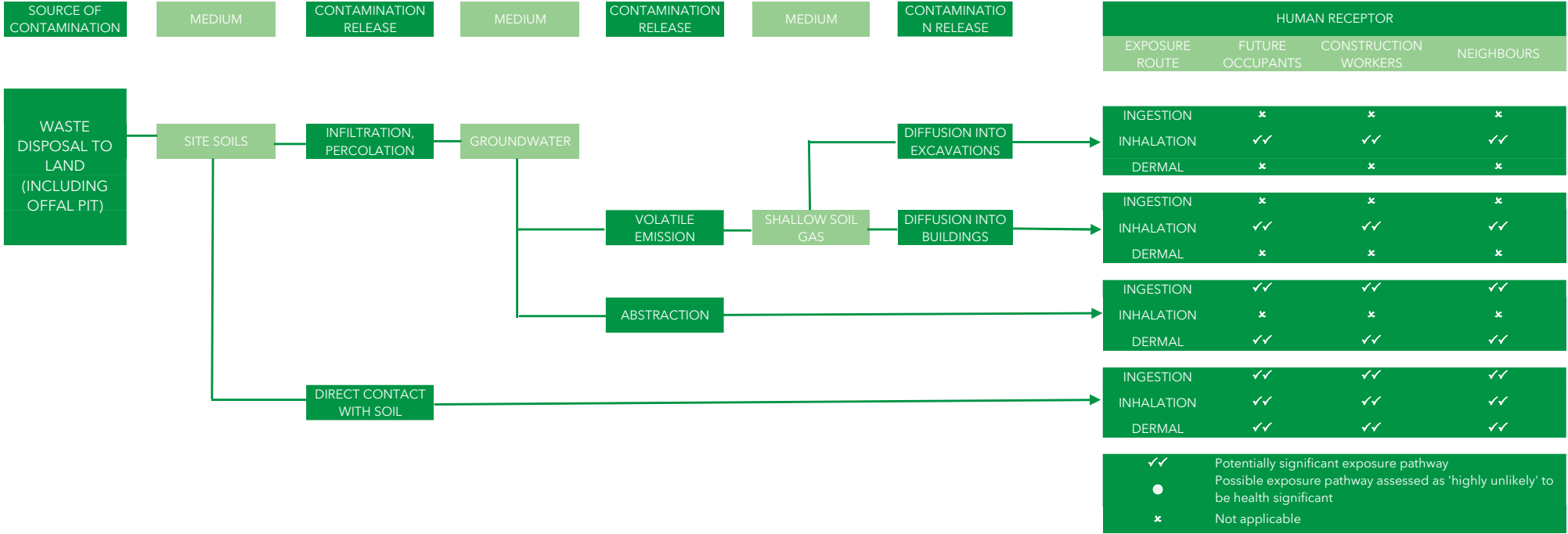
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Appendix 4

Conceptual Site Models

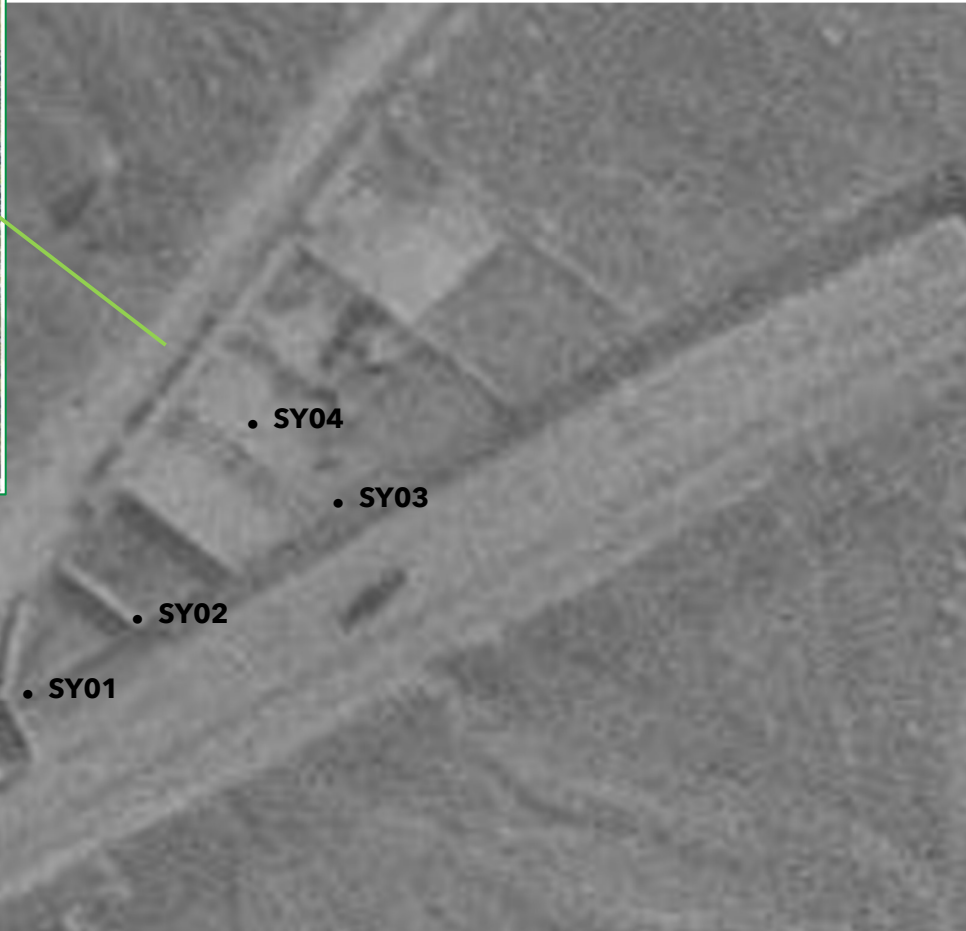


✓✓ Potentially significant exposure pathway
 ● Possible exposure pathway assessed as 'highly unlikely' to be health significant
 ✕ Not applicable



Appendix 5

Sampling Locations



CLS contaminated land solutions
RONGOĀ WHENUA POKE

CLIENT

Drones at Work Limited

NOT FOR CONSTRUCTION

FIGURE

FIGURE 1

PROJECT

69 INLAND KAIKOURA ROAD

SCALE

NTS

BY

HMD

CHECKED

NRP

DATE

24/01/2022

TITLE

REFERENCE

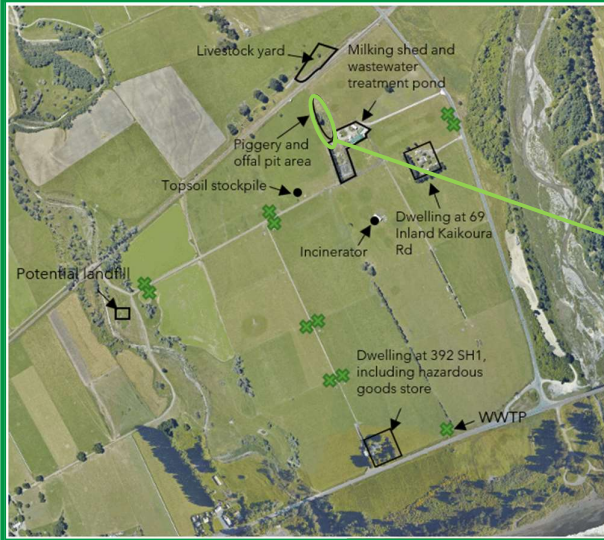
PROJECT

FIGURE NO

SAMPLING LOCATIONS STOCKYARDS

J2021031

A5 - 1



CLS contaminated land solutions
RONGOĀ WHENUA POKE

CLIENT

Drones at Work Limited

NOT FOR CONSTRUCTION

FIGURE

FIGURE 2

PROJECT

69 INLAND KAIKOURA ROAD

SCALE

NTS

BY

HMD

CHECKED

NRP

DATE

TITLE

REFERENCE

PROJECT

FIGURE NO

SAMPLING LOCATIONS
PIGGERY/OFFAL PIT_
INITIAL INVESTIGATION

J2021031

AS - 2

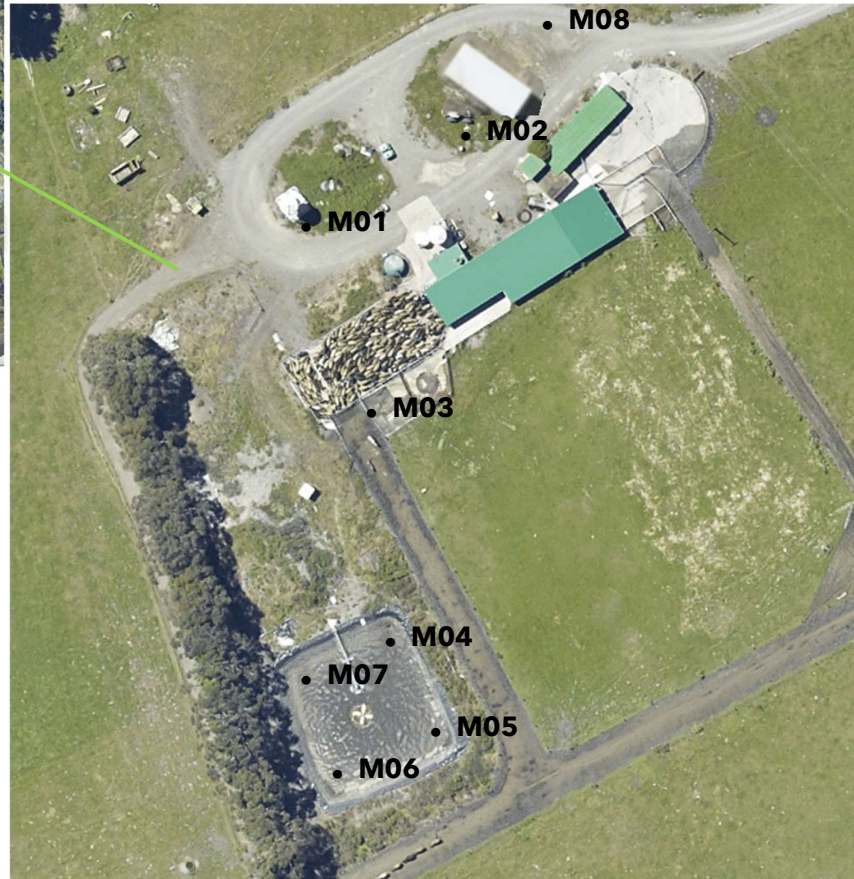



CLIENT Drones at Work Limited	NOT FOR CONSTRUCTION		SCALE	TITLE	SAMPLING LOCATIONS TOPSOIL STOCKPILE
	FIGURE	FIGURE 3	NTS	REFERENCE	
	PROJECT	69 INLAND KAIKOURA ROAD	CHECKED	PROJECT	J2021031
			DATE	FIGURE NO	A5 - 3



CLS contaminated land solutions
RONGOĀ WHENUA POKE

CLIENT	NOT FOR CONSTRUCTION	SCALE	TITLE	SAMPLING LOCATIONS
Drones at Work Limited	FIGURE 4	NTS		INCINERATOR - <u>INITIAL INVESTIGATION</u>
		BY	REFERENCE	
	PROJECT	HMD	PROJECT	J2021031
		NRP	FIGURE NO	A5 - 4
	69 INLAND KAIKOURA ROAD	DATE		
		24/01/2022		



	CLIENT		NOT FOR CONSTRUCTION		SCALE	TITLE	SAMPLING LOCATIONS MILKING SHED AREA
	Drones at Work Limited		FIGURE	FIGURE 5	NTS	REFERENCE	
			PROJECT	69 INLAND KAIKOURA ROAD	CHECKED	PROJECT	J2021031
					DATE	FIGURE NO	A5 - 5
					24/01/2022		



CLIENT Drones at Work Limited	NOT FOR CONSTRUCTION		SCALE	TITLE	SAMPLING LOCATIONS FIELDS
	FIGURE	FIGURE 6	NTS	REFERENCE	
	PROJECT	69 INLAND KAIKOURA ROAD	HMD	PROJECT	J2021031
			CHECKED	FIGURE NO	A5 - 6
			NRP		
			DATE		
		24/01/2022			



CLS contaminated land solutions
RONGOĀ WHENUA POKE

CLIENT

Drones at Work Limited

NOT FOR CONSTRUCTION

FIGURE FIGURE 7

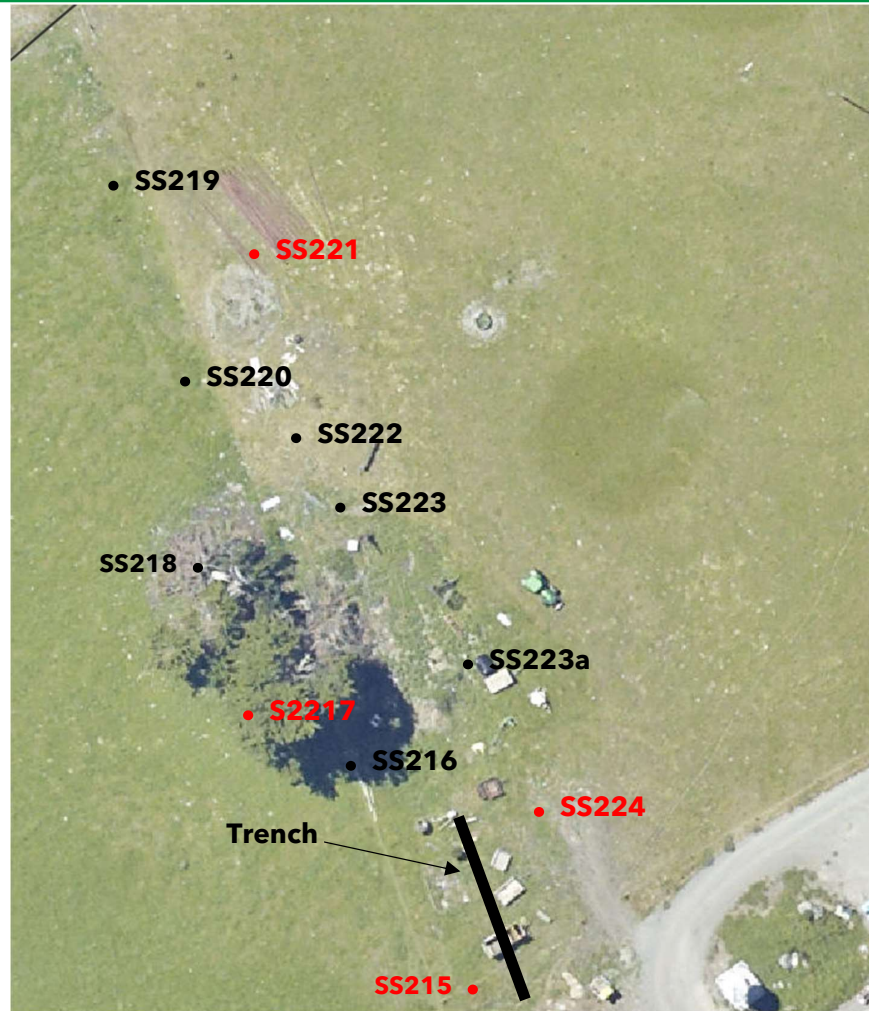
PROJECT 69 INLAND KAIKOURA ROAD

SCALE
NTS
BY HMD
CHECKED NRP
DATE 24/01/2022

TITLE
REFERENCE
PROJECT
FIGURE NO

SAMPLING LOCATIONS
SOAKPITS AND WWTP

J2021031
A5 - 7



CLIENT Drones at Work Limited	NOT FOR CONSTRUCTION		SCALE	TITLE	SAMPLING LOCATIONS PIGGERY/OFFAL PIT - PHASE 2 INVESTIGATION	
	FIGURE FIGURE 8		NTS			
		PROJECT 69 INLAND KAIKOURA ROAD		BY	REFERENCE	
			HMD	CHECKED	PROJECT	J2021031
			NRP	DATE	FIGURE NO	A5 - 8
			24/02/2022			

TRENCH DIMENSIONS	
LENGTH	20 METRES
WIDTH	1 METRE (REDUCING WITH DEPTH)
DEPTH	0.75 METRE



CLS contaminated land solutions
RONGOĀ WHENUA POKE

CLIENT	NOT FOR CONSTRUCTION	SCALE	TITLE	TRENCH IN ASSUMED OFFAL PIT AREA
Drones at Work Limited	FIGURE	FIGURE 9	REFERENCE	
	PROJECT	69 INLAND KAIKOURA ROAD	PROJECT	J2021031
			FIGURE NO	A5 - 9
			24/02/2022	



CLS contaminated land solutions
RONGOĀ WHENUA POKE

CLIENT	NOT FOR CONSTRUCTION		SCALE	TITLE	SAMPLING LOCATIONS INCINERATOR AREA - ASBESTOS RESULTS
	Drones at Work Limited	FIGURE	NTS	REFERENCE	
PROJECT		FIGURE 10	BY	PROJECT	J2021031
	69 INLAND KAIKOURA ROAD		HMD	FIGURE NO	A5 - 10
			CHECKED		
			NRP		
			DATE		
			24/02/2022		

Appendix 6

Results Assessment
Tables and
Laboratory Reports

Table No:	A1
Site:	Stock Yards
Project No:	J2021031
Sample media:	Soil
Analysis:	Total Recoverable Concentrations
End-Use:	Commercial / Industrial Outdoor Worker (Unpaved) and rural residential
Date:	24/01/2022
Revision:	0



Sample Name	SY01 - 0.0-0.1m SY02 - 0.0-0.1m SY03 - 0.0-0.1m SY04 - 0.0-0.1m				Assessment Criteria (mg/kg)				
	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	Protection of Human Health		Background	3 x Sediment Quality Guidelines	Protection of Groundwater for Potable Use
Sample Depth (m bgl)	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1					
Natural / Fill?	Reworked natural								
Soil Type	Sandy Gravel				Commercial / Industrial ^{6&7}	Rural Residential 25% ^{6&7}	Canterbury Level 2 Background Concentrations Recent ⁸	Australian and New Zealand Guidelines for Fresh and Marine Water Quality	IRB - US EPA SSL Values Dilution Factor x 20 ⁹
Metals (mg/kg)									
Arsenic	5	6	4	4	70	17	12.58	210	29
Cadmium ¹	0.27	0.35	0.26	0.39	1,300	0.8	0.19	30	8
Chromium ²	14	15	13	13	6,300	290	22.7	1110	38
Copper	14	19	13	17	>10,000	<10,000	20.3	810	-
Lead	51	49	41	97	3,300	160	40.96	660	-
Mercury ³	< 0.10	< 0.10	< 0.10	< 0.10	4,200	200	0.11	3	2
Nickel	11	14	9	10	6,000	400	20.7	156	130
Zinc	71	290	74	80	400,000	7,400	93.94	1,230	12,000
Pesticides (mg/kg)									
DDT ⁴	< 0.07	< 0.07	< 0.08	< 0.08	1,000	45	0.431	15	102*
Dieldrin ⁵	< 0.012	< 0.012	< 0.013	< 0.013	160	1.1	-	21	0.504**

Results in **green** Indicate an Exceedance of One or More of the Acceptance Criteria

The Acceptance Criteria that has been Exceeded is also in **green**

All concentrations are in mg/kg

Abbreviations:

IRB = International risk based

m bgl = meters below ground level

* SSL for DDT, DDE and DDD

** SSL for dieldrin + aldrin

Notes:

- Cadmium - SCS based on pH 5. Cadmium absorption (i.e. plant uptake of cadmium) increases with decreasing pH (see MfE)
- Chromium - SCS tabulated is for chromium VI. This is conservative as samples have been analysed for total chromium (i.e. III and VI).
- Mercury - SCS tabulated is for inorganic mercury. Samples have been analysed for total mercury and therefore this SCS is conservative.
- DDT - SCS is based on a sum of DDT, DDE and DDD
- Dieldrin - SCS applicable to either dieldrin or aldrin separately, or to the sum of aldrin and dieldrin if both are involved.
- As, Cd, Cr, Cu, Pb, Hg, B: Users Guide National Environmental Standard (NES) For Assessing and Managing Contaminants in Soil to Protect Human Health. New Zealand. 2012
- Ni & Zn: National Environmental Protection (Assessment of Site Contamination) Measure 1999 (Australia); Schedule B1 (as amended May 2013) - Guideline on Investigation Levels For Soil and Groundwater, Federal Register of Legislative Instruments F2013C00288, National Environmental Protection Council. (HIL - Health Investigation Level).
- Environment Canterbury Background Concentrations of Selected Trace Elements in Canterbury Soils. R07/1/2 Dated February 2007. Proposed level 2 background. DDT levels sourced from MfE 1998.
- Supplemental Guidance for Developing Soil Screening Levels (human health) at Superfund Sites (US EPA, 2002) based on soil pH 6.8. Figures derived for protection of potable water supply, but are also used as a guideline figure for protection of ecological receptors in waterbodies in the absence of an alternative.

Table No:	A2
Site:	Wastewater Treatment Plant, Incinerator, Topsoil Stockpile and Piggery
Project No:	J2021031
Sample media:	Soil
Analysis:	Total Recoverable Concentrations
End-Use:	Commercial / Industrial Outdoor Worker (Unpaved) and Rural Residential
Date:	24/01/2022
Revision:	0

Sample Name	TS01	TS02	WWTP01 - 0.0-0.1m	WWTP02 - 0.0-0.1m	I01 - 0.0-0.1m	P03 - 0.0-0.1m	P04 - 0.0-0.1m	Composite of TS01 and TS02	Composite of WWTP01 - 0.0-0.1m and WWTP02 - 0.0-0.1m	Assessment Criteria (mg/kg)				
										Protection of Human Health	Background	3 x Sediment Quality Guidelines	Protection of Groundwater for Potable Use	
Sample Depth (m bgl)	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1					
Natural / Fill?	Reworked natural													
Soil Type	Sandy Gravel								Commercial / Industrial ^{1&7}	Rural Residential 25% ^{6&7}	Canterbury Level 2 Background Concentrations Recent ⁸	Australian and New Zealand Guidelines for Fresh and Marine Water Quality	IRB - US EPA SSL Values Dilution Factor x 20 ⁹	
Metals (mg/kg)														
Arsenic	7	8	5	6	5	9	25	-	-	70	17	12.58	210	29
Cadmium ¹	0.27	0.25	0.27	0.17	2.6	0.57	0.48	-	-	1,300	0.8	0.19	30	8
Chromium ²	14	15	12	13	18	19	37	-	-	6,300	290	22.7	1110	38
Copper	17	16	10	11	19	27	38	-	-	>10,000	<10,000	20.3	810	-
Lead	15.6	17.5	12.2	11.5	16.4	75	179	-	-	3,300	160	40.96	660	-
Mercury ³	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	-	-	4,200	200	0.11	3	2
Nickel	12	13	9	10	14	9	11	-	-	6,000	400	20.7	156	130
Zinc	76	75	49	54	144	230	290	-	-	400,000	7,400	93.94	1,230	12,000
Pesticides (mg/kg)														
DDT ⁴	-	-	-	-	-	-	-	< 0.07	0.07	1,000	45	0.431	15	102*
Dieldrin ⁵	-	-	-	-	-	-	-	< 0.012	< 0.011	160	1.1	-	21	0.504**

Results in green indicate an Exceedance of One or More of the Acceptance Criteria

The Acceptance Criteria that has been Exceeded is also in green

All concentrations are in mg/kg

Abbreviations:

IRB = International risk based
m bgl = meters below ground level
* SSL for DDT, DDE and DDD
** SSL for dieldrin + aldrin

Notes:

- Cadmium - SCS based on pH 5. Cadmium absorption (i.e. plant uptake of cadmium) increases with decreasing pH (see MFE methodology document).
- Chromium - SCS tabulated is for chromium VI. This is conservative as samples have been analysed for total chromium (i.e. III and VI).
- Mercury - SCS tabulated is for inorganic mercury. Samples have been analysed for total mercury and therefore this SCS is conservative.
- DDT - SCS is based on a sum of DDT, DDE and DDD
- Dieldrin - SCS applicable to either dieldrin or aldrin separately, or to the sum of aldrin and dieldrin if both are involved.
- As, Cd, Cr, Cu, Pb, Hg, B: Users Guide National Environmental Standard (NES) For Assessing and Managing Contaminants in Soil to Protect Human Health. New Zealand. 2012
- Ni & Zn: National Environmental Protection (Assessment of Site Contamination) Measure 1999 (Australia); Schedule B1 (as amended May 2013) - Guideline on Investigation Levels For Soil and Groundwater, Federal Register of Legislative Instruments F2013C00288, National Environmental Protection Council. (HIL - Health Investigation Level).
- Environment Canterbury Background Concentrations of Selected Trace Elements in Canterbury Soils. R07/1/2 Dated February 2007. Proposed level 2 background. DDT levels sourced from MFE 1998.
- Supplemental Guidance for Developing Soil Screening Levels (human health) at Superfund Sites (US EPA, 2002) based on soil pH 6.8. Figures derived for protection of potable water supply, but are also used as a guideline figure for protection of ecological receptors in waterbodies in the absence of an alternative.

Table No:	A3
Site:	Milking Shed Area
Project No:	J2021031
Sample media:	Soil
Analysis:	Total Recoverable Concentrations
End-Use:	Commercial / Industrial Outdoor Worker (Unpaved) and Rural Residential
Date:	24/01/2022
Revision:	0

Sample Name	M01 - 0.0-0.1m	M02 - 0.0-0.1m	M03 - 0.0-0.1m	M04 - 0.0-0.1m	M05 - 0.0-0.1m	M06 - 0.0-0.1m	M07 - 0.0-0.1m	M08 - 0.0-0.1m	Composite of M01 - 0.0-0.1m, M02 - 0.0-0.1m, M03 - 0.0-0.1m and M08 - 0.0-0.1m	Composite of M04 - 0.0-0.1m, M05 - 0.0-0.1m, M06 - 0.0-0.1m and M07 - 0.0-0.1m	Assessment Criteria (mg/kg)				
	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	Commercial / Industrial ^{6&7}	Rural Residential 25% ^{6&7}	Canterbury Level 2 Background Concentrations Recent ⁸	Australian and New Zealand Guidelines for Fresh and Marine Water Quality	IRB - US EPA SSL Values Dilution Factor x 20 ⁷
Sample Depth (m bgl)	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1					
Natural / Fill?	Reworked natural										Protection of Human Health		Background	3 x Sediment Quality Guidelines	Protection of Groundwater for Potable Use
Soil Type	Sandy Gravel														
Metals (mg/kg)															
Arsenic	5	6	6	6	5	6	6	6	-	-	70	17	12.58	210	29
Cadmium ¹	0.18	0.32	0.25	0.14	0.15	0.16	0.13	0.22	-	-	1,300	0.8	0.19	30	8
Chromium ²	13	16	14	16	13	14	13	14	-	-	6,300	290	22.7	1110	38
Copper	20	18	19	19	17	17	15	16	-	-	>10,000	<10,000	20.3	810	-
Lead	16.9	28	24	15.2	14.5	15.1	14.7	16.5	-	-	3,300	160	40.96	660	-
Mercury ³	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	-	-	4,200	200	0.11	3	2
Nickel	11	14	12	16	13	12	12	11	-	-	6,000	400	20.7	156	130
Zinc	104	108	103	76	73	71	69	68	-	-	400,000	7,400	93.94	1,230	12,000
Pesticides (mg/kg)															
DDT ⁴	-	-	-	-	-	-	-	-	< 0.07	< 0.07	1,000	45	0.431	15	102*
Dieldrin ⁵	-	-	-	-	-	-	-	-	< 0.011	< 0.011	160	1.1	-	21	0.504**

Results in green Indicate an Exceedance of One or More of the Acceptance Criteria

The Acceptance Criteria that has been Exceeded is also in green

All concentrations are in mg/kg

Abbreviations:

SCS = Soil Contamination Standard

IRB = International risk based

m bgl = meters below ground level

* SSL for DDT, DDE and DDD

** SSL for dieldrin + aldrin

Notes:

- Cadmium - SCS based on pH 5. Cadmium absorption (i.e. plant uptake of cadmium) increases with decreasing pH (see MFE methodology document).
- Chromium - SCS tabulated is for chromium VI. This is conservative as samples have been analysed for total chromium (i.e. III and VI).
- Mercury - SCS tabulated is for inorganic mercury. Samples have been analysed for total mercury and therefore this SCS is conservative.
- DDT - SCS is based on a sum of DDT, DDE and DDD
- Dieldrin - SCS applicable to either dieldrin or aldrin separately, or to the sum of aldrin and dieldrin if both are involved.
- As, Cd, Cr, Cu, Pb, Hg, B: Users Guide National Environmental Standard (NES) For Assessing and Managing Contaminants in Soil to Protect Human Health. New Zealand. 2012
- Ni & Zn: National Environmental Protection (Assessment of Site Contamination) Measure 1999 (Australia); Schedule B1 (as amended May 2013) - Guideline on Investigation Levels For Soil and Groundwater, Federal Register of Legislative Instruments F2013C00288, National Environmental Protection Council. (HIL - Health Investigation Level).
- Environment Canterbury Background Concentrations of Selected Trace Elements in Canterbury Soils. R07/1/2 Dated February 2007. Proposed level 2 background. DDT levels sourced from MFE 1998.
- Supplemental Guidance for Developing Soil Screening Levels (human health) at Superfund Sites (US EPA, 2002) based on soil pH 6.8. Figures derived for protection of potable water supply, but are also used as a guideline figure for protection of ecological receptors in waterbodies in the absence of an alternative.

Table No:	A4
Site:	Fields
Project No:	J2021031
Sample media:	Soil
Analysis:	Total Recoverable Concentrations
End-Use:	Commercial / Industrial Outdoor Worker (Unpaved) and Rural Residential
Date:	24/01/2022
Revision:	0

Sample Name	F01 - 0.0-0.1m	F02 - 0.0-0.1m	F03 - 0.0-0.1m	F04 - 0.0-0.1m	F05 - 0.0-0.1m	F06 - 0.0-0.1m	F07 - 0.0-0.1m	F08 - 0.0-0.1m	Composite of F01 - 0.0-0.1m, F02 - 0.0-0.1m, F03 - 0.0-0.1m and F04 - 0.0-0.1m	Composite of F05 - 0.0-0.1m, F06 - 0.0-0.1m, F07 - 0.0-0.1m and F08 - 0.0-0.1m	Assessment Criteria (mg/kg)					
	Sample Depth (m bgl)	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	Protection of Human Health	Background	3 x Sediment Quality Guidelines	Protection of Groundwater for Potable Use	
Natural / Fill?	Reworked natural										Commercial / Industrial ^{6,7}		Rural Residential 25% ^{6,7}	Canterbury Level 2 Background Concentrations Recent ⁸	Australian and New Zealand Guidelines for Fresh and Marine Water Quality	IRB - US EPA SSL Values Dilution Factor x 20 ⁹
Soil Type	Sandy Gravel															
Metals (mg/kg)																
Arsenic	6	6	6	7	6	7	8	6	-	-	70	17	12.58	210	29	
Cadmium ¹	0.29	0.45	0.4	0.36	0.74	0.4	0.4	0.35	-	-	1,300	0.8	0.19	30	8	
Chromium ²	14	13	13	14	13	14	14	13	-	-	6,300	290	22.7	1110	38	
Copper	12	15	15	18	31	17	17	13	-	-	>10,000	<10,000	20.3	810	-	
Lead	12.6	14.4	14.7	17	18.9	16.3	17.4	12.6	-	-	3,300	160	40.96	660	-	
Mercury ³	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	-	-	4,200	200	0.11	3	2	
Nickel	11	10	10	11	9	12	12	10	-	-	6,000	400	20.7	156	130	
Zinc	55	62	71	68	82	74	81	62	-	-	400,000	7,400	93.94	1,230	12,000	
Pesticides (mg/kg)																
DDT ⁴	-	-	-	-	-	-	-	-	< 0.08	< 0.08	1,000	45	0.431	15	102*	
Dieldrin ⁵	-	-	-	-	-	-	-	-	< 0.013	< 0.013	160	1.1	-	21	0.504**	

Results in green Indicate an Exceedance of One or More of the Acceptance Criteria

The Acceptance Criteria that has been Exceeded is also in green

All concentrations are in mg/kg

Abbreviations:

IRB = International risk based

m bgl = meters below ground level

* SSL for DDT, DDE and DDD

** SSL for dieldrin + aldrin

Notes:

- Cadmium - SCS based on pH 5. Cadmium absorption (i.e. plant uptake of cadmium) increases with decreasing pH (see MfE methodology document).
- Chromium - SCS tabulated is for chromium VI. This is conservative as samples have been analysed for total chromium (i.e. III and VI).
- Mercury - SCS tabulated is for inorganic mercury. Samples have been analysed for total mercury and therefore this SCS is conservative.
- DDT - SCS is based on a sum of DDT, DDE and DDD
- Dieldrin - SCS applicable to either dieldrin or aldrin separately, or to the sum of aldrin and dieldrin if both are involved.
- As, Cd, Cr, Cu, Pb, Hg, B: Users Guide National Environmental Standard (NES) For Assessing and Managing Contaminants in Soil to Protect Human Health. New Zealand. 2012
- Ni & Zn: National Environmental Protection (Assessment of Site Contamination) Measure 1999 (Australia); Schedule B1 (as amended May 2013) - Guideline on Investigation Levels For Soil and Groundwater, Federal Register of Legislative Instruments F2013C00288, National Environmental Protection Council. (HIL - Health Investigation Level).
- Environment Canterbury Background Concentrations of Selected Trace Elements in Canterbury Soils. R07/1/2 Dated February 2007. Proposed level 2 background. DDT levels sourced from MfE 1998.
- Supplemental Guidance for Developing Soil Screening Levels (human health) at Superfund Sites (US EPA, 2002) based on soil pH 6.8. Figures derived for protection of potable water supply, but are also used as a guideline figure for protection of ecological receptors in waterbodies in the absence of an alternative.

Table No:	AS
Site:	Soak Pits
Project No:	J2021031
Sample media:	Soil
Analysis:	Total Recoverable Concentrations
End-Use:	Commercial / Industrial Outdoor Worker (Unpaved) and Rural Residential
Date:	24/01/2022
Revision:	0

Sample Name	SP01 - 1.0m	SP02 - 1.0m	SP03 - 0.9m	SP04 - 0.9m	SP05 - 1.20m	SP06 - 1.25m	SP07 - 0.7m	SP08 - 0.4m	SP09 - 1.0m	SP10 - 1.0m	Composite of SP01 - 1.0m and SP02 - 1.0m	Composite of SP03 - 0.9m and SP04 - 0.9m	Composite of SP05 - 1.20m and SP06 - 1.25m	Composite of SP07 - 0.7m and SP08 - 0.4m	Composite of SP09 - 1.0m and SP10 - 1.0m	Assessment Criteria (mg/kg)				
	Sample Depth (m bgl)	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	Protection of Human Health	Background	3 x Sediment Quality Guidelines	Protection of Groundwater for Potable Use
Natural / Fill?	Reworked natural															Protection of Human Health				
Soil Type	Sandy gravel															Commercial / Industrial ⁶	Rural Residential 25% ^{6,7}	Canterbury Level 2 Background Concentrations Recent ⁸	Australian and New Zealand Guidelines for Fresh and Marine Water Quality	IRB - US EPA SSL Values Dilution Factor x 20 ⁹
Metals (mg/kg)																				
Arsenic	6	6	7	7	8	8	7	7	6	7	-	-	-	-	-	70	17	12.58	210	29
Cadmium ¹	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	-	-	-	-	-	1,300	0.8	0.19	30	8
Chromium ²	15	13	13	13	16	16	15	14	13	14	-	-	-	-	-	6,300	290	22.7	1110	38
Copper	15	11	15	15	16	17	16	15	13	14	-	-	-	-	-	>10,000	<10,000	20.3	810	-
Lead	16.7	14.4	14.7	14.9	18.7	19.2	16.7	15.9	13.6	15.2	-	-	-	-	-	3,300	160	40.96	660	-
Mercury ³	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	-	-	-	-	-	4,200	200	0.11	3	2
Nickel	13	12	13	13	14	15	14	13	12	13	-	-	-	-	-	6,000	400	20.7	156	130
Zinc	67	57	59	59	68	67	62	60	53	59	-	-	-	-	-	400,000	7,400	93.94	1,230	12,000
Pesticides (mg/kg)																				
DDT ⁴	-	-	-	-	-	-	-	-	-	-	< 0.06	< 0.08	< 0.07	< 0.07	< 0.08	1,000	45	0.431	15	102*
Dieldrin ⁵	-	-	-	-	-	-	-	-	-	-	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012	160	1.1	-	21	0.504**

Results in **green** Indicate an Exceedance of One or More of the Acceptance Criteria

The Acceptance Criteria that has been Exceeded is also in **green**

All concentrations are in mg/kg

Abbreviations:

- IRB = International risk based
- m bgl = meters below ground level
- * SSL for DDT, DDE and DDD
- ** SSL for dieldrin + aldrin

Notes:

- Cadmium - SCS based on pH 5. Cadmium absorption (i.e. plant uptake of cadmium) increases with decreasing pH (see MIE methodology document).
- Chromium - SCS tabulated is for chromium VI. This is conservative as samples have been analysed for total chromium (i.e. III and VI).
- Mercury - SCS tabulated is for inorganic mercury. Samples have been analysed for total mercury and therefore this SCS is conservative.
- DDT - SCS is based on a sum of DDT, DDE and DDD
- Dieldrin - SCS applicable to either dieldrin or aldrin separately, or to the sum of aldrin and dieldrin if both are involved.
- As, Cd, Cr, Cu, Pb, Hg, B: Users Guide National Environmental Standard (NES) For Assessing and Managing Contaminants in Soil to Protect Human Health. New Zealand. 2012
- Ni & Zn: National Environmental Protection (Assessment of Site Contamination) Measure 1999 (Australia); Schedule B1 (as amended May 2013) - Guideline on Investigation Levels For Soil and Groundwater, Federal Register of Legislative Instruments F2013C00288, National Environmental Protection Council. (HIL - Health Investigation Level).
- Environment Canterbury Background Concentrations of Selected Trace Elements in Canterbury Soils. R07/1/2 Dated February 2007. Proposed level 2 background. DDT levels sourced from MIE 1998.
- Supplemental Guidance for Developing Soil Screening Levels (human health) at Superfund Sites (US EPA, 2002) based on soil pH 6.8. Figures derived for protection of potable water supply, but are also used as a guideline figure for protection of ecological receptors in waterbodies in the absence of an alternative.

Table No:	A6
Site:	Piggery/Dump Area and Incinerator
Project No:	J2021031
Sample media:	Soil and Bulk Material
Analysis:	Total Recoverable Concentrations
End-Use:	Commercial / Industrial Outdoor Worker (Unpaved) and Rural Residential
Date:	24/01/2022
Revision:	0



Sample Name	PPACM1	PPACM2	PPACM3	IPACM	PO1	PO2	I01	Assessment Criteria (w/w)	
Sample Depth (m bgl)	-	-	-	-	0.0	0.0	0.0		
Natural / Fill?	-	-	-	-	Reworked natural			Protection of Human Health	
Soil Type	Bulk Material	Bulk Material	Bulk Material	Bulk Material	Sandy Gravel			Commercial / Industrial	Residential
Type of asbestos									
Amosite	Not Detected	Not Detected	Detected	Detected	-	-	-	-	-
Chrysotile	Detected	Detected	Detected	Detected	-	-	-	-	-
Crocidolite	Not Detected	Not Detected	Not Detected	Not Detected	-	-	-	-	-
Organic Fibres	Not Detected	Not Detected	Not Detected	Not Detected	-	-	-	-	-
Synthetic Mineral Fibres	Not Detected	Not Detected	Not Detected	Not Detected	-	-	-	-	-
Unknown Asbestos	Not Detected	Not Detected	Not Detected	Not Detected	-	-	-	-	-
Sample Category	Fibre Cement	Fibre Cement	Fibre Cement	Fibre Cement	-	-	-	-	-
Sample Weight on receipt (g)	26.66	11.81	18	25.43	-	-	-	-	-
Asbestos Presence / Absence	Chrysotile (White Asbestos) detected.	Chrysotile (White Asbestos) detected.	Amosite (Brown Asbestos) detected. Chrysotile (White Asbestos) detected.	Amosite (Brown Asbestos) detected. Chrysotile (White Asbestos) detected.	-	-	-	-	-
Calculated results expressed as % w/w									
Asbestos in ACM as % of Total Sample	-	-	-	-	< 0.001	0.119	< 0.001	0.05%	0.01%
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	-	-	-	-	< 0.001	< 0.001	< 0.001	0.001%	0.001%

Results in **green** Indicate an Exceedance of One or More of the Acceptance Criteria

The Acceptance Criteria that has been Exceeded is also in **green**

Abbreviations:

m bgl = meters below ground level

Notes:

Refer to *New Zealand Guidelines for Assessing and Managing Asbestos In Soil* (BRANZ 2017) for details related to use of the soil guideline values

Table No:	A7
Site:	Incinerator Area
Project No:	12021031
Sample media:	Soil
Analysis:	Total Recoverable Concentrations
End-Use:	Commercial / Industrial Outdoor Worker (Unpaved) and Rural Residential
Date:	24/02/2022
Revision:	0

Sample Name	SS201 - 0.0m	SS202 - 0.0m	SS203 - 0.0m	SS204 - 0.0m	SS205 - 0.0m	SS206 - 0.0m	SS207 - 0.0m	SS208 - 0.0m	SS209 - 0.0m	SS210 - 0.0m	SS211 - 0.0m	Assessment Criteria (mg/kg)					
	Sample Depth (m bgl)	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	Protection of Human Health	Background	3 x Sediment Quality Guidelines	Protection of Groundwater for Potable Use	
Natural / Fill?	Reworked natural											Commercial / Industrial ^{6,7}		Rural Residential 25% ^{6,7}	Canterbury Level 2 Background Concentrations Recent ⁸	Australian and New Zealand Guidelines for Fresh and Marine Water Quality	IRB - US EPA SSL Values Dilution Factor x 20 ⁹
Soil Type	Sandy Gravel																
Metals (mg/kg)																	
Arsenic	9	6	4	4	4	8	8	11	10	5	14	70	17	12.58	210	29	
Cadmium ¹	0.35	0.72	0.4	0.19	0.36	0.14	0.17	0.26	0.32	< 0.10	0.28	1,300	0.8	0.19	30	8	
Chromium ²	15	13	10	11	11	13	13	15	14	12	17	6,300	290	22.7	1110	38	
Copper	26	19	21	15	19	15	17	25	25	13	24	>10,000	<10,000	20.3	810	-	
Lead	72	76	12.3	11.8	17.7	14.2	17.5	44	21	13	47	3,300	160	40.96	660	-	
Mercury ³	< 0.19	< 0.10	< 0.19	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	4,200	200	0.11	3	2	
Nickel	10	10	10	9	10	11	11	14	11	10	14	6,000	400	20.7	156	130	
Zinc	260	250	139	103	143	80	240	160	181	56	510	400,000	7,400	93.94	1,230	12,000	

Results in green Indicate an Exceedance of One or More of the Acceptance Criteria

The Acceptance Criteria that has been Exceeded is also in green

All concentrations are in mg/kg

Abbreviations:

IRB = International risk based
m bgl = meters below ground level

Notes:

- Cadmium - SCS based on pH 5. Cadmium absorption (i.e. plant uptake of cadmium) increases with decreasing pH (see MIE methodology document).
- Chromium - SCS tabulated is for chromium VI. This is conservative as samples have been analysed for total chromium (i.e. III and VI).
- Mercury - SCS tabulated is for inorganic mercury. Samples have been analysed for total mercury and therefore this SCS is conservative.
- DDT - SCS is based on a sum of DDT, DDE and DDD
- Dieldrin - SCS applicable to either dieldrin or aldrin separately, or to the sum of aldrin and dieldrin if both are involved.
- As, Cd, Cr, Cu, Pb, Hg, B: Users Guide National Environmental Standard (NES) For Assessing and Managing Contaminants in Soil to Protect Human Health. New Zealand. 2012
- Ni & Zn: National Environmental Protection (Assessment of Site Contamination) Measure 1999 (Australia); Schedule B1 (as amended May 2013) - Guideline on Investigation Levels For Soil and Groundwater, Federal Register of Legislative Instruments F2013C00288, National Environmental Protection Council. (HIL - Health Investigation Level).
- Environment Canterbury Background Concentrations of Selected Trace Elements in Canterbury Soils. R07/1/2 Dated February 2007. Proposed level 2 background. DDT levels sourced from MIE 1998.
- Supplemental Guidance for Developing Soil Screening Levels (human health) at Superfund Sites (US EPA, 2002) based on soil pH 6.8. Figures derived for protection of potable water supply, but are also used as a guideline figure for protection of ecological receptors in waterbodies in the absence of an alternative.

Table No:	A8
Site:	Piggery/Offal Pit Area
Project No:	12021031
Sample media:	Soil
Analysis:	Total Recoverable Concentrations
End-Use:	Commercial / Industrial Outdoor Worker (Unpaved) and Rural Residential
Date:	24/02/2022
Revision:	0

Sample Name	SS215 - 0.0m	SS216 - 0.0m	SS217 - 0.0m	SS218 - 0.0m	SS219 - 0.0m	SS220 - 0.0m	SS221 - 0.0m	SS222 - 0.0m	SS223 - 0.0m	SS223a - 0.0m	SS224 - 0.0m	Assessment Criteria (mg/kg)				
	Sample Depth (m bgl)	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	0.0m	Protection of Human Health	Background	3 x Sediment Quality Guidelines	Protection of Groundwater for Potable Use
Natural / Fill?	Reworked natural											Commercial / Industrial ^{4&7}	Rural Residential 25% ^{6&7}	Canterbury Level 2 Background Concentrations Recent ⁸	Australian and New Zealand Guidelines for Fresh and Marine Water Quality	IRB - US EPA SSL Values Dilution Factor x 20 ⁹
Soil Type	Sandy Gravel															
Metals (mg/kg)																
Arsenic	11	7	6	< 8	6	7	12	7	6	7	11	70	12	12.58	210	29
Cadmium ¹	2.3	0.34	0.97	0.4	0.27	0.36	0.84	0.67	0.52	0.52	0.67	1,300	0.8	0.19	30	8
Chromium ²	19	10	11	10	13	14	21	16	13	13	16	6,300	290	22.7	1110	38
Copper	21	21	31	25	17	20	26	32	23	21	33	>10,000	<10,000	20.3	810	-
Lead	74	16.7	22	22	17.8	21	23	39	37	27	166	3,300	160	40.96	660	-
Mercury ³	< 0.10	< 0.10	< 0.10	< 0.4	< 0.10	< 0.10	< 0.19	< 0.10	< 0.10	< 0.10	< 0.10	4,200	200	0.11	3	2
Nickel	11	9	8	8	10	10	9	12	10	9	10	6,000	400	20.7	156	130
Zinc	430	91	147	128	96	104	125	158	171	110	250	400,000	7,400	93.94	1,230	12,000

Results in **green** indicate an Exceedance of One or More of the Acceptance Criteria

The Acceptance Criteria that has been Exceeded is also in **green**

All concentrations are in mg/kg

Abbreviations:

IRB = International risk based

m bgl = meters below ground level

Notes:

1. Cadmium - SCS based on pH 5. Cadmium absorption (i.e. plant uptake of cadmium) increases with decreasing pH (see MIE methodology document).

2. Chromium - SCS tabulated is for chromium VI. This is conservative as samples have been analysed for total chromium (i.e. III and VI).

3. Mercury - SCS tabulated is for inorganic mercury. Samples have been analysed for total mercury and therefore this SCS is conservative.

4. DDT - SCS is based on a sum of DDT, DDE and DDD

5. Dieldrin - SCS applicable to either dieldrin or aldrin separately, or to the sum of aldrin and dieldrin if both are involved.

6. As, Cd, Cr, Cu, Pb, Hg, B: Users Guide National Environmental Standard (NES) For Assessing and Managing Contaminants in Soil to Protect Human Health. New Zealand. 2012

7. Ni & Zn: National Environmental Protection (Assessment of Site Contamination) Measure 1999 (Australia); Schedule B1 (as amended May 2013) - Guideline on Investigation Levels For Soil and Groundwater, Federal Register of Legislative Instruments F2013C00288, National Environmental Protection Council. (HIL - Health Investigation Level).

8. Environment Canterbury Background Concentrations of Selected Trace Elements in Canterbury Soils. R07/1/2 Dated February 2007. Proposed level 2 background. DDT levels sourced from MIE 1998.

9. Supplemental Guidance for Developing Soil Screening Levels (human health) at Superfund Sites (US EPA, 2002) based on soil pH 6.8. Figures derived for protection of potable water supply, but are also used as a guideline figure for protection of ecological receptors in waterbodies in the absence of an alternative.



Certificate of Analysis

Page 1 of 2

Client:	Contaminated Land Solutions Limited	Lab No:	2819088	A2Pv1
Contact:	Helen Davies	Date Received:	06-Jan-2022	
	C/- Contaminated Land Solutions Limited	Date Reported:	10-Jan-2022	
	8a Huntsbury Avenue	Quote No:	115654	
	Huntsbury	Order No:		
	Christchurch 8022	Client Reference:	P2021031	
		Submitted By:	Helen Davies	

Sample Type: Building Material

Sample Name	Lab Number	Sample Category	Sample Weight on receipt (g)	Asbestos Presence / Absence	Description of Asbestos in Non Homogeneous Samples
PPACM1	2819088.1	Fibre Cement	26.66	Chrysotile (White Asbestos) detected.	N/A
PPACM2	2819088.2	Fibre Cement	11.81	Chrysotile (White Asbestos) detected.	N/A
PPACM3	2819088.3	Fibre Cement	18.00	Amosite (Brown Asbestos) detected. Chrysotile (White Asbestos) detected.	N/A
IPACM	2819088.4	Fibre Cement	25.43	Amosite (Brown Asbestos) detected. Chrysotile (White Asbestos) detected.	N/A

Glossary of Terms

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

Summary of Methods

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

Sample Type: Building Material

Test	Method Description	Default Detection Limit	Sample No
Asbestos in Bulk Material			
Sample Category	Assessment of sample type. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	1-4
Sample Weight on receipt	Sample weight. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.01 g	1-4
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-4
Description of Asbestos in Non Homogeneous Samples	Form, dimensions and/or weight of asbestos fibres present. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1-4



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

Testing was completed between 06-Jan-2022 and 10-Jan-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.

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A handwritten signature in blue ink, appearing to read 'John Keneth Paglingayen', with a stylized flourish at the end.

John Keneth Paglingayen BApSc
Laboratory Technician - Asbestos



Certificate of Analysis

Client:	Contaminated Land Solutions Limited	Lab No:	2819089	A2Pv1
Contact:	Helen Davies	Date Received:	06-Jan-2022	
	C/- Contaminated Land Solutions Limited	Date Reported:	07-Jan-2022	
	8a Huntsbury Avenue	Quote No:	115654	
	Huntsbury	Order No:		
	Christchurch 8022	Client Reference:	P2021031	
		Submitted By:	Helen Davies	

Sample Type: Soil						
Sample Name:		PO1 04-Jan-2022	PO2 04-Jan-2022	I01 05-Jan-2022		
Lab Number:		2819089.1	2819089.2	2819089.3		
Asbestos Presence / Absence		Asbestos NOT detected.	Chrysotile (White Asbestos) detected.	Chrysotile (White Asbestos) detected.	-	-
Description of Asbestos Form		-	Fibre cement, ACM debris and Loose fibres	ACM debris	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	0.119	< 0.001	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	-	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	-	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	-	-
As Received Weight	g	934.7	822.0	491.3	-	-
Dry Weight	g	917.6	804.0	433.5	-	-
Moisture	%	2	2	12	-	-
Sample Fraction >10mm	g dry wt	448.6	347.4	76.2	-	-
Sample Fraction <10mm to >2mm	g dry wt	285.6	269.0	84.0	-	-
Sample Fraction <2mm	g dry wt	182.6	187.1	272.8	-	-
<2mm Subsample Weight	g dry wt	56.7	56.0	55.8	-	-
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	0.9602	< 0.00001	-	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	-	-
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	0.00574	0.00026	-	-



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Glossary of Terms

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

Please refer to the **BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil**.
<https://www.branz.co.nz/asbestos>

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Weight of Asbestos as Asbestos Fines in <10mm >2mm Fraction*	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	1-3
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1-3
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1-3
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1-3
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1-3
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1-3
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	1-3
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-3
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1-3
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-3
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-3
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-3
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-3
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-3

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-3
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-3

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

Testing was completed on 07-Jan-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.

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Dexter Paguirigan Dip Chem Engineering Tech
Laboratory Technician - Asbestos



Certificate of Analysis

Client:	Contaminated Land Solutions Limited	Lab No:	2819111	SPV1
Contact:	Helen Davies	Date Received:	06-Jan-2022	
	C/- Contaminated Land Solutions Limited	Date Reported:	11-Jan-2022	
	8a Huntsbury Avenue	Quote No:	115654	
	Huntsbury	Order No:		
	Christchurch 8022	Client Reference:	P2021031	
		Submitted By:	Helen Davies	

Sample Type: Soil

Sample Name:	SP01 - 1.0m 04-Jan-2022 10:00 am	SP02 - 1.0m 04-Jan-2022 10:10 am	SP03 - 0.9m 04-Jan-2022 2:08 pm	SP04 - 0.9m 04-Jan-2022 2:12 pm	SP05 - 1.20m 04-Jan-2022 2:35 pm
Lab Number:	2819111.1	2819111.2	2819111.3	2819111.4	2819111.5

Heavy Metals with Mercury, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	6	6	7	7	8
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	15	13	13	13	16
Total Recoverable Copper	mg/kg dry wt	15	11	15	15	16
Total Recoverable Lead	mg/kg dry wt	16.7	14.4	14.7	14.9	18.7
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	13	12	13	13	14
Total Recoverable Zinc	mg/kg dry wt	67	57	59	59	68

Sample Name:	SP06 - 1.25m 04-Jan-2022 2:38 pm	SP07 - 0.7m 04-Jan-2022 2:55 pm	SP08 - 0.4m 04-Jan-2022 2:58 pm	SP09 - 1.0m 05-Jan-2022 10:30 am	SP10 - 1.0m 05-Jan-2022 10:35 am
Lab Number:	2819111.6	2819111.7	2819111.8	2819111.9	2819111.10

Heavy Metals with Mercury, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	8	7	7	6	7
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	16	15	14	13	14
Total Recoverable Copper	mg/kg dry wt	17	16	15	13	14
Total Recoverable Lead	mg/kg dry wt	19.2	16.7	15.9	13.6	15.2
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	15	14	13	12	13
Total Recoverable Zinc	mg/kg dry wt	67	62	60	53	59

Sample Name:	Composite of SP01 - 1.0m and SP02 - 1.0m	Composite of SP03 - 0.9m and SP04 - 0.9m	Composite of SP05 - 1.20m and SP06 - 1.25m	Composite of SP07 - 0.7m and SP08 - 0.4m	Composite of SP09 - 1.0m and SP10 - 1.0m
Lab Number:	2819111.11	2819111.12	2819111.13	2819111.14	2819111.15

Individual Tests

Dry Matter	g/100g as rcvd	96	81	87	83	82
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Organochlorine Pesticides Screening in Soil

Aldrin	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
alpha-BHC	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
beta-BHC	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
delta-BHC	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
cis-Chlordane	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
trans-Chlordane	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
2,4'-DDD	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
4,4'-DDD	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012



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Sample Type: Soil						
Sample Name:	Composite of SP01 - 1.0m and SP02 - 1.0m	Composite of SP03 - 0.9m and SP04 - 0.9m	Composite of SP05 - 1.20m and SP06 - 1.25m	Composite of SP07 - 0.7m and SP08 - 0.4m	Composite of SP09 - 1.0m and SP10 - 1.0m	
Lab Number:	2819111.11	2819111.12	2819111.13	2819111.14	2819111.15	
Organochlorine Pesticides Screening in Soil						
2,4'-DDE	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
4,4'-DDE	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
2,4'-DDT	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
4,4'-DDT	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
Total DDT Isomers	mg/kg dry wt	< 0.06	< 0.08	< 0.07	< 0.07	< 0.08
Dieldrin	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
Endosulfan I	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
Endosulfan II	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
Endosulfan sulphate	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
Endrin	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
Endrin aldehyde	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
Endrin ketone	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
Heptachlor	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
Heptachlor epoxide	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
Hexachlorobenzene	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012
Methoxychlor	mg/kg dry wt	< 0.010	< 0.013	< 0.012	< 0.012	< 0.012

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%.	-	1-10
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-10
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	11-15
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	11-15
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-10

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Testing was completed between 07-Jan-2022 and 11-Jan-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.

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Martin Cowell - BSc
Client Services Manager - Environmental



Certificate of Analysis

Client:	Contaminated Land Solutions Limited	Lab No:	2819112	SPV1
Contact:	Helen Davies	Date Received:	06-Jan-2022	
	C/- Contaminated Land Solutions Limited	Date Reported:	11-Jan-2022	
	8a Huntsbury Avenue	Quote No:	115654	
	Huntsbury	Order No:		
	Christchurch 8022	Client Reference:	P2021031	
		Submitted By:	Helen Davies	

Sample Type: Soil

Sample Name:	M01 - 0.0-0.1m 04-Jan-2022 12:35 pm	M02 - 0.0-0.1m 04-Jan-2022 12:40 pm	M03 - 0.0-0.1m 04-Jan-2022 12:50 pm	M04 - 0.0-0.1m 04-Jan-2022 1:07 pm	M05 - 0.0-0.1m 04-Jan-2022 1:10 pm
Lab Number:	2819112.1	2819112.2	2819112.3	2819112.4	2819112.5

Heavy Metals with Mercury, Screen Level

	mg/kg dry wt	5	6	6	6	5
Total Recoverable Arsenic	mg/kg dry wt	5	6	6	6	5
Total Recoverable Cadmium	mg/kg dry wt	0.18	0.32	0.25	0.14	0.15
Total Recoverable Chromium	mg/kg dry wt	13	16	14	16	13
Total Recoverable Copper	mg/kg dry wt	20	18	19	19	17
Total Recoverable Lead	mg/kg dry wt	16.9	28	24	15.2	14.5
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	11	14	12	16	13
Total Recoverable Zinc	mg/kg dry wt	104	108	103	76	73

Sample Name:	M06 - 0.0-0.1m 04-Jan-2022 1:20 pm	M07 - 0.0-0.1m 04-Jan-2022 1:25 pm	M08 - 0.0-0.1m 04-Jan-2022 1:00 pm	Composite of M01 - 0.0-0.1m, M02 - 0.0-0.1m, M03 - 0.0-0.1m and M08 - 0.0-0.1m	Composite of M04 - 0.0-0.1m, M05 - 0.0-0.1m, M06 - 0.0-0.1m and M07 - 0.0-0.1m
Lab Number:	2819112.6	2819112.7	2819112.8	2819112.9	2819112.10

Individual Tests

Dry Matter	g/100g as rcvd	-	-	-	92	95
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Heavy Metals with Mercury, Screen Level

	mg/kg dry wt	6	6	6	-	-
Total Recoverable Arsenic	mg/kg dry wt	6	6	6	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.16	0.13	0.22	-	-
Total Recoverable Chromium	mg/kg dry wt	14	13	14	-	-
Total Recoverable Copper	mg/kg dry wt	17	15	16	-	-
Total Recoverable Lead	mg/kg dry wt	15.1	14.7	16.5	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	-
Total Recoverable Nickel	mg/kg dry wt	12	12	11	-	-
Total Recoverable Zinc	mg/kg dry wt	71	69	68	-	-

Organochlorine Pesticides Screening in Soil

Aldrin	mg/kg dry wt	-	-	-	< 0.011	< 0.011
alpha-BHC	mg/kg dry wt	-	-	-	< 0.011	< 0.011
beta-BHC	mg/kg dry wt	-	-	-	< 0.011	< 0.011
delta-BHC	mg/kg dry wt	-	-	-	< 0.011	< 0.011
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.011	< 0.011
cis-Chlordane	mg/kg dry wt	-	-	-	< 0.011	< 0.011
trans-Chlordane	mg/kg dry wt	-	-	-	< 0.011	< 0.011
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.011	< 0.011
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.011	< 0.011
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.011	< 0.011
4,4'-DDE	mg/kg dry wt	-	-	-	< 0.011	< 0.011
2,4'-DDT	mg/kg dry wt	-	-	-	< 0.011	< 0.011



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Sample Type: Soil						
Sample Name:	M06 - 0.0-0.1m 04-Jan-2022 1:20 pm	M07 - 0.0-0.1m 04-Jan-2022 1:25 pm	M08 - 0.0-0.1m 04-Jan-2022 1:00 pm	Composite of M01 - 0.0-0.1m, M02 - 0.0-0.1m, M03 - 0.0-0.1m and M08 - 0.0-0.1m	Composite of M04 - 0.0-0.1m, M05 - 0.0-0.1m, M06 - 0.0-0.1m and M07 - 0.0-0.1m	
Lab Number:	2819112.6	2819112.7	2819112.8	2819112.9	2819112.10	
Organochlorine Pesticides Screening in Soil						
4,4'-DDT	mg/kg dry wt	-	-	-	< 0.011	< 0.011
Total DDT Isomers	mg/kg dry wt	-	-	-	< 0.07	< 0.07
Dieldrin	mg/kg dry wt	-	-	-	< 0.011	< 0.011
Endosulfan I	mg/kg dry wt	-	-	-	< 0.011	< 0.011
Endosulfan II	mg/kg dry wt	-	-	-	< 0.011	< 0.011
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.011	< 0.011
Endrin	mg/kg dry wt	-	-	-	< 0.011	< 0.011
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.011	< 0.011
Endrin ketone	mg/kg dry wt	-	-	-	< 0.011	< 0.011
Heptachlor	mg/kg dry wt	-	-	-	< 0.011	< 0.011
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.011	< 0.011
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.011	< 0.011
Methoxychlor	mg/kg dry wt	-	-	-	< 0.011	< 0.011

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%.	-	1-8
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-8
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	9-10
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	9-10
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-8

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

Testing was completed between 07-Jan-2022 and 11-Jan-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.

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Martin Cowell - BSc
Client Services Manager - Environmental



Certificate of Analysis

Client:	Contaminated Land Solutions Limited	Lab No:	2819113	SPV2
Contact:	Helen Davies	Date Received:	06-Jan-2022	
	C/- Contaminated Land Solutions Limited	Date Reported:	12-Jan-2022	
	8a Huntsbury Avenue	Quote No:	115654	
	Huntsbury	Order No:		
	Christchurch 8022	Client Reference:	P2021031	
		Submitted By:	Helen Davies	

Sample Type: Soil

Sample Name:	TS01 04-Jan-2022 1:55 pm	TS02 04-Jan-2022 1:57 pm	WWTP01 - 0.0-0.1m 05-Jan-2022 8:25 am	WWTP02 - 0.0-0.1m 05-Jan-2022 8:30 am	I01 - 0.0-0.1m 05-Jan-2022 8:00 am
Lab Number:	2819113.1	2819113.2	2819113.3	2819113.4	2819113.5

Individual Tests

Dry Matter	g/100g as rcvd	-	-	-	-	90
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Heavy Metals with Mercury, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	7	8	5	6	5
Total Recoverable Cadmium	mg/kg dry wt	0.27	0.25	0.27	0.17	2.6
Total Recoverable Chromium	mg/kg dry wt	14	15	12	13	18
Total Recoverable Copper	mg/kg dry wt	17	16	10	11	19
Total Recoverable Lead	mg/kg dry wt	15.6	17.5	12.2	11.5	16.4
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	12	13	9	10	14
Total Recoverable Zinc	mg/kg dry wt	76	75	49	54	144

Polycyclic Aromatic Hydrocarbons Screening in Soil*

Total of Reported PAHs in Soil	mg/kg dry wt	-	-	-	-	< 0.3
1-Methylnaphthalene	mg/kg dry wt	-	-	-	-	< 0.011
2-Methylnaphthalene	mg/kg dry wt	-	-	-	-	< 0.011
Acenaphthylene	mg/kg dry wt	-	-	-	-	< 0.011
Acenaphthene	mg/kg dry wt	-	-	-	-	< 0.011
Anthracene	mg/kg dry wt	-	-	-	-	< 0.011
Benzo[a]anthracene	mg/kg dry wt	-	-	-	-	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	-	-	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	-	-	< 0.03
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	-	-	< 0.03
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	-	-	< 0.011
Benzo[e]pyrene	mg/kg dry wt	-	-	-	-	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	-	-	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	-	-	-	-	< 0.011
Chrysene	mg/kg dry wt	-	-	-	-	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	-	-	< 0.011
Fluoranthene	mg/kg dry wt	-	-	-	-	< 0.011
Fluorene	mg/kg dry wt	-	-	-	-	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	-	-	< 0.011
Naphthalene	mg/kg dry wt	-	-	-	-	< 0.06
Perylene	mg/kg dry wt	-	-	-	-	< 0.011
Phenanthrene	mg/kg dry wt	-	-	-	-	< 0.011
Pyrene	mg/kg dry wt	-	-	-	-	< 0.011



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Sample Type: Soil

Sample Name:		P03 - 0.0-0.1m 05-Jan-2022 9:15 am	P04 - 0.0-0.1m 05-Jan-2022 9:20 am	Composite of TS01 and TS02	Composite of WWTP01 - 0.0-0.1m and WWTP02 - 0.0-0.1m	
Lab Number:		2819113.6	2819113.7	2819113.8	2819113.9	
Individual Tests						
Dry Matter	g/100g as rcvd	91	94	88	89	-
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	9	25	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.57	0.48	-	-	-
Total Recoverable Chromium	mg/kg dry wt	19	37	-	-	-
Total Recoverable Copper	mg/kg dry wt	27	38	-	-	-
Total Recoverable Lead	mg/kg dry wt	75	179	-	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	-	-	-
Total Recoverable Nickel	mg/kg dry wt	9	11	-	-	-
Total Recoverable Zinc	mg/kg dry wt	230	290	-	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	< 0.012	< 0.011	-
alpha-BHC	mg/kg dry wt	-	-	< 0.012	< 0.011	-
beta-BHC	mg/kg dry wt	-	-	< 0.012	< 0.011	-
delta-BHC	mg/kg dry wt	-	-	< 0.012	< 0.011	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.012	< 0.011	-
cis-Chlordane	mg/kg dry wt	-	-	< 0.012	< 0.011	-
trans-Chlordane	mg/kg dry wt	-	-	< 0.012	< 0.011	-
2,4'-DDD	mg/kg dry wt	-	-	< 0.012	< 0.011	-
4,4'-DDD	mg/kg dry wt	-	-	< 0.012	< 0.011	-
2,4'-DDE	mg/kg dry wt	-	-	< 0.012	< 0.011	-
4,4'-DDE	mg/kg dry wt	-	-	< 0.012	0.041	-
2,4'-DDT	mg/kg dry wt	-	-	< 0.012	< 0.011	-
4,4'-DDT	mg/kg dry wt	-	-	< 0.012	0.028	-
Total DDT Isomers	mg/kg dry wt	-	-	< 0.07	0.07	-
Dieldrin	mg/kg dry wt	-	-	< 0.012	< 0.011	-
Endosulfan I	mg/kg dry wt	-	-	< 0.012	< 0.011	-
Endosulfan II	mg/kg dry wt	-	-	< 0.012	< 0.011	-
Endosulfan sulphate	mg/kg dry wt	-	-	< 0.012	< 0.011	-
Endrin	mg/kg dry wt	-	-	< 0.012	< 0.011	-
Endrin aldehyde	mg/kg dry wt	-	-	< 0.012	< 0.011	-
Endrin ketone	mg/kg dry wt	-	-	< 0.012	< 0.011	-
Heptachlor	mg/kg dry wt	-	-	< 0.012	< 0.011	-
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.012	< 0.011	-
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.012	< 0.011	-
Methoxychlor	mg/kg dry wt	-	-	< 0.012	< 0.011	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.011	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Acenaphthene	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Anthracene	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.011	0.015	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.013	0.017	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.015	0.020	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.011	0.012	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	0.013	-	-	-

Sample Type: Soil					
Sample Name:	P03 - 0.0-0.1m 05-Jan-2022 9:15 am	P04 - 0.0-0.1m 05-Jan-2022 9:20 am	Composite of TS01 and TS02	Composite of WWTP01 - 0.0-0.1m and WWTP02 - 0.0-0.1m	
Lab Number:	2819113.6	2819113.7	2819113.8	2819113.9	
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	< 0.011	-	-
Chrysene	mg/kg dry wt	< 0.011	0.015	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.011	-	-
Fluoranthene	mg/kg dry wt	< 0.011	0.023	-	-
Fluorene	mg/kg dry wt	< 0.011	< 0.011	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	0.016	-	-
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	-	-
Perylene	mg/kg dry wt	< 0.011	< 0.011	-	-
Phenanthrene	mg/kg dry wt	< 0.011	0.014	-	-
Pyrene	mg/kg dry wt	< 0.011	0.023	-	-

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%.	-	1-7
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	5-7
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-7
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	8-9
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	5-7
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	5-9
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-4
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	5-7
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	5-7

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

Testing was completed between 07-Jan-2022 and 12-Jan-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.

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Martin Cowell - BSc
Client Services Manager - Environmental



Certificate of Analysis

Client:	Contaminated Land Solutions Limited	Lab No:	2819115	SPV1
Contact:	Helen Davies	Date Received:	06-Jan-2022	
	C/- Contaminated Land Solutions Limited	Date Reported:	11-Jan-2022	
	8a Huntsbury Avenue	Quote No:	115654	
	Huntsbury	Order No:		
	Christchurch 8022	Client Reference:	P2021031	
		Submitted By:	Helen Davies	

Sample Type: Soil

Sample Name:	F01 - 0.0-0.1m 05-Jan-2022 8:45 am	F02 - 0.0-0.1m 05-Jan-2022 8:50 am	F03 - 0.0-0.1m 05-Jan-2022 8:55 am	F04 - 0.0-0.1m 05-Jan-2022 9:05 am	F05 - 0.0-0.1m 05-Jan-2022 9:30 am
Lab Number:	2819115.1	2819115.2	2819115.3	2819115.4	2819115.5

Heavy Metals with Mercury, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	6	6	6	7	6
Total Recoverable Cadmium	mg/kg dry wt	0.29	0.45	0.40	0.36	0.74
Total Recoverable Chromium	mg/kg dry wt	14	13	13	14	13
Total Recoverable Copper	mg/kg dry wt	12	15	15	18	31
Total Recoverable Lead	mg/kg dry wt	12.6	14.4	14.7	17.0	18.9
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	11	10	10	11	9
Total Recoverable Zinc	mg/kg dry wt	55	62	71	68	82

Sample Name:	F06 - 0.0-0.1m 05-Jan-2022 9:40 am	F07 - 0.0-0.1m 05-Jan-2022 10:15 am	F08 - 0.0-0.1m 05-Jan-2022 10:45 am	Composite of F01 - 0.0-0.1m, F02 - 0.0-0.1m, F03 - 0.0-0.1m and F04 - 0.0-0.1m	Composite of F05 - 0.0-0.1m, F06 - 0.0-0.1m, F07 - 0.0-0.1m and F08 - 0.0-0.1m
Lab Number:	2819115.6	2819115.7	2819115.8	2819115.9	2819115.10

Individual Tests

Dry Matter	g/100g as rcvd	-	-	-	81	79
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Heavy Metals with Mercury, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	7	8	6	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.40	0.40	0.35	-	-
Total Recoverable Chromium	mg/kg dry wt	14	14	13	-	-
Total Recoverable Copper	mg/kg dry wt	17	17	13	-	-
Total Recoverable Lead	mg/kg dry wt	16.3	17.4	12.6	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	-
Total Recoverable Nickel	mg/kg dry wt	12	12	10	-	-
Total Recoverable Zinc	mg/kg dry wt	74	81	62	-	-

Organochlorine Pesticides Screening in Soil

Aldrin	mg/kg dry wt	-	-	-	< 0.013	< 0.013
alpha-BHC	mg/kg dry wt	-	-	-	< 0.013	< 0.013
beta-BHC	mg/kg dry wt	-	-	-	< 0.013	< 0.013
delta-BHC	mg/kg dry wt	-	-	-	< 0.013	< 0.013
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.013	< 0.013
cis-Chlordane	mg/kg dry wt	-	-	-	< 0.013	< 0.013
trans-Chlordane	mg/kg dry wt	-	-	-	< 0.013	< 0.013
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.013	< 0.013
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.013	< 0.013
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.013	< 0.013
4,4'-DDE	mg/kg dry wt	-	-	-	< 0.013	0.019
2,4'-DDT	mg/kg dry wt	-	-	-	< 0.013	< 0.013



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Sample Type: Soil						
Sample Name:		F06 - 0.0-0.1m 05-Jan-2022 9:40 am	F07 - 0.0-0.1m 05-Jan-2022 10:15 am	F08 - 0.0-0.1m 05-Jan-2022 10:45 am	Composite of F01 - 0.0-0.1m, F02 - 0.0-0.1m, F03 - 0.0-0.1m and F04 - 0.0-0.1m	Composite of F05 - 0.0-0.1m, F06 - 0.0-0.1m, F07 - 0.0-0.1m and F08 - 0.0-0.1m
Lab Number:		2819115.6	2819115.7	2819115.8	2819115.9	2819115.10
Organochlorine Pesticides Screening in Soil						
4,4'-DDT	mg/kg dry wt	-	-	-	< 0.013	< 0.013
Total DDT Isomers	mg/kg dry wt	-	-	-	< 0.08	< 0.08
Dieldrin	mg/kg dry wt	-	-	-	< 0.013	< 0.013
Endosulfan I	mg/kg dry wt	-	-	-	< 0.013	< 0.013
Endosulfan II	mg/kg dry wt	-	-	-	< 0.013	< 0.013
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.013	< 0.013
Endrin	mg/kg dry wt	-	-	-	< 0.013	< 0.013
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.013	< 0.013
Endrin ketone	mg/kg dry wt	-	-	-	< 0.013	< 0.013
Heptachlor	mg/kg dry wt	-	-	-	< 0.013	< 0.013
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.013	< 0.013
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.013	< 0.013
Methoxychlor	mg/kg dry wt	-	-	-	< 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%.	-	1-8
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-8
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	9-10
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	9-10
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-8

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

Testing was completed between 07-Jan-2022 and 11-Jan-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.

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Martin Cowell - BSc
Client Services Manager - Environmental



Certificate of Analysis

Client:	Contaminated Land Solutions Limited	Lab No:	2819114	SPV2
Contact:	Helen Davies	Date Received:	06-Jan-2022	
	C/- Contaminated Land Solutions Limited	Date Reported:	02-Mar-2022	(Amended)
	8a Huntsbury Avenue	Quote No:	115654	
	Huntsbury	Order No:		
	Christchurch 8022	Client Reference:	P2021031	
		Submitted By:	Helen Davies	

Sample Type: Soil						
Sample Name:	SY01 - 0.0-0.1m	SY02 - 0.0-0.1m	SY03 - 0.0-0.1m	SY04 - 0.0-0.1m	SY01 - 0.2m	
	04-Jan-2022	04-Jan-2022	04-Jan-2022	04-Jan-2022	04-Jan-2022	
	10:36 am	11:00 am	11:30 am	11:35 am	10:45 am	
Lab Number:	2819114.1	2819114.2	2819114.3	2819114.4	2819114.5	
Individual Tests						
Dry Matter	g/100g as rcvd	86	87	78	77	-
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	6	4	4	5
Total Recoverable Cadmium	mg/kg dry wt	0.27	0.35	0.26	0.39	< 0.10
Total Recoverable Chromium	mg/kg dry wt	14	15	13	13	12
Total Recoverable Copper	mg/kg dry wt	14	19	13	17	13
Total Recoverable Lead	mg/kg dry wt	51	49	41	97	20
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	11	14	9	10	11
Total Recoverable Zinc	mg/kg dry wt	71	290	74	80	57
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
alpha-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
beta-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
delta-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
cis-Chlordane	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
trans-Chlordane	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
2,4'-DDD	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
4,4'-DDD	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
2,4'-DDE	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
4,4'-DDE	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
2,4'-DDT	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
4,4'-DDT	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
Total DDT Isomers	mg/kg dry wt	< 0.07	< 0.07	< 0.08	< 0.08	-
Dieldrin	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
Endosulfan I	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
Endosulfan II	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
Endosulfan sulphate	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
Endrin	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
Endrin aldehyde	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
Endrin ketone	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
Heptachlor	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
Heptachlor epoxide	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
Hexachlorobenzene	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-
Methoxychlor	mg/kg dry wt	< 0.012	< 0.012	< 0.013	< 0.013	-



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil						
Sample Name:		SY02 - 0.2m 04-Jan-2022 11:10 am	SY03 - 0.2m 04-Jan-2022 11:30 am	SY04 - 0.2m 04-Jan-2022 11:40 am		
Lab Number:		2819114.6	2819114.7	2819114.8		
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	4	4	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.11	< 0.10	0.12	-	-
Total Recoverable Chromium	mg/kg dry wt	12	12	11	-	-
Total Recoverable Copper	mg/kg dry wt	12	10	11	-	-
Total Recoverable Lead	mg/kg dry wt	21	19.7	38	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	-
Total Recoverable Nickel	mg/kg dry wt	12	10	10	-	-
Total Recoverable Zinc	mg/kg dry wt	66	58	61	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces report '2819114-SPv1' issued on 11-Jan-2022 at 2:02 pm.
Reason for amendment: Heavy metals added to samples 5-8 as requested.

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%.	-	1-8
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-8
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	1-4
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-4

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

Testing was completed between 07-Jan-2022 and 02-Mar-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.

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Ara Heron BSc (Tech)
Client Services Manager - Environmental



Certificate of Analysis

Client:	Contaminated Land Solutions Limited	Lab No:	2896356	SPV2
Contact:	Helen Davies	Date Received:	25-Feb-2022	
	C/- Contaminated Land Solutions Limited	Date Reported:	07-Mar-2022	
	8a Huntsbury Avenue	Quote No:	110877	
	Huntsbury	Order No:		
	Christchurch 8022	Client Reference:	69 Inland Kaikoura Road	
		Submitted By:	Helen Davies	

Sample Type: Soil

Sample Name:	SS201 - 0.0m 24-Feb-2022 9:20 am	SS202 - 0.0m 24-Feb-2022 9:40 am	SS203 - 0.0m 24-Feb-2022 10:00 am	SS204 - 0.0m 24-Feb-2022 10:30 am	SS205 - 0.0m 24-Feb-2022 10:35 am
Lab Number:	2896356.1	2896356.3	2896356.5	2896356.7	2896356.9

Heavy Metals with Mercury, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	9	6	4	4	4
Total Recoverable Cadmium	mg/kg dry wt	0.35	0.72	0.40	0.19	0.36
Total Recoverable Chromium	mg/kg dry wt	15	13	10	11	11
Total Recoverable Copper	mg/kg dry wt	26	19	21	15	19
Total Recoverable Lead	mg/kg dry wt	72	76	12.3	11.8	17.7
Total Recoverable Mercury	mg/kg dry wt	< 0.19	< 0.10	< 0.19	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	10	10	10	9	10
Total Recoverable Zinc	mg/kg dry wt	260	250	139	103	143

Sample Name:	SS206 - 0.0m 24-Feb-2022 10:40 am	SS207 - 0.0m 24-Feb-2022 11:00 am	SS208 - 0.0m 24-Feb-2022 11:05 am	SS209 - 0.0m 24-Feb-2022 11:10 am	SS210 - 0.0m 24-Feb-2022 12:45 pm
Lab Number:	2896356.11	2896356.13	2896356.15	2896356.17	2896356.19

Heavy Metals with Mercury, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	8	8	11	10	5
Total Recoverable Cadmium	mg/kg dry wt	0.14	0.17	0.26	0.32	< 0.10
Total Recoverable Chromium	mg/kg dry wt	13	13	15	14	12
Total Recoverable Copper	mg/kg dry wt	15	17	25	25	13
Total Recoverable Lead	mg/kg dry wt	14.2	17.5	44 #1	21	13.0
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	11	11	14	11	10
Total Recoverable Zinc	mg/kg dry wt	80	240	160	181	56

Sample Name:	SS211 - 0.0m 24-Feb-2022 12:55 pm	SS215 - 0.0m 24-Feb-2022	SS216 - 0.0m 24-Feb-2022	SS217 - 0.0m 24-Feb-2022	SS218 - 0.0m 24-Feb-2022
Lab Number:	2896356.21	2896356.23	2896356.25	2896356.27	2896356.29

Individual Tests

Dry Matter	g/100g as rcvd	-	-	-	-	72
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Heavy Metals with Mercury, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	14	11	7	6	< 8
Total Recoverable Cadmium	mg/kg dry wt	0.28	3.3	0.34	0.97	0.4
Total Recoverable Chromium	mg/kg dry wt	17	19	10	11	10
Total Recoverable Copper	mg/kg dry wt	24	21	21	31	25
Total Recoverable Lead	mg/kg dry wt	47	74	16.7	22	22
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.4
Total Recoverable Nickel	mg/kg dry wt	14	11	9	8	8
Total Recoverable Zinc	mg/kg dry wt	510	430	91	147	128



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The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil

Sample Name:	SS211 - 0.0m 24-Feb-2022 12:55 pm	SS215 - 0.0m 24-Feb-2022	SS216 - 0.0m 24-Feb-2022	SS217 - 0.0m 24-Feb-2022	SS218 - 0.0m 24-Feb-2022
Lab Number:	2896356.21	2896356.23	2896356.25	2896356.27	2896356.29

Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	-	-	-	< 0.4
1-Methylnaphthalene	mg/kg dry wt	-	-	-	< 0.014
2-Methylnaphthalene	mg/kg dry wt	-	-	-	< 0.014
Acenaphthylene	mg/kg dry wt	-	-	-	< 0.014
Acenaphthene	mg/kg dry wt	-	-	-	< 0.014
Anthracene	mg/kg dry wt	-	-	-	< 0.014
Benzo[a]anthracene	mg/kg dry wt	-	-	-	< 0.014
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	-	< 0.014
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	-	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	-	< 0.04
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	-	-	< 0.014
Benzo[e]pyrene	mg/kg dry wt	-	-	-	< 0.014
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	-	< 0.014
Benzo[k]fluoranthene	mg/kg dry wt	-	-	-	< 0.014
Chrysene	mg/kg dry wt	-	-	-	< 0.014
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	-	< 0.014
Fluoranthene	mg/kg dry wt	-	-	-	< 0.014
Fluorene	mg/kg dry wt	-	-	-	< 0.014
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	-	< 0.014
Naphthalene	mg/kg dry wt	-	-	-	< 0.07
Perylene	mg/kg dry wt	-	-	-	< 0.014
Phenanthrene	mg/kg dry wt	-	-	-	< 0.014
Pyrene	mg/kg dry wt	-	-	-	< 0.014

Sample Name:	SS219 - 0.0m 24-Feb-2022	SS220 - 0.0m 24-Feb-2022	SS221 - 0.0m 24-Feb-2022	SS222 - 0.0m 24-Feb-2022	SS223 - 0.0m 24-Feb-2022
Lab Number:	2896356.31	2896356.33	2896356.35	2896356.37	2896356.39

Individual Tests						
Dry Matter	g/100g as rcvd	95	-	83	87	87
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	6	7	19	7	6
Total Recoverable Cadmium	mg/kg dry wt	0.27	0.36	0.84	0.67	0.52
Total Recoverable Chromium	mg/kg dry wt	13	14	21	16	13
Total Recoverable Copper	mg/kg dry wt	17	20	26	32	23
Total Recoverable Lead	mg/kg dry wt	17.8	21	23	39	37
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.19	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	10	10	9	12	10
Total Recoverable Zinc	mg/kg dry wt	96	104	125	158	171

Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	-	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.011	-	< 0.012	< 0.012	< 0.012
2-Methylnaphthalene	mg/kg dry wt	< 0.011	-	< 0.012	< 0.012	< 0.012
Acenaphthylene	mg/kg dry wt	< 0.011	-	< 0.012	< 0.012	< 0.012
Acenaphthene	mg/kg dry wt	< 0.011	-	< 0.012	< 0.012	< 0.012
Anthracene	mg/kg dry wt	< 0.011	-	< 0.012	< 0.012	< 0.012
Benzo[a]anthracene	mg/kg dry wt	< 0.011	-	< 0.012	< 0.012	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	-	< 0.012	0.019	0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.03	-	< 0.03	0.03	< 0.03
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.03	-	< 0.03	0.03	< 0.03
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.011	-	< 0.012	0.025	0.016
Benzo[e]pyrene	mg/kg dry wt	< 0.011	-	< 0.012	0.012	< 0.012

Sample Type: Soil

Sample Name:	SS219 - 0.0m 24-Feb-2022	SS220 - 0.0m 24-Feb-2022	SS221 - 0.0m 24-Feb-2022	SS222 - 0.0m 24-Feb-2022	SS223 - 0.0m 24-Feb-2022
Lab Number:	2896356.31	2896356.33	2896356.35	2896356.37	2896356.39

Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	-	< 0.012	0.014	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	-	< 0.012	< 0.012	< 0.012
Chrysene	mg/kg dry wt	< 0.011	-	< 0.012	0.018	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	-	< 0.012	< 0.012	< 0.012
Fluoranthene	mg/kg dry wt	< 0.011	-	< 0.012	0.025	0.015
Fluorene	mg/kg dry wt	< 0.011	-	< 0.012	< 0.012	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	-	< 0.012	0.014	< 0.012
Naphthalene	mg/kg dry wt	< 0.06	-	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.011	-	< 0.012	< 0.012	< 0.012
Phenanthrene	mg/kg dry wt	< 0.011	-	< 0.012	0.012	< 0.012
Pyrene	mg/kg dry wt	< 0.011	-	< 0.012	0.028	0.014

Sample Name:	SS223a - 0.0m 24-Feb-2022	SS224 - 0.0m 24-Feb-2022			
Lab Number:	2896356.41	2896356.43			

Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	7	11	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.52	0.67	-	-	-
Total Recoverable Chromium	mg/kg dry wt	13	16	-	-	-
Total Recoverable Copper	mg/kg dry wt	21	33	-	-	-
Total Recoverable Lead	mg/kg dry wt	27	166	-	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	-	-	-
Total Recoverable Nickel	mg/kg dry wt	9	10	-	-	-
Total Recoverable Zinc	mg/kg dry wt	110	250	-	-	-

Analyst's Comments

#1 It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample. Replicate 1 = 44mg/kg, replicate 2 = 90mg/kg.

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	29, 31, 35, 37, 39
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	29, 31, 35, 37, 39
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	29, 31, 35, 37, 39

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	29, 31, 35, 37, 39
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	29, 31, 35, 37, 39

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

Testing was completed between 01-Mar-2022 and 07-Mar-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.

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Kim Harrison MSc
Client Services Manager - Environmental



Certificate of Analysis

Page 1 of 2

Client:	Contaminated Land Solutions Limited	Lab No:	2896765	A2Pv2
Contact:	Helen Davies	Date Received:	25-Feb-2022	
	C/- Contaminated Land Solutions Limited	Date Reported:	09-Mar-2022	(Amended)
	8a Huntsbury Avenue	Quote No:	110877	
	Huntsbury	Order No:		
	Christchurch 8022	Client Reference:	69 Inland Kaikoura Road	
		Submitted By:	Helen Davies	

Sample Type: Soil

Sample Name	Lab Number	As Received Weight (g)	Dry Weight (g)	<2mm Subsample Weight (g dry wt)	Asbestos Presence / Absence	Description of Asbestos Form
SS201 0.0m	2896765.1	709.0	627.7	53.9	Asbestos NOT detected.	-
SS202 0.1m	2896765.4	843.5	771.8	51.5	Chrysotile (White Asbestos) detected.	Loose fibres (major)
SS203 0.0m	2896765.5	517.0	342.1	51.6	Asbestos NOT detected.	-
SS204 0.0m	2896765.6	674.3	588.4	53.1	Asbestos NOT detected.	-
SS205 0.0m	2896765.7	582.6	485.0	51.2	Asbestos NOT detected.	-
SS206 0.0m	2896765.8	830.7	771.6	50.9	Asbestos NOT detected.	-
SS207 0.0m	2896765.9	729.1	604.2	54.5	Asbestos NOT detected.	-
SS208 0.0m	2896765.10	948.4	892.9	56.6	Amosite (Brown Asbestos), Chrysotile (White Asbestos) and Crocidolite (Blue Asbestos) detected.	ACM debris (major)
SS209 0.0m	2896765.11	577.9	461.3	56.0	Asbestos NOT detected.	-
SS210 0.0m	2896765.12	897.3	876.2	50.6	Asbestos NOT detected.	-
SS211 0.0m	2896765.13	709.6	626.4	54.7	Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.	Fibre cement (2 x1 cm), ACM debris (major) and Loose fibres (major)
SS215 0.0m	2896765.14	622.4	566.5	59.5	Asbestos NOT detected.	-
SS216 0.0m	2896765.15	499.8	368.9	55.7	Asbestos NOT detected.	-
SS217 0.0m	2896765.16	510.5	392.0	51.3	Asbestos NOT detected.	-
SS218 0.0m	2896765.17	461.5	342.7	51.3	Asbestos NOT detected.	-
SS220 0.0m	2896765.19	702.2	626.5	57.7	Asbestos NOT detected.	-
SS221 0.0m	2896765.20	555.6	487.8	55.8	Asbestos NOT detected.	-
SS222 0.0m	2896765.21	637.1	585.2	55.8	Asbestos NOT detected.	-
SS223 0.0m	2896765.22	513.1	439.0	57.2	Asbestos NOT detected.	-
SS223a 0.0m	2896765.23	727.8	657.4	55.2	Asbestos NOT detected.	-
SS224 0.0m	2896765.24	499.4	402.4	50.6	Asbestos NOT detected.	-
SS208 0.15m	2896765.27	317.7	270.9	50.6	Chrysotile (White Asbestos) detected.	Loose fibres (minor)
SS211 0.15m	2896765.28	370.5	318.1	53.0	Asbestos NOT detected.	-

Glossary of Terms

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

Analyst's Comments

Amended Report: This certificate of analysis replaces report '2896765-A2Pv1' issued on 02-Mar-2022 at 1:05 pm.
Reason for amendment: Additional analysis added.



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 4-17, 19-24, 27-28
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 4-17, 19-24, 27-28
<2mm Subsample Weight	Sample dried at 100 to 105°C, weight of <2mm sample fraction taken for asbestos identification if less than entire fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	1, 4-17, 19-24, 27-28
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 4-17, 19-24, 27-28
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 4-17, 19-24, 27-28

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

Testing was completed between 01-Mar-2022 and 09-Mar-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.

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

John Keneth Paglingayen BApSc
Laboratory Technician - Asbestos

Appendix 7

Agon Solutions
Limited Asbestos
Removal Report

Agon Solutions Limited
agonasbestos@gmail.com

3rd March

69 Inland Kaikoura Rd

Asbestos removal

Attn: Helen Davies

Agon Solutions Limited was engaged by Drones at Work Limited to identify surface asbestos debris at 69 Inland Kaikoura Road. The property is a farm that is being subdivided into residential sections.

The areas of concern were identified as the incinerator and the old piggery.

The incinerator sits behind a concrete barn and the historic piggery area is a clear site.

Figures 1 and 2. Incinerator and environs



Figure 3. Piggery



On the 22nd of February I travelled to the above address and met the owner Richard Watherston on site. I asked Mr Watherston to identify the areas that were to be investigated then donned PPE and began to hand pick the areas.

The grass in both areas had been sprayed to enable visual confirmation of ACM.

ACM (cement sheet and super six) was found around the containers, barn, timber pile, incinerator and the used farm equipment.

Figure 4. Incinerator area



There was a notable increase in the concentration of ACM on the west side of the barn.

Figures 4 and 5 west side of barn





Figure 6. ACM from incinerator area

The areas beneath the containers, timber pile, farm equipment and boulders could not be visually investigated

The piggery area revealed only a small amount of ACM, mainly in a line at the southern boundary suggesting the existence of an historic structure.

Figure 7. ACM from piggery area.



Worksafe was notified of this project.

[Notification Of Licensed Asbestos Removal - agonasbestos@gmail.com - Gmail \(google.com\)](mailto:agonasbestos@gmail.com)

The material was visually identified and placed into a 200mu asbestos waste bag then double bagged, gooseneck tied and taken to Eco Drop in Bromley, Christchurch and disposed of as asbestos waste.

Ecocentral Limited
9 Baigent Way,
Middleton,
Christchurch 8024,
New Zealand

**ECO
DROP**

Metro
GST Number 102-833-082

Tax Invoice
MET458898\1

Date Wed, 23 Feb 2022 1:24 PM
Customer Cash Customers
Vehicle JTL163
Order No 69 Inland rd mat garrett
Operator W

Item Description	Charge
Asbestos	\$41.40
Gate Rate	
0.00 t @ \$518.00/t	
Sub Total	\$41.40
Rounding	\$0.00
Total Charge	\$41.40
Total Charge Includes GST	\$5.40

Appendix 8

CLS Asbestos
Removal Report

ASBESTOS REMOVAL REPORT

Project number	J2021031	Date	10 March 2022
Project name	69 Inland Kaikoura Rd	Recorded by	Helen Davies
Record Number	002	Total pages	4

Background

A phase 2 contaminated land investigation was conducted at 69 Inland Kaikōura Road, Peketā, Canterbury on 24 February 2022. During the investigation, visual ACM was observed in one area of the site as shown in **Figure 1**.

Figure 1. Location of ACM within the site at 69 Inland Kaikoura Road



The quantity of ACM was less than 1m² and was non-friable. As such, Helen Davies of CLS was able to remove it from site as unlicensed asbestos work, with no requirement to inform WorkSafe prior to the work. This memo described the removal that occurred.

Details of asbestos removal

Date and duration: 24 February 2022, 1hr (8.10am - 9.10am)

Location: Incinerator area as shown in **Figure 1**.

Description of asbestos: ACM fragments

Type of asbestos: Amosite (Brown Asbestos), Chrysotile (White Asbestos) and Crocidolite (Blue Asbestos)¹.

Estimated volume or area: Multiple fragments, estimated cumulatively to be less than 1m²

Condition: Non-friable

Combined weight of all ACM removed from site by CLS on 24 February 2022: 1,850g

Removal Process

The ACM fragments were collected into Ziplock bags, with removal locations marked on the ground in pink survey paint and photographed (see **Figure 2**). On completion of the work all Ziplock bags were weighed and placed into a 200-micron asbestos waste bag. The bag was goose-neck tied as shown in **Figure 3**.

Figure 2. ACM removal



¹ The type of asbestos is based on a report from Hill Laboratories in which results of analysis of bulk ACM are reported. Refer to CLS 2022, *69 Inland Kaikoura Road Preliminary and Detailed Site Investigation* for further details.


Figure 3. ACM prepared for disposal



Disposal

The Asbestos waste bag was transferred by Helen Davies of CLS to Eco Central Ltd's waste transfer station located in Bromley, Christchurch on 10 March 2022. The disposal docket is reproduced in **Figure 4**.

Figure 4. Disposal Docket

Ecocentral Limited 9 Baigent Way, Middleton, Christchurch 8024, New Zealand	
Metro GST Number 102-833-082	
<hr/> Tax Invoice MET467288\1 <hr/>	
Date	Thu, 10 Mar 2022 3:25 PM
Customer	Cash Customers
Vehicle	MYZ402
Order No	69 Inland kaikoura rd helen davyes
Operator	GG
<hr/>	
Item Description	Charge
Asbestos	\$41.40
Gate Rate	
0.02 t @ \$518.00/t	
Sub Total	\$41.40
Rounding	\$0.00
Total Charge	\$41.40
Total Charge Includes GST	\$5.40

END