Soil Contamination Risk
Preliminary Site Investigation Report

606 Ridge Road,
Motukarara

July 2022

QUALITY CONTROL AND CERTIFICATION SHEET

Client: Lochlea Farming Co. Ltd

Date of issue: 5 July 2022

Report written by:

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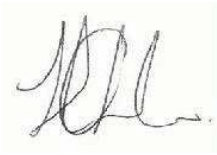
(6 years contaminated land experience)

Signed: 

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CONTENTS

APPENDICES

1 Executive Summary

The site is a rural property located at 606 Ridge Road in Motukarara, Canterbury. The site is currently the subject of a subdivision application which seeks to create a 4.65ha lot which is to include the residential dwelling and farm buildings and three vacant 1ha lots. The balance of the site is approximately 34.75ha. The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS) require an assessment of the likelihood of soil contamination being present. It is also noted that Momentum Environmental Ltd is obligated to consider the requirements of Section 10 (4) of the Health and Safety at Work (Asbestos) Regulations 2016. This report details the work undertaken to assess the risks.

This Preliminary Site Investigation has identified the following potential sources of contamination:

- The use and storage of persistent pesticides in and around the farm buildings.
- Potential sheep dip or spray race operation within the sheep yards, adjacent to the woolshed/shearing shed.
- The presence of storage tanks and drums for fuels or chemicals in and around the farm buildings.
- The storage of treated timber outside.
- A portion of the site located within the shot fall zone of the adjacent Waihora Clay Target Club
- Two burn areas identified during the site inspection.
- Lead based paint products and asbestos containing materials (ACM) on historical buildings located at the site.

The location of these potential sources of contamination are shown on the Site Inspection and Risk Areas Plan attached in **Appendix E**.

Following subdivision, proposed Lot 5 will continue to be production land and therefore the NESCS does not apply to proposed Lot 5. Proposed Lots 1-4 will stop being production land and therefore the NESCS must be considered for these areas.

This Preliminary Site Investigation has identified multiple potential sources of contamination within proposed Lot 1 that warrant further investigation in the form of a Detailed Site Investigation. At this stage, no further investigation is recommended within proposed Lots 2-4 as no potentially contaminating activities have been identified for these areas.

In terms of planning status at the time of writing of this report, the NESCS does apply to the proposed subdivision and resource consent will be required.

2 Objectives of the Investigation

This report has been prepared in general accordance with the Ministry for the Environment's "Contaminated Land Management Guidelines No 1: Reporting on Contaminated Sites in New Zealand, revised 2021". This report includes all requirements for a Preliminary Site Investigation report.

The objective of this report is to:

- Collect and assess information from multiple sources to understand previous and current land uses.
- To describe the site's physical and environmental features to understand potential pathways and receptors.
- To establish under the NESCS whether it is more likely than not that an activity or industry described in the Hazardous Activities and Industries List (HAIL) is being, or has been, undertaken on the site.
- To assess whether there is any risk to potential receptors that would warrant further investigation.

3 Scope of Work Undertaken

The scope of the work undertaken has included:

- Obtaining and review of Environment Canterbury (ECan) GIS data including the Listed Land Use Register (LLUR).
- Search of Land Information New Zealand (LINZ) orchard database.
- Review of relevant historical aerial photographs.
- Review of relevant historical certificate of titles (CTs).
- Review of Selwyn District Council (SDC) property files.
- Site inspection.
- Preparation of this report in accordance with MfE guidelines.

4 Site Identification

The site is located at 606 Ridge Road in Motukarara, Canterbury as shown on the plan in **Figure 1** below. The site is legally described as Section 3 Block IV Res 959 and is approximately 42.42ha.

Figure 1 – Location Plan

5 Site Description

5.1 Environmental Setting

Table 1 – Environmental Setting

Topography	The site is generally flat land.
Geology	The ECan GIS database describes the soils at the site as a combination of the Motukarara deep silt over sand, the Waikuku deep sand and the Kaiapoi deep silt over sand, as shown in **Figure 2** below. Wells on site indicate that topsoils are underlain by grey and blue sand with some silt.
Soil Trace Elements	According to the ECan GIS database, natural concentrations of trace elements for the site are a mixture of the 'Regional, Saline Grey Recent' and 'Regional, Yellow Brown Sand' (YBS) soil groups, as shown in **Figure 2** below.
Groundwater	The site lies over the coastal confined gravel aquifer system. The on-site bore logs shows groundwater levels are between 0.28m and 6.28m deep. Groundwater flow is generally in a southerly direction.
Surface Water	The ECan GIS database shows a drain runs parallel with the south-western boundary of the site. Multiple drains are also present within the surrounding area. The Halswell River is located 50m to the east of the site. Lake Ellesmere is located approximately 2.5km south-west of the site.

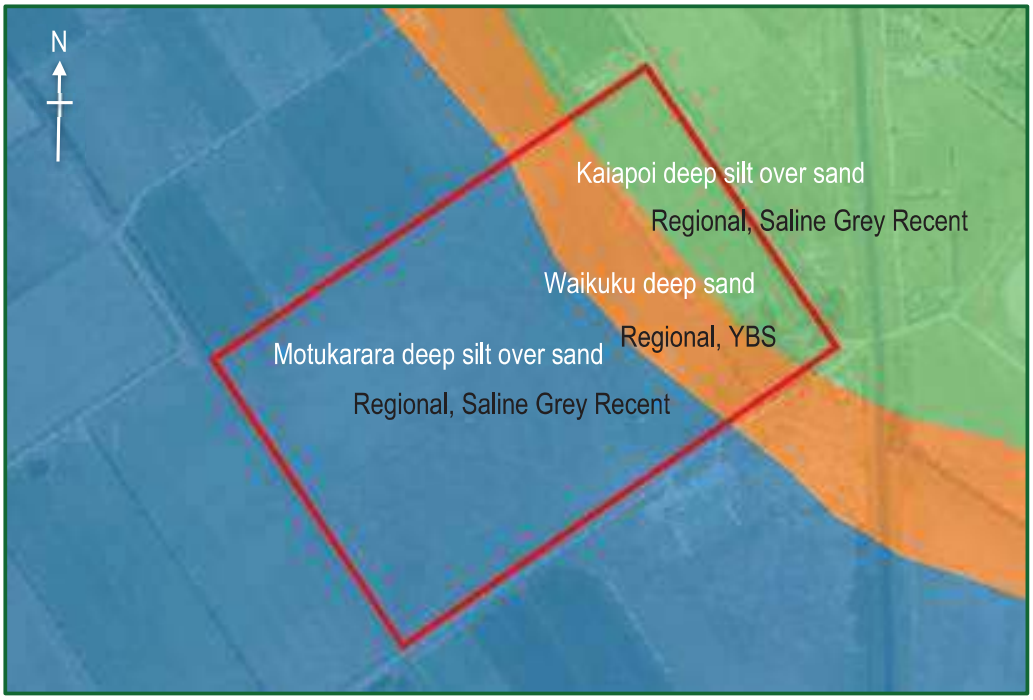


Figure 2 – Geological Setting

5.2 Site Layout and Current Site Uses

The site is currently used for rural and rural residential purposes. A residential dwelling and farm sheds are located in the eastern corner of the site. The remainder of the site is vacant pastoral land used for a combination of stock grazing and pastoral cropping.

5.3 Surrounding Land Uses

The surrounding land is used for a mix of rural and rural residential purposes. The Waihora Target Clay Club is located beyond Gammacks Road to the south of the site. The Motukarara Raceway and Waihora Park reserve is located approximately 600m east of the site.

5.4 Geotechnical Investigations

At the time of writing no geotechnical investigations were available to MEL.

6 Proposed Site Use

It is proposed to subdivide the site to create a 4.65ha lot which is to include the residential dwelling and farm buildings, three vacant 1ha lots and a 34.75ha lot which is to be amalgamated with an adjoining property off Gammacks Road. It is proposed that a "no build" covenant will be placed on the 34.75ha lot. This proposal involves the subdivision, change of use of the land, possible soil disturbance and disposal of soils off-site.

A Scheme Plan is attached in **Appendix A.**

7 Historical Site Use Assessment

7.1 Previous Site Ownership and Use

Historical Certificate of Titles (CTs) were reviewed with the following relevant ownership information outlined below.

21 July 1893	Annie Robinson, wife of George Robinson, farmer
11 June 1946	Herbert Ray Woods, an Ashburton farmer
21 April 1993	Joseph John Murdoch, a Motukarara farmer and Heather Ruth Murdoch, his wife
31 May 2022	Lochlea Farming Co Ltd

Note that some of the older information was of poor quality and difficult to follow, therefore the accuracy of the spelling of names and dates is not guaranteed. Copies of the historical Certificate of Title are included in **Appendix B.**

7.2 District Council Records

The site is currently zoned Outer Plains in the operative Selwyn District Plan and General Rural Zone in the proposed Selwyn District Plan.

The property files were provided by Selwyn District Council on 22 June 2022. Information within the property file included the following consent applications:

- A Building permit application to construct a single storey implement shed, dated 18 July 1977. The implement shed is to have corrugated iron walls and roof.
- A Building Consent application to construct a woolshed, dated 8 February 1995.
- A Building Consent application to construct a garage/workshop, dated 27 January 2000.
- A Building Consent application for dwelling alterations, dated 23 February 2008.

7.3 Regional Council Records

According to the ECan Listed Land Use Register (LLUR) a small portion of the site is listed on the Listed Land Use Register (LLUR) as per Hazardous Activities and Industries List (HAIL) C2 – gun clubs or rifle ranges. The listing is associated with the neighbouring Waihora Clay Target Club as a portion of the site is located within the shot fall zone. The site is categorised as 'Contaminated – Agricultural'. A Preliminary Site Investigation is available for the Waihora Clay Target Club and will be reviewed in **Section 8** of this report. The area of interest is shown in **Figure 2** below.

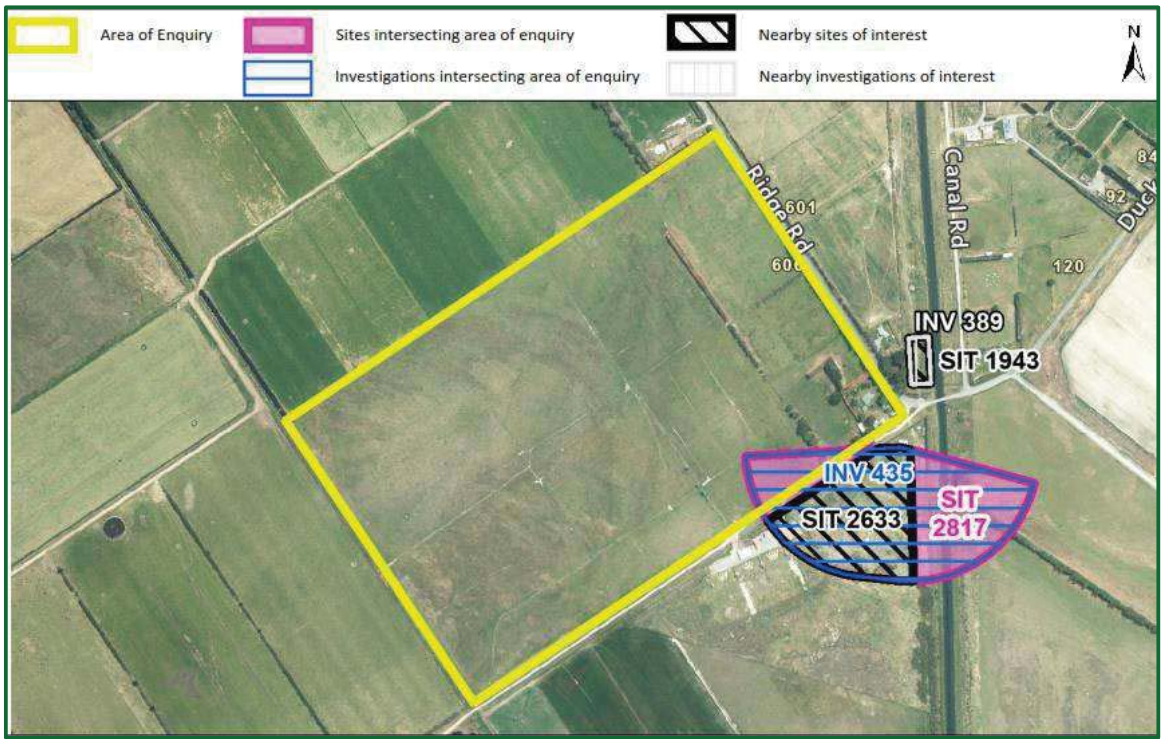


Figure 3 – LLUR HAIL Location Map

An additional property location within a 100m radius of the site is also listed on the LLUR. A portion of land located on the corner of Canal and Ridge Roads is listed as HAIL G3 – landfill sites. The area of land is categorised as 'partially investigated'. The LLUR Statement notes that this location contains an old rural dump site used by locals. An investigation report is available for the area and will be reviewed in **Section 8** of this report.

See the full LLUR Statement in **Appendix C.**

The ECan GIS database shows 13 bores on site, 11 of which are active. M36/7568 is located within the residential area of the site and is used for domestic and stock water supply. The remaining bores are used for stock water supply. There are several other active bores within a 100m radius of the site, mostly used for stock water supply.

The ECan GIS database shows two active resource consents for the site. Both resource consents are active and permit the use of the site for farming activity. There are multiple active resource consents within a 100m radius of the site. These are largely associated with taking and using water from the adjacent Halswell River

7.4 LINZ Records

The LINZ Orchard Layer does not show the site, or any nearby properties as having listed orchards.

7.5 Review of Historical Aerial Photographs

A total of eight aerial photographs have been sourced from the ECan GIS database. Copies of the aerial photographs used are included in **Appendix D**.

- The earliest available aerial photograph is from **1940-1944** and shows the majority of the site is vacant, pastoral land. The residential area located in the eastern corner of the site contains a dwelling and multiple farm buildings. The residential area is surrounded by a dense shelterbelt. The surrounding land is largely rural and rural residential land.
- The next available aerial photograph is from **1960-1964** and shows no significant changes to the pastoral portion of the site. The residential area contains a dwelling, garage and domestic shed, a woolshed, shearing shed and sheep yards. Multiple smaller farm buildings are also present. The paddock to the rear of the residential area contains multiple lighter coloured areas indicating potential soil disturbance activities. A potential burn pile is also present. A large rectangular implement shed is also present in the paddock to the north of the residential area. A shed is now present beyond the site to the south-east, this appears to be the location of the Waihora Clay Target Club. There are no other changes significant to the surrounding area.
- The **1965-1969** aerial photograph shows no significant changes to the site or surrounding area.
- The **1975-1979** aerial photograph shows no significant changes to the site or surrounding area.
- The **1990-1994** aerial photograph shows the addition of an implement shed adjacent to the treeline in the paddock to the rear of the residential area. There are no other significant changes to the site or surrounding area.
- The **2000-2004** aerial photograph shows no significant changes to the site. A residential dwelling is now present on the property to the north-east of the site.
- The **2010-2014** aerial photograph shows evidence of burn areas in the paddocks to the rear and to the north of the residential area. The large rectangular implement shed noted in the paddock to the north of the residential area is now half the size. Development works are occurring beyond the site to the south-east as indicated by multiple stockpiles of material and several truck and trailers.
- The **latest** aerial photograph shows no significant changes to the site. A gravelled area and shed which is used as part of the Waihora Clay Target Club is now present in the area of the development works previously noted.

8 Previous Investigations

8.1 Initial Investigation into Lead Contamination at Clay Target Clubs and Wetlands in Canterbury, June 1997

A preliminary investigation was commissioned by Canterbury Regional Council and the Ministry for the Environment to assess the potential impacts of lead shot use at clay target clubs and wetland shooting areas. Thirteen active and three inactive clay target clubs were included in the investigation and the Waihora Clay Target Club was one of three selected for sampling.

The report notes that clay target clubs are often subject to intensive shooting undertaken over long periods of time and often in areas where agricultural land uses such as cropping and grazing are carried out. The report also included a definition of the target and shot fall zones. The target fall zone extending approximately 50m from the trap or skeet house. The shot fall zone extends between 50m and 200m from the trap or skeet house.

The Waihora Clay Target Club is noted as commencing in approximately 1946. The land use in the shot fall zone, which includes a portion of the site, is noted as being pasture, grazing and sheep. **Figure 4** below shows the soil sample locations within the Waihora Clay Target Club and corresponding lead concentrations (mg/kg).

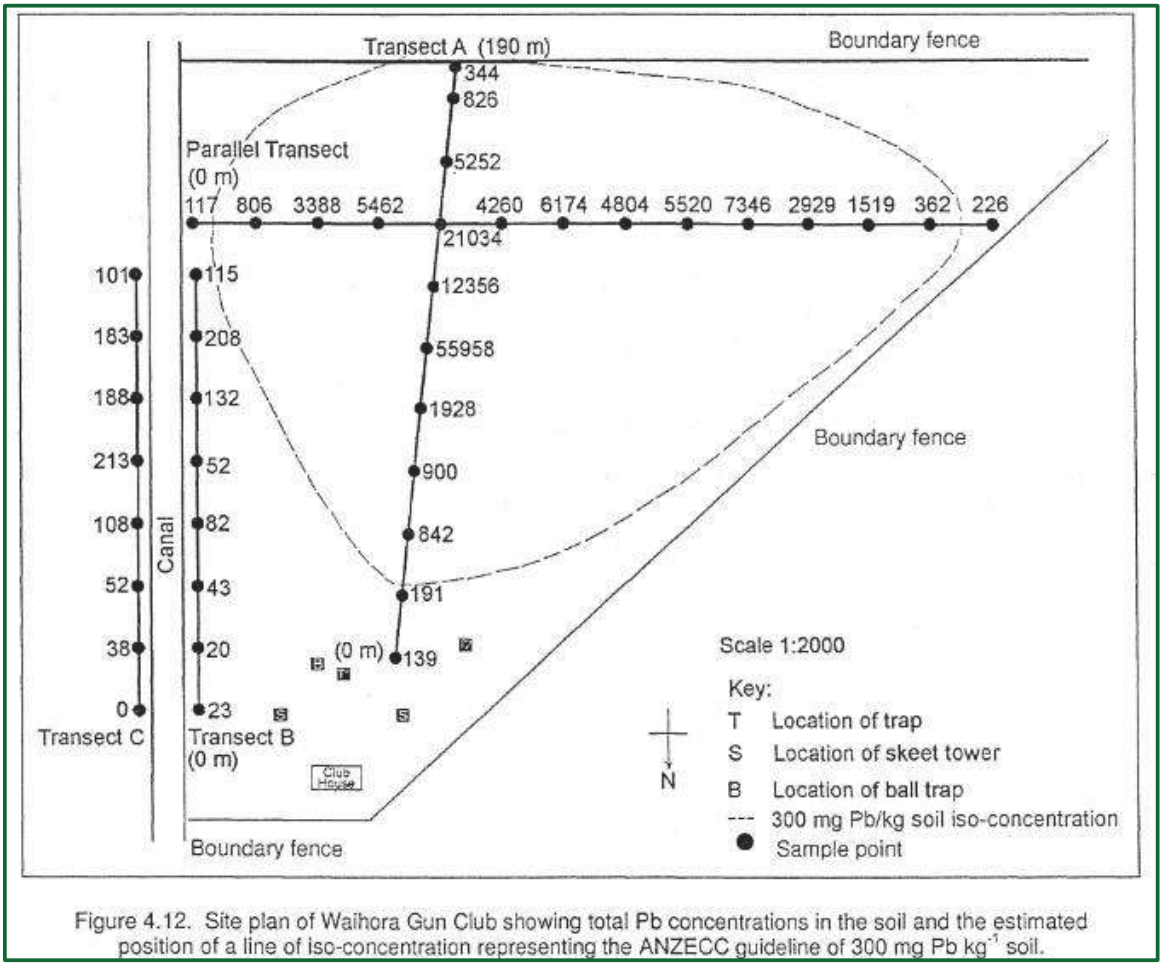


Figure 4.12. Site plan of Waihora Gun Club showing total Pb concentrations in the soil and the estimated position of a line of iso-concentration representing the ANZECC guideline of 300 mg Pb kg^{-1} soil.

Figure 4 – Waihora Clay Target Club Sample Locations and Corresponding Lead Concentrations

The report states that the maximum lead concentrations at all three sampled sites were at a distance of 120m or 140m from the traps. The Waihora Clay Target Club was categorised as having a medium risk potential, likely to require further action. The report concludes that the shot fall zone is often the area containing the highest concentrations of lead, which extends onto neighbouring land used for agricultural purposes. The report recommends that steps be taken to further investigate and characterise contamination resulting from clay target clubs and implement suggested site management measures to mitigate potential adverse effects to human health and the environment.

8.2 Environmental Site Assessment at a former Landfill, Hodgens Bridge, cnr Canal and Ridge Roads, Motukarara – Pattle Delamore Partners (PDP), June 2013

The Preliminary Environmental Investigation states that a former landfill is located on the western side of the Halswell Canal, at the intersection of Canal and Ridge Roads, approximately 70m north-east of the site. Site history information states that the area was used by local residents for dumping general farm waste including wire, machinery, fence and building materials and at least seven crushed cars. The landfill was in operation from 1975-1990 and was approximately 10m long by 5m wide.

The report concludes that any leachate produced by the landfill may pose a risk to surface water and groundwater in the landfill vicinity and downgradient of the landfill. The risk to groundwater users in the area was considered low due to the depth to wells, low permeability and separation distance from the landfill.

9 Site Inspection

A site inspection was undertaken on 23 June 2022 to assess the likelihood of soil contamination on the site. The residential and farmyard area is located within the eastern corner of the site and accessed via Gammacks Road. The residential dwelling is a weatherboard structure and surrounded by garden beds, pathways and a patio area. A domestic vegetable garden is located to the rear of the dwelling. A concrete block garage/workshop is located adjacent to the vegetable garden. The garage/workshop has a concrete base and was empty at the time of the site inspection. Within the treeline to the rear of the dwelling is a corrugated iron and timber firewood storage shed, a small timber structure, likely an outdoors toilet and a small cottage. The cottage is painted timber and the paint is flaking and in a deteriorated condition.

Photo 1 & Photo 2 – Dwelling

Photo 3 – Rear of the dwelling

Photo 4 – Vegetable garden

Photo 5 – Garage/workshop

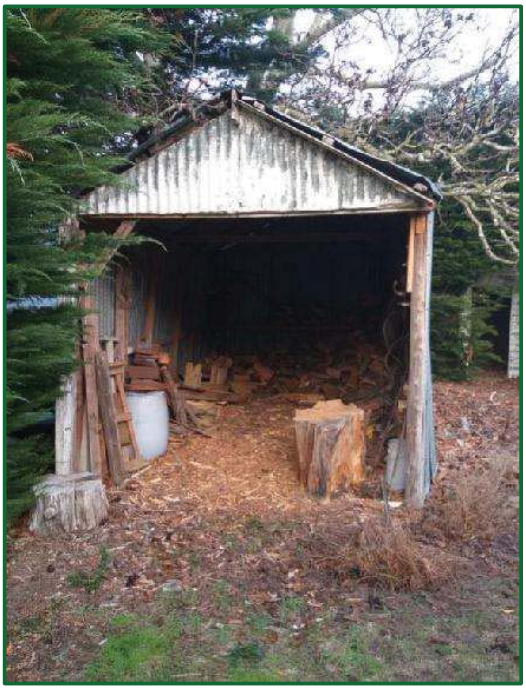


Photo 6 – Firewood storage shed

Photo 7 – Outdoors toilet

Photo 8 – Painted timber cottage

Within the farmyard area along the eastern boundary of the site is a modern, versatile style garage with a concrete base. To the rear of the garage are some animal pens attached to a small concrete block shed and loading ramp. The shed has a concrete base and separate closed off section which has a sign reading 'Danger Poison Chemical Store'. The shed was not accessible at the time of the site inspection however from the window, there were no obvious signs of large-scale chemical or fuel storage occurring within the shed. Adjacent to the loading ramp is a small, dilapidated timber and corrugated iron shed.

Photo 9 – Versatile style garage

Photo 10 – Animal pens

Photo 11 – Shed and animal pens

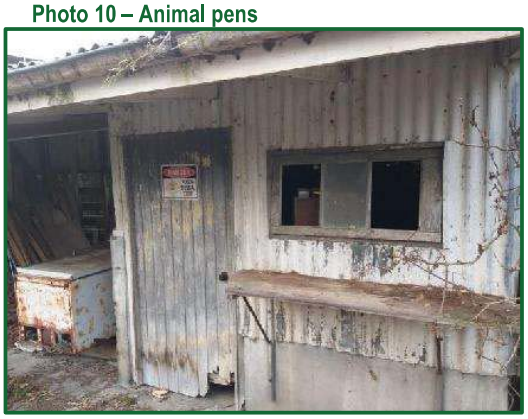


Photo 12 – Shed

Photo 13 – Loading ramp

Photo 14 – Dilapidated shed

Along the southern boundary of the site is a large painted timber woolshed/shearing shed. The painted timber is flaking and in a deteriorated condition. Sheep yards are present to the rear of the shed and a potential foot rot trough is present within the yards. There are also several broken pieces of concrete within the ground surrounding the sheep yards. To the rear of the sheep yards is a 4-bay implement shed. The shed is a corrugated iron and timber structure with an earth base. There was evidence of some oil and chemical storage occurring and isolated oil spots on the shed floor. An aboveground diesel storage tank (AST) is located in the treeline to the north of the implement shed. There were no obvious signs of spills or leaks surrounding the AST.

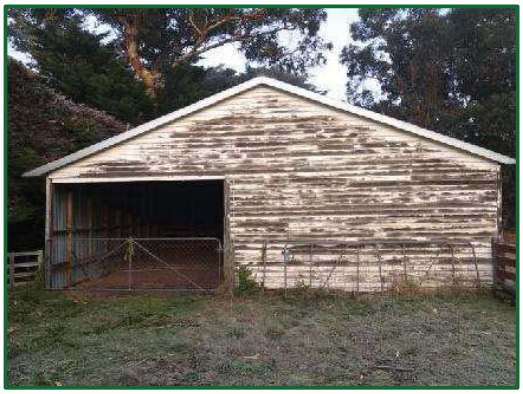


Photo 15 – Woolshed/shearing shed

Photo 16 – Sheep yards

Photo 17 & 18 – Sheep yards and potential foot rot trough

Photo 19 – 4-bay implement shed

Photo 20 – Evidence of oil spots on shed floor

Photo 21 – AST

Two burn areas are present in the paddock to the rear of the residential and farmyard areas. Both burn areas contain anthropogenic material such as glass, wiring, metal, nails, timber and an oil can. A chicken hutch, farm machinery, oil drums and a stockpile of treated timber are being stored along the treeline on the southern boundary of the site.

Photo 22 & 23 – Burn areas

Photo 24 – Chicken hutch

Photo 25 – Treated timber stockpile

Within the paddock to the north of the residential area is a large, dilapidated implement shed and some general farm storage occurring. The remaining paddocks are being used for stock grazing and winter feed production.

Photo 26 - Dilapidated shed

Photo 27 – Evidence of general farm storage

Photo 28 – Pastoral cropping in paddocks

A plan showing the layout of the site and potential sources of contamination is included in **Appendix E**.

10 Risk Assessment

10.1 Potential HAIL Uses Identified

The Hazardous Activities and Industries List (HAIL) compiled by The Ministry for the Environment include the following categories (*in italics*) that could be associated with the historical uses of the site with a summary of the risk of these activities having been carried out on the site.

A – Chemical manufacture, application and bulk storage

10. Persistent pesticide bulk storage or use, including sport turfs, market gardens, orchards, glasshouses or spray sheds

For its known history, much of the site has been used for pastoral farming activities. The normal uses of fertilisers and pastoral weed controls associated with these farming activities is unlikely to have caused soil contamination that would pose a risk to human health. However, multiple farm buildings were present at the site prior to the early 1940's and several more added in subsequent years. The use and storage of persistent pesticides in and around farm buildings on site cannot be discounted.

Contaminants of concern include heavy metals and organochlorine pesticides (OCPs).

8. Livestock dip or spray race operations

Sheep yards and a potential foot rot trough were identified during the site inspection. In the area surrounding the foot rot trough were several broken pieces of concrete. Although a plunge dip structure cannot be seen, the use of these yards for spray treatments cannot be discounted.

Contaminants of concern include heavy metals and OCP's.

17. Storage tanks and drums for fuel, chemicals or liquid waste

One aboveground diesel storage tank and several smaller drums and chemical storage areas were identified during the site inspection.

Contaminants of concern include heavy metals and petroleum hydrocarbons.

18. Wood treatment or preservation including the commercial use of antisapstain chemicals during milling, or bulk storage of treated timber outside

A stockpile of uncovered copper chromium arsenate (CCA) treated timber posts were being stored on bare ground outside. There are risks associated with the leaching of timber treatment chemicals into soils directly beneath and surrounding the storage areas.

Contaminants of concern include heavy metals.

C – Explosives and ordinances production, storage and use

2. Gun clubs or rifle ranges, including clay target clubs that use lead munitions outdoors

A portion of the site is listed on the ECan LLUR as it lies within the shot fall zone of the adjacent Waihora Clay Target Club. An investigation reviewed as part of this PSI identified lead contamination, associated with lead munitions, at the Waihora Clay Target Club which may extend onto the site.

Contaminants of concern include lead.

G – Cemeteries and waste recycling, treatment and disposal

5. Waste disposal to land

During the site inspection two burn areas were identified in the paddock to the rear of the residential and farmyard areas. Both burn areas contain anthropogenic material such as glass, wiring, metal, nails, timber and an oil can.

Contaminants of concern associated with burn areas is dependent on the material disposed of but could include heavy metals, asbestos and petroleum hydrocarbons.

H - Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment

A portion of land located on the corner of Canal and Ridge Roads, approximately 70m north-east of the site, is listed as HAIL G3 – landfill sites. A previous report undertaken on the landfill notes that the area was used by local residents for dumping general farm waste including wire, machinery, fence and building materials and at least seven crushed cars. The landfill was in operation from 1975-1990 and was approximately 10m long by 5m wide.

Due to the separation distance between the landfill and the site, the size of the landfill and the timeframe since the landfill was last in operation, it is not considered to pose a risk of migration of contaminants to the site in sufficient quantities to pose a risk to human health.

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

Historical CTs suggest the site has been occupied since 1893 and buildings have been present on site since at least the early 1940's. Based on the era of the buildings present it is highly likely that lead based paint products and asbestos containing materials (ACM) have been used and any natural deterioration or intentional removal may have caused contamination of the surrounding soils.

Contaminants of concern include heavy metals and asbestos.

10.2 NESCS Regulation 6(3) Probability Assessment

In terms of the NESCS, Regulation 5(7) states that land is considered to be covered if an activity or industry described in the HAIL is being undertaken; has been undertaken; or is more likely than not to have been undertaken on it. Regulation 6 describes the methods for determining this. Method 6(3) is to rely on a Preliminary Site Investigation. The NESCS Users Guide indicates the test for 'more likely than not' is that there is more than a 50 percent likelihood of the HAIL having occurred. **Table 2** below states the likelihood of each HAIL identified:

Table 2 – NESCS Probability Assessment

HAIL Category	6(3)a - Is being undertaken	6(3)b – has been undertaken	6(3)c – likelihood of having been undertaken (if not confirmed)
HAIL A10 – persistent pesticide use/storage	-	-	More likely than not
HAIL A8 – livestock dip or spray race operation	-	-	More likely than not
HAIL A17 – storage of fuels or chemicals	Yes	-	-
HAIL A18 – bulk storage of treated timber outside	Yes	-	-
HAIL C2 – Gun clubs or rifle ranges	Yes	-	-
HAIL G5 – waste disposal to land	Yes	-	-
HAIL Class H – migration of contaminants	-	-	Highly unlikely
HAIL Class I – any other - lead paint	-	-	More likely than not

At present, the site is considered to be production land. Regulation 5(8) of the NESCS states that if the piece of land is production land the regulations apply only for certain uses, which includes the following subclause:

(c) to subdivide land in a way that causes the piece of land to stop being production land.

Following subdivision, proposed Lot 5 will continue to be production land and therefore the NESCS does not apply to proposed Lot 5. Proposed Lots 1-4 will stop being production land and therefore the NESCS must be considered for these areas.

This Preliminary Site Investigation has identified multiple HAIL activities within proposed Lot 1 that warrant further investigation in the form of Detailed Site Investigation. At this stage, no further investigation is recommended within proposed Lots 2-4 as no potentially contaminating activities have been identified for these areas.

In terms of planning status at the time of writing of this report, the NESCS does apply to the proposed subdivision and resource consent will be required.

10.3 Conceptual Site Model

The following conceptual site model indicates potentially complete exposure pathways associated with the identified risk areas within proposed Lot 1 shown in **Figure 2** below.

Table 3 – Conceptual Site Model

Potential Source	Pathways		Receptor	Exposure Pathway Status
• Livestock dip and spray race • Treated timber storage outside • Storage of fuels and chemicals in and around farm buildings • Shot fall zone of the adjacent Waihora Clay Target Club • Burn areas • Historical buildings	Human	Dermal contact, ingestion and inhalation through soil contact	Site users	Potentially complete
			Workers involved in soil disturbance at the site	Potentially complete
	Ecological	Infiltration through soils to groundwater	Groundwater (assumed to be between 1.13m and 2.10m at the site)	Likely incomplete
		Surface runoff to waterways	Nearest waterways are adjacent drains and the Halswell River ~50m east.	Likely incomplete

Figure 2 – Risk Areas Plan

11 Conclusion

This Preliminary Site Investigation has identified the following potential sources of contamination:

- The use and storage of persistent pesticides in and around the farm buildings.
- Potential sheep dip or spray race operation within the sheep yards, adjacent to the woolshed/shearing shed.
- The presence of storage tanks and drums for fuels or chemicals in and around the farm buildings.
- The storage of treated timber outside.
- A portion of the site located within the shot fall zone of the adjacent Waihora Clay Target Club
- Two burn areas identified during the site inspection.
- Lead based paint products and ACM on historical buildings located at the site.

Following subdivision, proposed Lot 5 will continue to be production land and therefore the NESCS does not apply to proposed Lot 5. Proposed Lot 1 will stop being production land and therefore the NESCS must be considered for this area.

The potential sources of contamination contained within proposed Lot 1 have been described as the residential risk area, farmyard risk area, burn areas and shot fall zone, and are shown on the plan in **Figure 5** above. Based on the potential risk to human health in a rural residential setting, it is recommended that further investigation be undertaken in the form of a Detailed Site Investigation.

At this stage, no further investigation is recommended within proposed Lots 2-4 as no potential sources of contamination have been identified for these areas.

In terms of planning status at the time of writing of this report, the NESCS does apply to the proposed subdivision and resource consent will be required.

12 Limitations

Momentum Environmental Limited has performed services for this project in accordance with current professional standards for environmental site assessments, and in terms of the client's financial and technical brief for the work. Any reliance on this report by other parties shall be at such party's own risk. It does not purport to completely describe all the site characteristics and properties. Where data is supplied by the client or any third party, it has been assumed that the information is correct, unless otherwise stated. Momentum Environmental Limited accepts no responsibility for errors or omissions in the information provided. Should further information become available regarding the conditions at the site, Momentum Environmental Limited reserves the right to review the report in the context of the additional information.

Opinions and judgments expressed in this report are based on an understanding and interpretation of regulatory standards at the time of writing and should not be construed as legal opinions. As regulatory standards are constantly changing, conclusions and recommendations considered to be acceptable at the time of writing, may in the future become subject to different regulatory standards which cause them to become unacceptable. This may require further assessment and/or remediation of the site to be suitable for the existing or proposed land use activities. There is no investigation that is thorough enough to preclude the presence of materials at the site that presently or in the future may be considered hazardous.

Appendix A – Scheme Plan

GENERAL NOTES

Property Address:	606 Ridge Road, Motukarara
Registered Owners:	Lochlea Farming Co Ltd
Comprised in:	CB25B/823
Local Authority:	Selwyn District Council
Total Area:	42.4161ha
Zoning:	Outer Plains

N

1. Existing lot boundaries shown are derived from information sourced from LINZ.
2. Horizontal Datum:
   NZGD 2000
   Mount Pleasant Circuit
3. Areas and dimensions are approximate only and subject to Council approval and final survey.
4. Aerial image sourced from LINZ data service taken in October and November 2020.
5. Lot 5 hereon and Lot 2 DP 446830 are to be subject to **No Build Covenant.**

LEGEND:
No Build Covenant Area

AMALGAMATION CONDITIONS

THAT LOT 1 HEREON BE HELD WITH LOT 2 DP 446830 (RT 563371) AND ONE RECORD OF TITLE BE ISSUED

THAT LOT 5 HEREON BE TRANSFERRED TO THE OWNER OF SECTION 2 BLOCK IV RES 959 (RT CB27K/308) AND ONE RECORD OF TITLE BE ISSUED

Revision	App	Date
A INITIAL ISSUE	GF	17.05.22

Surveyed		
Designed	GF	17.05.22
Drawn	JK	17.05.22
Reviewed	GF	17.05.22
Approved	GRAHAM FOWLER	17.05.22

Client
LOCHLEA FARMING CO LTD

Project Title
606 RIDGE ROAD
SUBDIVISION

Sheet Title
LOTS 1-5
BEING A SUBDIVISION
OF SECTION 3 BLOCK IV
RESERVE 959

GRAHAM FOWLER
CONSULTING

Scale (A3 Original) 1:5000

50 25 0 50 100 150 m

Project No	Sheet	Revision
GF-066	V60	A

H:\CHC\7101x\7101\30 Draughting Services G. Fowler\GF-066-Lochlea farming Co. Ltd - 606 Ridge Road\320 Drawings\3_Drawing\GF-066-V60.dwg. Plotted By Jonnie Kerr at 17/05/2022 2:44:37 pm Scale 1:1

Appendix B – Historical Certificates of Title

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Historical Search Copy

R.W. Muir
Registrar-General
of Land

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

Identifier **CB25B/823**

Land Registration District **Canterbury**

Date Issued 30 September 1983

Prior References

455372.1 (6584) CB161/23

Estate Fee Simple

Area 42.4161 hectares more or less

Legal Description Section 3 Block IV Reserve 959

Original Registered Owners

Joseph John Murdoch and Heather Ruth Murdoch

Interests

Subject to Section 5 Coal Mines Act 1979

Subject to Section 8 Mining Act 1971

12454141.1 Transfer to Lochlea Farming Co Limited - 31.5.2022 at 11:38 am

12454141.2 Mortgage to ASB Bank Limited - 31.5.2022 at 11:38 am

Reference:
Certificate No. 455372/1 (6584)
LIP Vol. 161 Folio 23
Transfer No.

Land and Deeds 72

REGISTER

No. 25B/823

CERTIFICATE OF TITLE UNDER LAND TRANSFER ACT

This Certificate dated the 30th day of September one thousand nine hundred and eighty-three under the seal of the District Land Registrar of the Land Regulation District of CANTERBURY being a Certificate in lieu of Grant, **WITNESSETH** that HERBERT RAY WOODS of Motukarara, Farmer ——

is seised of an estate in fee simple (subject to such reservations, restrictions, encumbrances, liens, and interests as are notified by memorial underwritten or endorsed hereon) in the land hereinafter described, delineated with bold black lines on the plan hereon, be the several admeasurements a little more or less, which said land was originally acquired by THE ABOVENAMED ——

as from the 31st day of May one thousand nine hundred and eighty-three under Section 124A Land Act 1948 —— that is to say: All that parcel of land containing 42.4161 hectares or thereabouts being Section 3 Block IV Reserve 959 ——

DISTRICT LAND REGISTRAR

for Assistant Land Registrar

Subject to:

The reservations and conditions imposed by Section 8 Mining Act 1971 and Section 5 Coal Mines Act 1979

for A.L.R.

Mortgage A28354/1 [illegible] of New Zealand - 11.12.1992 at 10.[illegible]am

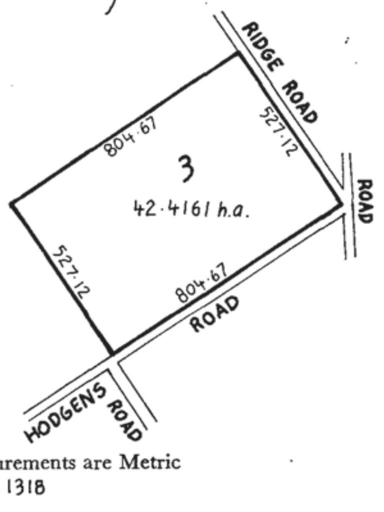
DISCHARGED

for A.L.R.

Transfer A47645/2 to Joseph John Murdoch of Motukarara, Farmer and Heather Ruth Murdoch, his wife - 21.4.1993 at 11.55am

for A.L.R.

Ellesmere County



No. 25B/823

Measurements are Metric
S.O. 1318

CERTIFICATE OF TITLE

66909C—6000/1/75TC

NEW ZEALAND. CANCELLED (Crown Lands Form No. 76.

Register-book, Vol. 161 fol. 23.

161/ 23

Canterbury LAND DISTRICT.

LEASE IN PERPETUITY UNDER PART III. OF "THE LAND ACT, 1892."

No. 59

This Deed, made the Twenty first day of July, 1895, between Her Majesty the Queen (who with her heirs and successors is hereinafter termed "the lessor"), of the one part, and Annie Robinson, wife of George Robinson of West Eyreton, in the Land District of Canterbury, in the said colony, farmer (hereinafter, with her executors, administrators, and permitted assigns, referred to as and included in the term "the lessee"), of the other part, **Witnesseth** that, in consideration of the rent hereinafter reserved, and of the covenants, conditions, and agreements herein contained and implied and on the part of the lessee to be paid, observed, and performed, the lessor doth hereby demise and lease unto the lessee **All** that piece or parcel of land containing by admeasurement One hundred and four acres three roods ten perches, a little more or less, situate in the Land District of Canterbury aforesaid, and being Section numbered 3 Block IV Subdivision of Reserve 959 Block XIV, Survey District of Halswell as the same is more particularly delineated and described in the plan drawn hereon, and therein coloured red in outline; together with the rights, easements, and appurtenances to the same belonging: To hold the said several premises intended to be hereby demised unto the lessee for the term of nine hundred and ninety-nine years and five months, commencing from the day of the date hereof and expiring on the First day of January which shall first ensue after the expiration of nine hundred and ninety-nine years from the 1st day of January next. **Yielding** and paying therefor unto the Receiver of Land Revenue for the said District of Canterbury the annual rent of Eight pounds seven shillings and eight pence (£ 8 : 7 : 8), payable half-yearly in advance on the 1st day of January and 1st day of July in each and every year during the said term, free from all deductions whatsoever. The first payment of such rent having been made, the next payment to become due to be made on the 1st day of July next.

And it is hereby declared and agreed that these presents are intended to take effect as a lease in perpetuity under Part III. of "The Land Act, 1892," and the provisions of that statute applicable to such leases; and, so far as the same apply to the term estate or interest hereby granted or created, and to the relations between the lessor and lessee from time to time, shall be binding in all respects upon the parties hereto in the same manner as if such provisions had been fully set out herein: **And** it is hereby further declared that if any dispute or disagreement shall arise between the parties hereto touching the construction of these presents, or in anywise relating hereto, such dispute or disagreement shall be referred to arbitration in the manner set forth in section 79 of the said Act; and neither of the said parties shall take or cause to be taken any steps or proceedings to set aside or call in question any award or decision which may have been given upon any such reference as final.

In Witness whereof the Commissioner of Crown Lands for the Land District of Canterbury on behalf of the lessor, hath hereunto set his hand, and these presents have been also executed by the said lessee, the day and year first above written.

BLOCK XIV HALSWELL DIST.

Subdivision of Block IV Reserve 959

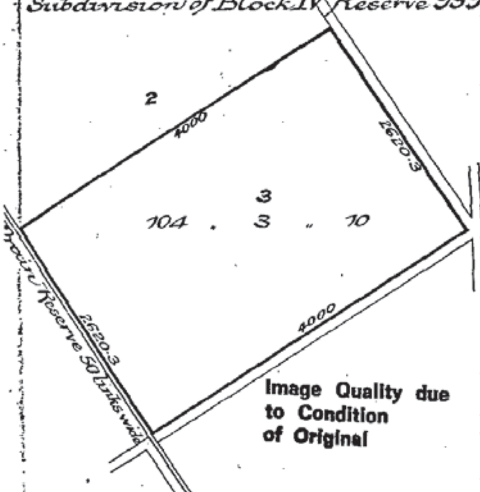


Image Quality due to Condition of Original

Scale 10 Chains to an Inch

METRIC AREA:— 42.4161 ha

Signed by the said Commissioner, on behalf of the said lessor, in the presence of—

Name G. Dunnage

Occupation Clerk Crown Lands Office

W. G. Marchant
Lessor

Signed by the above-named Annie Robinson as lessee, in the presence of—

Name Wm Lancaster

Residence Gebbies Valley.

Occupation Schoolmaster

Annie Robinson

Lessee

161/ 23

161/23

Mortgage 34620 produced 14 August 1895 at 10.45 AM. Annie Robinson to The Government Advances to Settlers Office. Superintendent

DISCHARGED 9.12.1903

No. 57

DATED 21 July, 1895.

Her Majesty the Queen

TO

Annie Robinson

Canterbury Land District.

Transfer of Within Lease produced 18th October 1897 at 12.30 pm. Annie Robinson to Foxbrook Woodward of Rakaia Island Gebbie's Flat Carpenter.

Mortgage 43521 produced 2 April 1900 at 2.30 pm. Foxbrook Woodward to Frederick ... Chinnery

DISCHARGED 9.12.1903

LEASE

3 Block IV Subdivision of Reserve 957, Of Section ..., Block XIV

Halswell Survey District.

Under "The Land Act, 1892."

Nine hundred and ninety-nine years from 1st January, 1894

Entered at 3 p.m. o'clock on the 25th day of August, 1895

District Land Registrar.

Transfer of within Lease produced 9 December 1903 at 11.40 a.m. Foxbrook Woodward to Edward Hodgen of Motukarara Farmer.

Mortgage 52980 produced 9 December 1903 at 11.40 a.m. Edward Hodgen to ...

DISCHARGED

Transfer 269726 produced 11 June 1946 at 2.55 pm. Edward Hodgen to Herbert Ray Woods of Motukarara Farmer.

Mortgage 225230 Produced 11 June 1946 at 1.55 p.m. Herbert Ray Woods to ... Williams & Stanford Alexander

DISCHARGED 8.9.19..

Mortgage 230821 produced 8 September 1947 at 11.40 am Herbert Ray Woods to The State Advances Corporation of New Zealand.

DISCHARGED

A.R.

THIS REPRODUCTION (ON A REDUCED SCALE) CERTIFIED TO BE A TRUE COPY OF THE ORIGINAL REGISTER FOR THE PURPOSES OF SECTION 215A LAND TRANSFER ACT 1952.

A. Simson A.L.R.

161/ 23

Certificate 455372/1 Cancelled and Freehold C.T. 25B/823 issued for the within land

A.L.R.

CANCELLED

DUPLICATE DESTROYED

Sections 141 to 147 of "The Land Act, 1892."

Compulsory Residence.

141. Residence on any land, not being land purchased for cash, selected under this Part of this Act shall be compulsory, and shall commence in bush-lands or on swamp-lands within four years, and in open or partly open land within one year, from the date of selection; and thereafter such residence shall be continuous—

(1.) On lands occupied with right of purchase, for six years on bush-lands or on swamp-lands, and for seven years on open or partly open land:

(2.) On lease-in-perpetuity lands, for a term of ten years.

But these conditions of residence shall not apply to any person who has acquired an interest in any lease or license under an intestacy or by virtue of a will.

142. The Board may dispense with residence if the lessee or licensee reside and continue to reside on lands contiguous to the lands held under lease or license. Lands shall be deemed to be contiguous to each other if only separated by a road or stream, or by such interval of space as the Board may determine in each case.

The Board may also dispense with residence for four years after the commencement of the term where residence is otherwise compulsory in cases where the lessees or licensees are youths or unmarried women living within the land district, and residing with their parents or near relatives.

In case of the death of either or both parents of a child or children, residence may be dispensed with until such child or one of such children respectively attain the age of seventeen years.

143. Personal residence may also be dispensed with by the Board in the cases hereinafter mentioned:—

(1.) Whenever any two persons, being licensees with right of purchase or lessees in perpetuity, have lawfully intermarried at some period not sooner than twelve months after the issue of the last of such licenses or leases, such persons may reside on such one of the selections of land made by them as they may think fit.

(2.) Whenever any two persons, one of whom has become a selector of land with right of purchase or a lessee in perpetuity, and the other is an owner or occupier of freehold land, have lawfully intermarried at some period not sooner than twelve months from the issue of the license or lease held by such selector, such selector may reside on such freehold.

(3.) Residence on such selection or on such freehold, as may be the case, shall be deemed a compliance with the conditions of section one hundred and forty-one in respect of residence by such several persons.

(4.) The Board, however, shall have a discretionary power to dispense with personal residence on sufficient and satisfactory grounds being shown for non-residence.

Improvements.

144. Every selector of lands under this Part of this Act, whether for occupation with right of purchase or for lease in perpetuity, shall put on the land comprised in his license or lease, as the case may be, substantial improvements—

(a.) Within one year from the date of his license or lease, to a value equal to ten per centum of the price of the land;

(b.) Within two years from the date of his license or lease, to a value equal to another ten per centum of the price of the land;

(c.) And thereafter, but within six years from the date of his license or lease, to a value equal to another ten per centum of the price of the land;

And in addition thereto shall, within six years from the date of his license or lease, put substantial improvements of a permanent character on first-class land to the value of one pound, and on second-class land to an amount equal to the net price of every acre of such land: Provided that in no case shall the additional improvements required on second-class land be more than ten shillings per acre.

And every selector shall be bound at any time when so required by the Board to make and sign a statutory declaration as to his fulfilment of the conditions of occupation and improvement of the land in his occupation up to the time of making the said declaration.

145. Any holder of bush lands or swamp lands on deferred payments under section one hundred and fourteen of "The Land Act, 1885," or in any special settlement under regulations made before the twenty-seventh day of February, one thousand eight hundred and ninety-one, under Part V. of such Act, and any holder of a perpetual lease of any land under section one hundred and forty-eight of such Act, shall be deemed to have complied with the requirements of section twenty-one of "The Land Act Amendment Act, 1887," if within six years from the date of his license or lease he has brought or shall bring into cultivation twice the amount of land required by the herein first above mentioned sections or regulations respectively, and in addition thereto has put or shall put substantial improvements of a permanent character on the land in his occupation to the value of one pound for every acre of such land.

146. In the case of suburban lands the Board in its discretion may dispense with conditions as to improvements of special monetary value, where such substantial improvements have been effected as in the opinion of the Board are reasonable in the circumstances.

147. The Board, on compliance with the provisions of section eighty-three, or on their being satisfied by a statutory declaration that the transferor is unable or not in a condition to make the improvements on the land required by this Act, may sanction a transfer, either by way of mortgage or otherwise, of land other than cash land, or of any interest in such land, held under this Part of this Act, at any time after the first selection thereof, to any person not disqualified who shall make the declaration under the particular system under which the land is held, as given in the Schedules to this Act.

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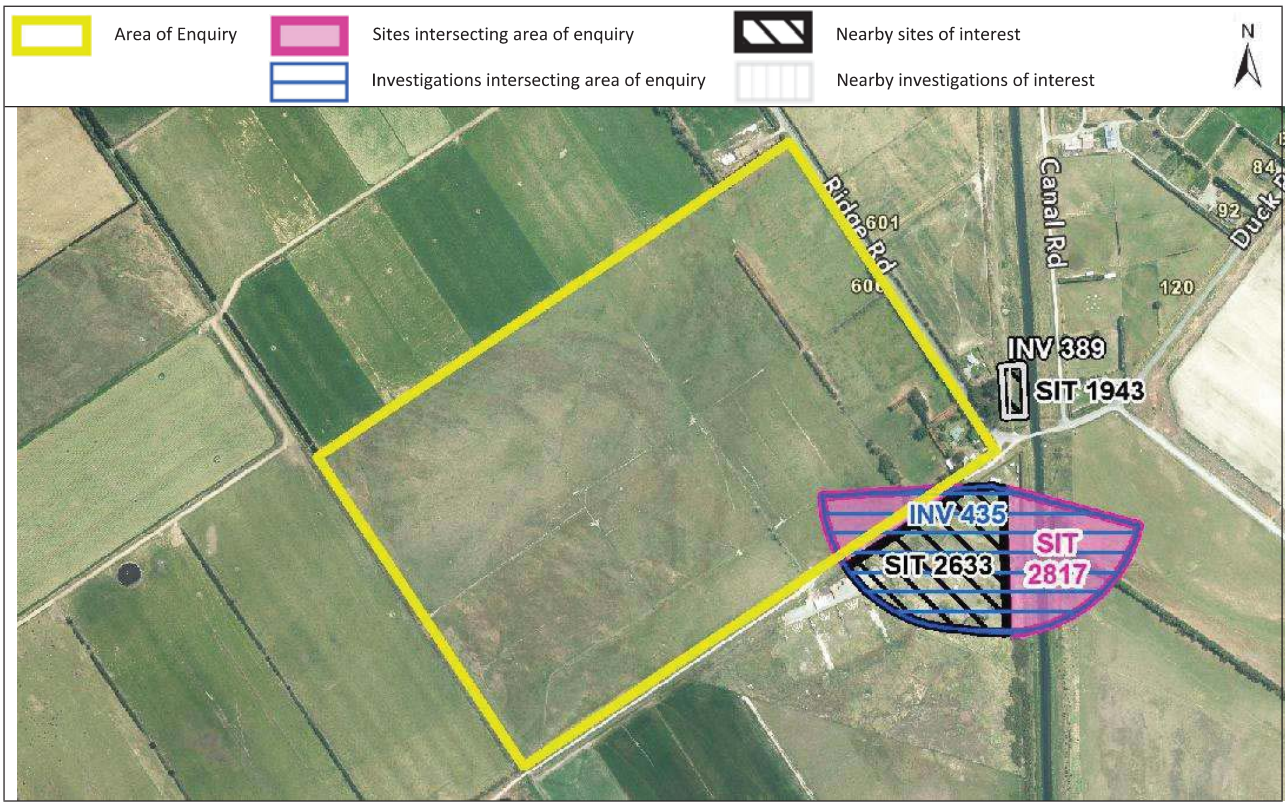
Appendix C – LLUR Statement

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 ENQ318146

Date generated: 13 June 2022
Land parcels: Section 3 Block IV RES 959



The information presented in this map is specific to the area within a 100m radius of property you have selected. Information on properties outside the serach radius 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
2817	Waihora Clay Target Club shot fall zone (off site)	0 Canal Road, Motukarara	C2 - Gun clubs or rifle ranges;	Contaminated - Agricultural

Please note that the above table represents a summary of sites and HAILs intersecting the area of enquiry only.

Nearby sites

Site number	Name	Location	HAIL activity(s)	Category
1943	Former landfill, Hodgens Bridge	Corner Canal and Ridge Roads, Motukarara	G3 - Landfill sites;	Partially Investigated
2633	Waihora Clay Target Club and shot fall zone (on site)	0 Gammacks Road, Motukarara	C2 - Gun clubs or rifle ranges;	Contaminated - Industrial/Commercial

Please note that the above table represents a summary of sites and HAILs intersecting the area of enquiry within a 100m buffer.

More detail about the sites

Site 1943: Former landfill, Hodgens Bridge (Within 100m of enquiry area.)

Category: Partially Investigated
Definition: Verified HAIL has been partially investigated.

Location: Corner Canal and Ridge Roads, Motukarara
Legal description(s): RES 5193

HAIL activity(s):

Period from	Period to	HAIL activity
1975	1990	Landfill sites

Notes:

6 Dec 1999 1998 CRC Records: Old rural dump site (informal) used by locals. Trench alongside river. Since filled in and levelled off.

2 Jun 2010 As part of the Listed Land Use Register (LLUR) classification update process, the information held on file for this site was appraised on 2 June 2010. The site's category was changed to *Partially Investigated* from *Verified HAIL*. The site has been subject of a preliminary study, which identified the approximate location of the landfill, documented its available history, and undertook a desktop assessment of risk posed to human health and environment. The study concluded that leachate generated in the landfill may affect the downgradient surface water and groundwater receptors. Source: PDP Limited Report titled; "Stage One Environmental Site Assessment at a former landfill, Hodgens Bridge", 1 May 2001. Ecan reference: C13C/81154.

Investigations:

INV 389 **Stage One Environmental Site Assessment at a former landfill, Hodgens Bridge, cnr Canal & Ridge Roads, Motukarara**
Pattle Delamore Partners Ltd - Preliminary Site Investigation
1 May 2001

Summary of investigation(s):

A desktop survey of a former landfill site located on the banks of Selwyn River, north of Hodgens Bridge, Motukarara has shown that the site was used as a landfill for 15 years from 1975 until 1990. The refuse comprised predominantly general farm wastes, some crushed cars, furniture, tins and bottles. The landfill area has been covered over since 1992 and its exact size is not known. In 1992 the surface of the landfill was approximately 10 m long and 5 m wide, but it is believed that the landfill was progressively extended and covered over during its lifetime. Any leachate produced by the landfill may pose a risk to surface water and groundwater in the site vicinity and downgradient of the site. The risk to documented groundwater users in the site area was considered to be low, given the depth of the wells, the low permeability strata in the site vicinity, and the separation distance from the landfill site.

Site 2633: Waihora Clay Target Club and shot fall zone (on site) (Within 100m of enquiry area.)

Category: Contaminated - Industrial/Commercial
Definition: The site has been investigated. Results show that the land has a hazardous substance in or on it that has, or is reasonably likely to have, significant adverse effects on human health and/or the environment.

Location: 0 Gammacks Road, Motukarara
Legal description(s): Lot 1 DP 446830

HAIL activity(s):

Period from	Period to	HAIL activity
1946	present	Gun clubs or rifle ranges, including clay target clubs that use lead munitions outdoors

Notes:

13 Feb 2014 The site has been actively used for clay target shooting since 1946. The site and some adjoining properties have become contaminated by the lead shot used. Soil samples taken at the site in 1997 showed the soil to be contaminated with lead, above the NEPC acceptance value for residential land use and above the Canadian acceptance value for agricultural land use. Conservative dimensions were used in identifying properties in the shot fall zone.

Investigations:

INV 435 **Initial Investigation into Lead Contamination at Clay Target Clubs and Wetlands in Canterbury**
ECan - Preliminary Site Investigation
1 Jun 1997

Summary of investigation(s):

A preliminary investigation into the environmental impacts of lead shot use at clay target clubs and wetland shooting areas was carried out in the Canterbury region.

Thirteen active and three inactive clay target clubs were identified in the report. A history of shooting and the level of use was compiled for each site.

Forty soil samples were taken from four transects. The maximum concentration of total soil lead was 55,558 mg/kg measured 100m from the traps. The majority of samples exceeded the NEPC acceptance value for lead for residential land use and the Canadian acceptance value for agricultural land use.

Site 2817: Waihora Clay Target Club shot fall zone (off site) (Intersects enquiry area.)

Category: Contaminated - Agricultural
Definition: The site has been investigated. Results show that the land has a hazardous substance in or on it that has, or is reasonably likely to have, significant adverse effects on human health and/or the environment.

Location: 0 Canal Road, Motukarara
Legal description(s): RES 5194,Section 16 Block V RES 959,Section 3 Blk IV RES 959

HAIL activity(s):

Period from	Period to	HAIL activity
1946	present	Gun clubs or rifle ranges, including clay target clubs that use lead munitions outdoors

Notes:

5 Apr 2004 This site is within the shot fall zone of the Waihora Clay Target Club.

Investigations:

There are no investigations associated with this site.

Nearby investigations of interest

There are no investigations associated with the area of enquiry.

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.

Appendix D – Historical Aerial Photographs

canterbury maps

1940-1944

N

0 0.06 0.12 0.18 0.24 Kilometres

Scale: 1:6,000 @A4

Map Created by Canterbury Maps on 14/06/2022 at 11:14 AM

canterbury maps

1960-1964

N

0 0.07 0.14 0.21 0.28 Kilometres

Scale: 1:7,000 @A4

Map Created by Canterbury Maps on 14/06/2022 at 11:15 AM

canterbury maps

1965-1969

N

0 0.07 0.14 0.21 0.28 Kilometres

Scale: 1:7,000 @A4

Map Created by Canterbury Maps on 14/06/2022 at 11:17 AM

canterbury maps

1975-1979

N

0 0.06 0.12 0.18 0.24 Kilometres

Scale: 1:6,000 @A4

Map Created by Canterbury Maps on 14/06/2022 at 11:18 AM

canterbury maps

1990-1994

N

0 0.06 0.12 0.18 0.24 Kilometres

Scale: 1:6,000 @A4

Map Created by Canterbury Maps on 14/06/2022 at 11:18 AM

canterbury maps

2000-2004

N

0 0.06 0.12 0.18 0.24 Kilometres

Scale: 1:6,000 @A4

Map Created by Canterbury Maps on 14/06/2022 at 11:19 AM

canterbury maps

2010-2014

N

0 0.06 0.12 0.18 0.24 Kilometres

Scale: 1:6,000 @A4

Map Created by Canterbury Maps on 14/06/2022 at 11:20 AM

canterbury maps

Latest

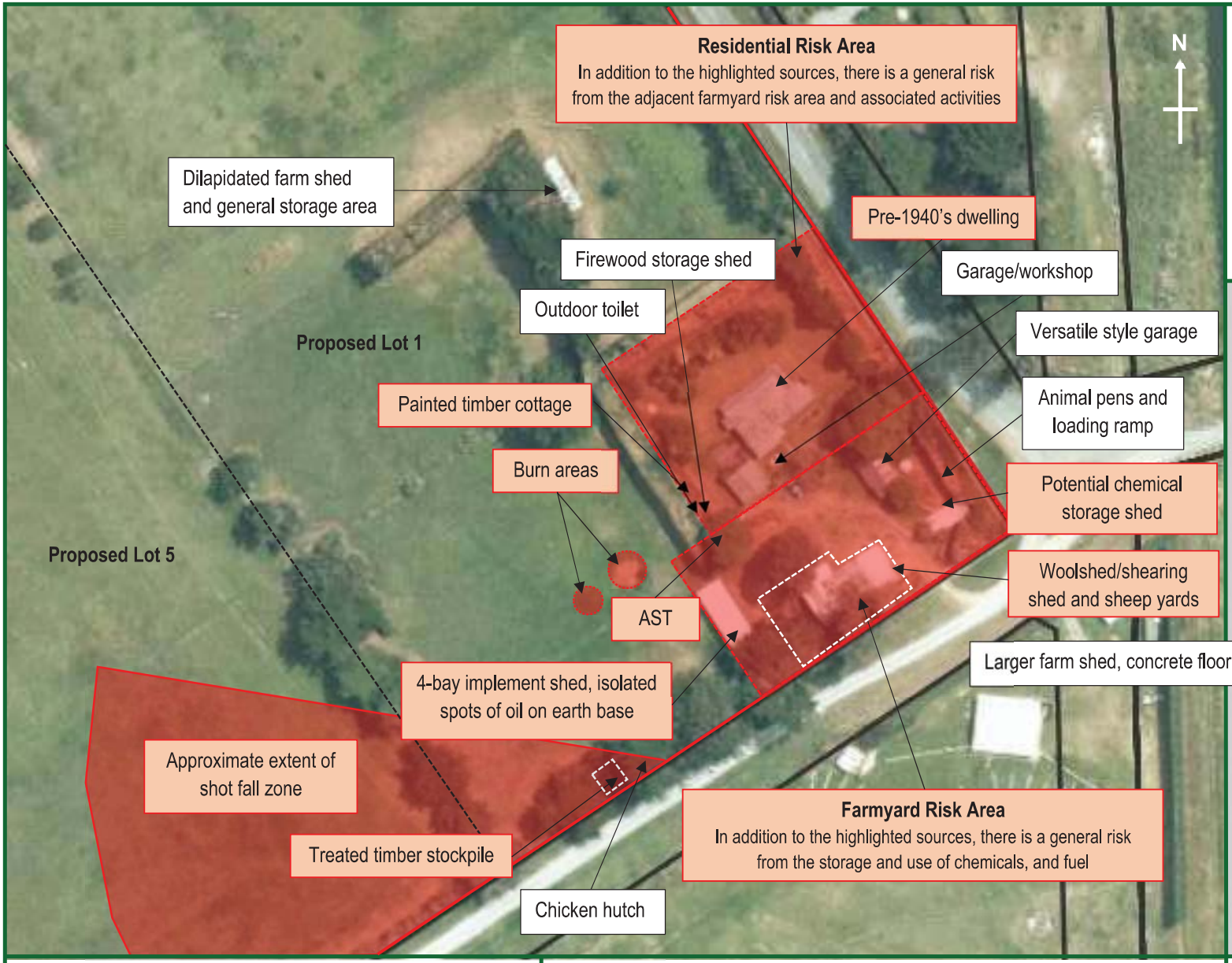
N

0 0.06 0.12 0.18 0.24 Kilometres

Scale: 1:6,000 @A4

Map Created by Canterbury Maps on 14/06/2022 at 11:20 AM

Appendix E – Site Inspection and Risk Areas Plan



MOMENTUM ENVIRONMENTAL LTD.

Specialist soil contamination experts, keeping your project moving.

www.momentumenviro.co.nz

LEGEND

- text — Potential source of contamination
- text — Description of structures/areas not considered to pose a risk
- Approx. extent of risk areas

Graphic scale is approximate only

0 10 20 30 40 50m

Date: 28 June 2022 **Drawing No:** 681/1

606 Ridge Road, Motukarara

Site Inspection Plan

Notes:

1. This plan has been prepared for soil contamination risk assessment purposes only. No liability is accepted if the plan is used for any other purposes.
2. Any measurements taken from this plan which are not dimensioned on the electronic copy are at the risk of the user.
3. Soil sample locations are approximate only

Soil Contamination Risk
Detailed Site Investigation Report
and Remediation Action Plan

606 Ridge Road,
Motukarara (Residential Area)

September 2022

www.momentumenviro.co.nz

Specialist soil contamination experts, keeping your project moving.

Quality Control and Certification Sheet

Client: Lochlea Farming Co. Ltd

Date of Issue: 20September 2022

Report written by:

Hollie Griffith, Environmental Scientist, BEMP, CEnvP
(6 years contaminated land experience)

Signed: 

Email: hollie@momentumenviro.co.nz
Phone: 027 513 4057

Report reviewed and certified as a Suitably Qualified and Experienced Practitioner by:

Nicola Peacock, Principal Environmental Engineer, NZCE, CEnvP
(13 years contaminated land experience within 29 years environmental experience)

Signed: 

Email: nicola@momentumenviro.co.nz
Phone: 021 1320 321

CONTENTS

APPENDICES

1 Executive Summary

The site is a rural property located at 606 Ridge Road in Motukarara, Canterbury. The site is currently the subject of a subdivision application which seeks to create a 4.65ha lot which is to include the residential dwelling and farm buildings and three vacant 1ha lots. The balance of the site is approximately 34.75ha. The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS) require an assessment of the likelihood of soil contamination being present. It is also noted that Momentum Environmental Ltd is obligated to consider the requirements of Section 10 (4) of the Health and Safety at Work (Asbestos) Regulations 2016. This report details the work undertaken to assess the risks.

A Preliminary Site Investigation (PSI) was undertaken by Momentum Environmental Ltd (MEL) in July 2022. The PSI identified the following potential sources of contamination as per the Hazardous Activities and Industries List (HAIL):

- Potential sheep dip or spray race operation within the sheep yards, adjacent to the woolshed/shearing shed (HAIL A8).
- The use and storage of persistent pesticides in and around the farm buildings (HAIL A10).
- The presence of storage tanks and drums for fuels or chemicals in and around the farm buildings (HAIL A17).
- The storage of treated timber outside (HAIL A18).
- A portion of the site located within the shot fall zone of the adjacent Waihora Clay Target Club (HAIL C2).
- Two burn areas identified during the site inspection (HAIL G5).
- Lead based paint products and asbestos containing materials (ACM) on historical buildings located at the site (HAIL Class I).

The PSI identified multiple potential sources of contamination within proposed Lot 1 that warranted further investigation in the form of a Detailed Site Investigation (DSI). No further investigation was recommended within proposed Lots 2-4 as no potentially contaminating activities were identified for these areas. Following subdivision, proposed Lot 5 will continue to be production land and therefore the NESCS does not apply to proposed Lot 5 and no further investigation was recommended.

This DSI is restricted to the residential curtilage area of Lot 1. Soil sampling undertaken as part of this DSI has shown one area of lead contamination within soils adjacent to and within the existing vegetable garden. The highest lead concentration identified was 519mg/kg compared to the 'residential 10% produce' soil guideline value (SGV) of 210mg/kg. The sample was collected from soils within the existing vegetable garden. The remaining sample results have shown contaminant concentrations are below the 'residential 10% produce' SGVs, and no asbestos was detected in the soil samples collected from the site.

Based on the moderate risk to human health associated with the lead contamination, it is recommended the soils adjacent to and within the vegetable garden are remediated prior to the reoccupation of the dwelling and ongoing use of the area for residential purposes.

The recommended remediation option is excavation and relocation on-site into a managed bund or similar. This is considered a logistically feasible option given the space available within the

remainder of Lot 1 (outside of the residential curtilage area) and Lot 5. Offsite disposal is also an option.

The lead contamination has not been fully delineated to the north of the vegetable garden, however this can be undertaken during the remediation process, using a portable XRF. Where contaminated soils extend beyond the vegetable garden, managing the soils in-situ and implementing an Ongoing Site Management Plan (OSMP) may be suitable.

Following successful remediation of the lead contaminated soils within and adjacent to the existing vegetable garden, a Site Validation Report will be produced and provided to Selwyn District Council and ECan. Where contaminated soils extend beyond the vegetable garden and the decision is made to manage the soils in-situ, an OSMP will be produced and provided to Selwyn District Council and ECan.

Resource consent is not required under the NESCS for the remediation works as the expected volume is within the permitted activity volumes. Resource consent under the NESCS for the future subdivision of the site will be required as a 'restricted discretionary' activity.

2 Objectives of the Investigation

This report has been written in general accordance with the Ministry for the Environment's (MfE) "Contaminated Land Management Guidelines No 1: Reporting on Contaminated Sites in New Zealand, revised 2021" (CLMG) and the "New Zealand Guidelines for Assessing and Managing Asbestos in Soils" (NZ GAMAS). The report includes all requirements for a Detailed Site Investigation Report and Remediation Action Plan.

The objective of this investigation is to:

- Collect and assess information from multiple sources to understand previous and current land uses.
- Describe the site's physical and environmental features to understand potential pathways and receptors.
- Collect and analyse site information, including soil sampling and testing, to determine the extent of any contamination present to inform remediation or site management options.
- Provide remediation or site management recommendations to the client based on identified human health and/or environmental risks.

3 Scope of Work Undertaken

The scope of the work undertaken has included:

- Review of previous investigations undertaken on the site.
- Designing a sampling and analysis plan based on the identified contaminant risks.
- On site soil sampling and laboratory testing for contaminants of concern.
- Analysis of results against applicable soil guidelines values (SGVs).
- Preparation of this report in accordance with MfE guidelines.

4 Site Identification

The site is located at 606 Ridge Road in Motukarara, Canterbury as shown on the plan in **Figure 1** below. The site is legally described as Section 3 Block IV Res 959 and is approximately 42.42ha.

Figure 1 – Location Plan

5 Site Description

5.1 Environmental Setting

Table 1 – Environmental Setting

Topography	The site is generally flat land.
Geology	The ECan GIS database describes the soils at the site as a combination of the Motukarara deep silt over sand, the Waikuku deep sand and the Kaiapoi deep silt over sand, as shown in **Figure 2** below. Wells on site indicate that topsoils are underlain by grey and blue sand with some silt.
Soil Trace Elements	According to the ECan GIS database, natural concentrations of trace elements for the site are a mixture of the 'Regional, Saline Grey Recent' and 'Regional, Yellow Brown Sand' (YBS) soil groups, as shown in **Figure 2** below.
Groundwater	The site lies over the coastal confined gravel aquifer system. The on-site bore logs shows groundwater levels are between 0.28m and 6.28m deep. Groundwater flow is generally in a southerly direction.
Surface Water	The ECan GIS database shows a drain runs parallel with the south-western boundary of the site. Multiple drains are also present within the surrounding area. The Halswell River is located 50m to the east of the site. Lake Ellesmere is located approximately 2.5km south-west of the site.

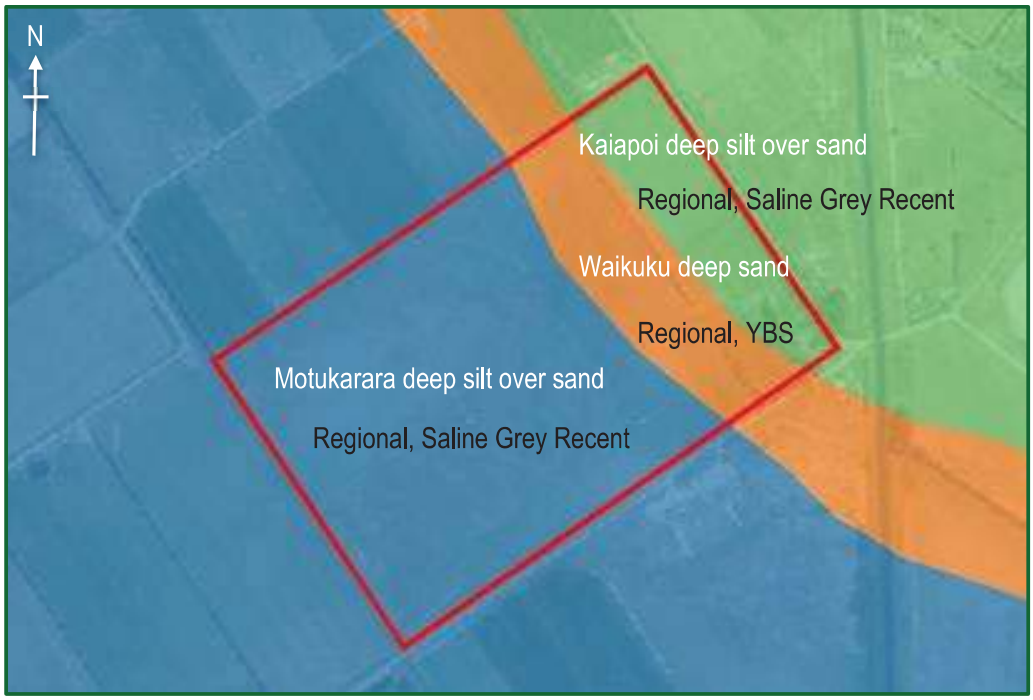


Figure 2 – Geological Setting

5.2 Site Layout and Current Site Uses

The site is currently used for rural and rural residential purposes. A residential dwelling and farm sheds are located in the eastern corner of the site. The remainder of the site is vacant pastoral land used for a combination of stock grazing and pastoral cropping.

5.3 Surrounding Land Uses

The surrounding land is used for a mix of rural and rural residential purposes. The Waihora Target Clay Club is located beyond Gammacks Road to the south of the site. The Motukarara Raceway and Waihora Park reserve is located approximately 600m east of the site.

5.4 Geotechnical Investigations

At the time of writing no geotechnical investigations were available to Momentum Environmental Ltd (MEL).

6 Proposed Site Use

It is proposed to subdivide the site to create a 4.65ha lot which is to include the residential dwelling and farm buildings, three vacant 1ha lots and a 34.75ha lot which is to be amalgamated with an adjoining property off Gammacks Road. It is proposed that a "no build" covenant will be placed on the 34.75ha lot. This proposal involves the subdivision, change of use of the land, possible soil disturbance and disposal of soils off-site.

A Scheme Plan is attached in **Appendix A**.

7 Summary of Preliminary Site Investigation

A Preliminary Site Investigation (PSI) was undertaken by Momentum Environmental Ltd (MEL) in July 2022. The PSI identified the following potential sources of contamination as per the Hazardous Activities and Industries List (HAIL):

- Potential sheep dip or spray race operation within the sheep yards, adjacent to the woolshed/shearing shed (HAIL A8).
- The use and storage of persistent pesticides in and around the farm buildings (HAIL A10).
- The presence of storage tanks and drums for fuels or chemicals in and around the farm buildings (HAIL A17).
- The storage of treated timber outside (HAIL A18).
- A portion of the site located within the shot fall zone of the adjacent Waihora Clay Target Club (HAIL C2).
- Two burn areas identified during the site inspection (HAIL G5).
- Lead based paint products and asbestos containing materials (ACM) on historical buildings located at the site (HAIL Class I).

The PSI identified multiple potential sources of contamination within proposed Lot 1 that warranted further investigation in the form of a Detailed Site Investigation (DSI). No further investigation was recommended within proposed Lots 2-4 as no potentially contaminating activities were identified for these areas. Following subdivision, proposed Lot 5 will continue to be production land and therefore the NESCS does not apply to proposed Lot 5 and no further investigation was recommended.

The risk areas associated with proposed Lot 1 are shown in **Figure 3** below. The PSI Site Inspection Plan is attached in **Appendix A**. A full copy of the PSI can be provided upon request.

Figure 3 – Risk Areas Plan

8 Sampling and Analysis Plan

8.1 Sampling Design

The proposed subdivision does not result in a change of use of the land, soil disturbance or off-site soil disposal activities for proposed Lot 1. As proposed Lot 1 is currently used for residential purposes, the proposed subdivision will not result in an increased risk for ongoing residential activities at the site. The residential risk area is sufficiently separated from the remaining risk areas within proposed Lot 1 by permanent fencing and dense hedgerows. Therefore, it is highly unlikely that any residential activities will be undertaken outside of the residential curtilage area and within other risk areas identified in Lot 1. As such, the proposed sampling regime is restricted to the residential risk area within proposed Lot 1. This will assist in quantifying the contamination present in the residential curtilage area and inform any future remedial or site management measures. No investigation of the remaining risk areas is being undertaken at this time given the continuing use in these areas.

The primary potential source of contamination within the residential risk area is lead-based paint products and asbestos containing materials (ACM) on the existing dwelling. For the purpose of sampling design, the residential risk area is to be treated as a single exposure area as detailed in **Table 2** below.

Table 2 – Sampling Design in Residential Area

Contaminants of concern	Heavy metals and asbestos.
Number of sample locations	Targeted sampling guided by XRF testing for heavy metals.
Depth of samples	Due to the likely mode of contamination and likely exposure to soils in a residential setting, surface and shallow (250mm) sample depths are considered appropriate. Deeper samples will be taken if XRF testing and/or visual or olfactory evidence indicates contamination at greater depth.
Testing methodology	Sampling will be undertaken in conjunction with XRF testing. A selection of samples will be submitted for heavy metal analysis to confirm the XRF results. Selected samples will also be submitted for asbestos presence/absence analysis with semi-quantitative analysis to follow any positive results.
Field Sampling Technique	Samples to be taken by hand using a stainless-steel spade, trowel or fresh disposable nitrile gloves.

8.2 Soil Guideline Values

Human health soil contaminant standards for a group of 12 priority contaminants were derived under a set of five land-use scenarios and are legally binding under The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Health) Regulations 2011 (NES). These standards have been applied where applicable. The regulations describe these as Soil Contaminant Standards. For contaminants other than the 12 priority contaminants, the hierarchy as set out in the Ministry for the Environment Contaminated Land Management Guidelines No 2 has been followed. These are generally described as Soil Guideline Values. For simplicity, this report uses the terminology Soil Guideline Values (SGV) when referring to the appropriate soil contaminant standard or other derived value from the hierarchy. For soil, guideline values are predominantly risk based, in that they are typically derived using designated exposure scenarios that relate to different land uses. For each exposure scenario, selected pathways of exposure are used to derive guideline values. These pathways typically include soil ingestion, inhalation and dermal adsorption. The guideline values for the appropriate land use scenario relate to the most critical pathway.

The land-use scenarios applicable for the proposed residential development of the site would be 'residential 10% produce'. The 'commercial/industrial' land use scenario is used as a proxy for workers involved in disturbing soils.

The adopted trigger value used to determine need for assessment of ecological receptors (including stormwater disposal areas) also referred to as Ecological Guideline Values (EGVs) is the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (online) – Sediment GV-high (ANZWQ).

For comparison of site concentrations against expected background levels heavy metal concentrations will be assessed against the expected background levels as published in *Background Concentrations in Canterbury soils*, Tonkin and Taylor, July 2007.

8.3 Quality Assurance and Quality Control

Field quality assurance measures as described in Section 4.3.1 of the "Contaminated Land Management Guidelines No 5: Site Investigation and Analysis of Soils, revised 2021" (CLMG) are to be followed. These include using trained staff, choosing appropriate sample containers, accurate and individual labelling and recording of locations, completing appropriate laboratory chain of custody forms, chilling of samples as appropriate and timely delivery to laboratories. All non-disposable sampling equipment should be decontaminated between samples using Decon 90 and rinsed with tap water. All samples are to be submitted to IANZ accredited laboratories. Quality control to ensure freedom from sample cross-contamination is to be measured by the appropriate use of duplicate and rinsate blank samples.

8.4 XRF Testing Procedure and Quality Assurance Measures

The XRF to be used is a Thermo Scientific Niton XL2 GOLDD. The manufacturer's instructions are to be followed in the use of the device. Calibration samples are to be tested prior to each day's testing and compared with the manufacturer's specifications, and silicon blank readings are to be taken approximately every 20 samples to ensure there is no contamination of the XRF window.

The US EPA Method 6200 - Field Portable X-ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment (2007) is used as guidance for the use of the XRF and quality assurance measures. This method recommends that 5% of XRF tests should be verified through lab testing.

As the device reads 23 metals, the contaminants to focus on should be narrowed down to those likely to be present based on the risk profile and the limitations of the XRF. It is noted that the XRF is not suitable for measuring cadmium with the limit of detection being higher than the residential SGV. As cadmium is primarily associated with fertiliser storage or industrial processes it is considered unlikely to be a significant contaminant of concern, however, is included in the standard laboratory metal suite tested. The results from the XRF for arsenic, cadmium, chromium, copper, lead, nickel and zinc are to be analysed in detail but only reported if relevant to human health risk.

9 Sampling Results

9.1 Summary of Works/Field Observations

Soil sampling was undertaken on 22 August 2022 in general accordance with the proposed sampling plan. Sample locations were placed around the dwelling and within the garden area. Samples were collected from the surface soils and between 250-300mm. An additional sample was collected at 400mm at one sample location (SS4) adjacent to the vegetable garden as the XRF indicated that elevated concentrations of lead were present at 250-300mm.

Soils consisted of topsoils, underlain by brown fine to medium sands with some silt present. There was no visible indication of asbestos present in the soils, however due to the era of the dwelling, asbestos in soils samples were collected from sample locations directly adjacent to the dwelling. All surface soil samples were analysed at the laboratory for seven heavy metals to support the XRF data. All remaining samples were held cold at the laboratory.

Photo 1 – Dwelling and approximate location of SS1

Photo 2 – Dwelling and approximate location of SS3

Photo 3 – Existing vegetable garden and approximate location of SS4 & SS5

Photo 4 – Garden area

A Sample Location Plan is included in **Appendix B.**

9.2 Results of the XRF Quality Assurance Measures

The XRF used was a Thermo Scientific Niton XL2 GOLDD. The manufacturer's instructions were followed in the use of the device. Calibration checks and blank testing showed no quality control issues.

In accordance with the US EPA Method 6200 - Field Portable X-ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment (2007), 47% of the samples collected from within the residential area were laboratory tested for seven heavy metals.

A regression analysis was not able to be performed on the arsenic XRF readings and laboratory results due to the quantity of results below the limit of detection. A regression analysis was performed on the lead XRF readings and laboratory results to determine a statistical R^2 error result. The resulting R^2 value of 0.9586 is above the acceptable value of 0.70 and gave a value of 135mg/kg that could reliable be expected to be below the 'residential 10% produce' soil guideline value (SGV) of 210mg/kg for lead. **Figure 4** below shows the graphed results.

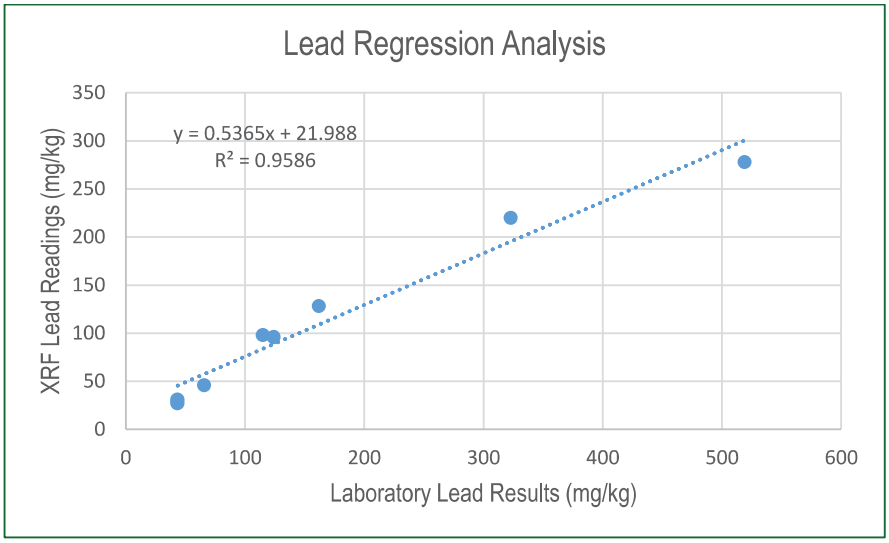


Figure 4 – XRF Regression Analysis

9.3 Results of Field & Laboratory Quality Assurance and Quality Control

No quality control issues were identified during sampling. The Relative Percentage Differences (RPD) for the duplicate samples ranged from 0-16%, indicating no quality control issues.

All laboratory tested samples were submitted to Analytica Laboratories for analysis. Analytica Laboratories hold IANZ accreditation. As part of holding accreditation the laboratory follows appropriate testing and quality control procedures. No quality control issues were identified.

9.4 Evaluation of Results

The laboratory sample results showed lead concentrations above the 'residential 10% produce' soil guideline values (SGV) of 210mg/kg in surface soils at two sample locations. At sample location SS4.1 the lead concentration was 323mg/kg. At sample location SS5.1 the lead concentration was 519mg/kg. The XRF test results show the elevated concentrations of lead remain at a sample depth of 250-300mm but reduce to below the 'residential 10% produce' SGV at 400mm. The XRF test results show a minor exceedance of the lead SGV based on the regression analysis at sample location SS3. However, the corresponding laboratory results show concentrations of lead below the 'residential 10% produce' SGV.

There were no other exceedances of the 'residential 10% produce' SGVs in samples collected from the residential area.

The lead concentrations at sample locations SS4 and SS5 are above the ecological guideline value (EGV) of 220mg/kg. There were no other exceedances of the EGV.

The majority of sample locations contained concentrations of one or more analytes above expected background values.

No asbestos was detected in the soil samples collected from the site.

Tables of Laboratory Results are included in **Appendix C**, a Table of XRF Results is included in **Appendix D** and copies of the Laboratory Reports are included in **Appendix E**.

10 Risk Assessment

The soil sampling results have shown lead concentrations exceed the 'residential 10% produce' SGV in sample locations adjacent to and within the existing vegetable garden. Contamination appears to extend to a depth of at least 400mm. The lead contamination is fully delineated to the east, as shown by lead concentrations below the 'residential 10% produce' SGV at sample location SS9. The lead contamination is likely to extend to the garage to the south which has been present since at least the early 1960's. The lead contamination has not been fully delineated to the north.

The remaining sample results have shown contaminant concentrations are below the 'residential 10% produce' SGVs and no asbestos was detected in the soil samples collected from the site.

The following conceptual site model addresses the potential risks within the residential area at the site:

Table 2 – Conceptual Site Model

Conceptual Site Model				
Source	**Pathways**		**Receptor**	**Risk Assessment**
Lead concentrations above the 'residential 10% produce' SGV at two sample locations within the existing vegetable garden.	Human	Dermal contact, ingestion and inhalation	Future site occupiers / land users	Moderate risk to human health in a residential setting.
			Workers involved in soil disturbance at the site	Low risk to human health as the 'commercial/industrial' SGV was not exceeded and no soil disturbance activities are proposed within Lot 1.
	Ecological	Infiltration through soils to groundwater	Groundwater is likely to be 0.28-6.28m deep at the site	Low risk as heavy metals bind well to the soils and are likely to be limited to the top 400mm of soils.
		Surface runoff to waterways	Surrounding drains	Low risk due to separation distance to drains.

Based on the moderate risk to human health, it is recommended the contaminated soils are remediated prior to the reoccupation of the dwelling and ongoing use of the area for residential purposes.

11 Scope and Purpose of Remediation

11.1 Remediation Objectives

The remediation objectives for the site are to remove any pathways between the contaminants and the receptors of significance. Based on the results for this site the significant receptors are primarily the future site residents as the property is currently unoccupied. There are multiple ways to achieve this objective including, but not limited to, removal of the contaminated material, capping to create a barrier between the contaminated material and the receptor, mixing to dilute contaminants, or by implementing ongoing site management measures to reduce the risk.

Other ancillary objectives include:

- To ensure that appropriate site management measures are in place to protect workers from exposure to contaminants contained in the soils.
- To ensure that soil management controls are in place to prevent tracking of contaminants, dust, stormwater runoff and erosion.
- To ensure that any contaminated soils removed off-site are disposed of to an appropriate location.

11.2 Summary of Remedial Options

The remediation options considered include:

- Excavating and removing all contaminated soils to an approved disposal facility.
- Excavating and removing all contaminated soils to an alternative location on site, such as a managed bund or similar.

Excavation and relocation of contaminated material to an alternative location on site is a cost-efficient option for the client and is logistically feasible given the space available within the remainder of Lot 1 (outside of the residential curtilage area) and Lot 5.

Excavation and disposal of the contaminated soils to an approved disposal facility is an alternative to relocation on site, should the client wish to pursue this option.

Managing the contaminated soils in-situ and implementing an Ongoing Site Management Plan (OSMP) restricting produce consumption and contact with soils is not considered to be a suitable option for the site as the contaminated soils are located within the vegetable garden. Where contaminated soils extend beyond the vegetable garden, implementing an OSMP for those areas may be suitable.

The approximate extent of the remediation area is shown on the Sample Location Plan included in **Appendix B** of this report. Further delineation is required to the north of the vegetable garden to fully understand the extent of contamination present.

11.3 Proposed Standard of Remediation

The standard of remediation for the site is to ensure all soils within the vegetable garden containing lead concentrations above the 'residential 10% produce' SGV of 210mg/kg have been excavated and remaining soils contain concentrations below the 'residential 10% produce' SGV.

11.4 Proposed Remediation Methodology

The remediation of the site is to occur as follows:

1. A site meeting between the contractors on-site representative and Momentum Environmental Ltd is to take place prior to any remediation work commencing.
2. Set up all site controls and equipment as required in the Site Management Plan detailed below in **Section 12**.
3. Excavate contaminated soils in accordance with the objectives set out above and within the area highlighted on the Sample Location Plan attached in **Appendix B**. Relocate soils to a suitable location on site.

4. Following excavation works, the excavated areas including walls (where applicable) and base, should be tested by XRF to confirm the remediation goal has been achieved. When the XRF results indicate success, laboratory validation sampling should be undertaken.
5. Decontaminate all equipment prior to commencing other site earthworks.
6. Implement an accidental contamination discovery protocol for subsequent earthworks at the site.

11.5 Remediation Volumes

The following estimated volumes have been provided in good faith to assist in consenting and estimating the extent and cost of works required. The likely affected volumes are based on the current known or expected extent of contamination found and is not to be taken as the final or maximum likely volume. All remediation of contaminated soils has the risk of extending further out or deeper due to hidden areas of contamination.

At this stage, contamination appears to extend to a depth of at least 400mm. The lead contamination is fully delineated to the east, as shown by lead concentrations below the 'residential 10% produce' SGV at sample location SS9. The lead contamination is likely to extend to the garage to the south which has been present since at least the early 1960's. The lead contamination has not been fully delineated to the north. If restricted to just the vegetable garden, the estimated in-situ volume of contaminated material is 26m³. Further delineation to the north can be undertaken during the remediation process using the portable XRF. Where contaminated soils extend beyond the vegetable garden, implementing an OSMP for those areas may be suitable.

The approximate extent of the remediation area is shown on the Sample Location Plan included in **Appendix B** of this report.

11.6 Regulatory Requirements

Soil sampling has shown contamination levels exceed the applicable standards in Regulation 7 of the NESCS. Therefore, any activities that trigger the NESCS may require resource consent.

The remediation will include the activities of soil disturbance and off-site disposal. NESCS Regulation 8(3) provides criteria by which soil disturbance activities may be considered a 'permitted activity'. The permitted activity volumes are compared with the expected remediation volumes in the table below:

Table 3 – Maximum Permitted Volume Assessment

		Remediation Soil Disturbance Volume	Complies?
Area of the 'piece of land'	2,660m² (residential risk area)		
Permitted soil disturbance volume - 25 m³ per 500m²	133m³	26m³	Yes
Permitted removal volume - 5m³ per 500m² per year	27m³ (53m³ over two years)	26m³	Yes

Based on the above the soil disturbance volumes above, the proposed remediation can be carried out as a permitted activity. Resource consent under the NESCS for the future subdivision of the site will be required as a 'restricted discretionary' activity.

It is recommended that a planner fully assess all proposed activities associated with the development against the Land and Water Regional Plan to determine whether consents from ECan are necessary due to the identification of contaminated land.

11.7 Disposal Documentation

To ensure the material has been disposed of in the confirmed location, photographs are to be taken throughout the process to show compliance with any resource consent conditions.

12 Site Management Plan

12.1 Site Setup

Prior to any works commencing the following should be in place on site:

- The contaminated area should be clearly identified with site entry and exits, and paths to the disposal location planned before works commence.
- Appropriate washing facilities should be put in place to clean any equipment exposed to contaminated soils.
- Hand washing facility must be available for all workers, in the immediate area of the work site.
- Remediation should be planned in advance to ensure it occurs in a staged approach/ methodical manner to ensure that vehicles do no track contaminated soils onto clean areas.

12.2 Stormwater and Soil Management

Remediation work should not take place during heavy rain or high wind. If rainfall occurs and tracking of wet contaminated soils to other parts of the site becomes a risk, work will cease. Soil will be loaded directly onto trucks and will not be stockpiled on site, other than within the excavated area.

Appropriate controls should be in place to ensure unintentional tracking or movement of contaminated soils to other parts of the subject site does not occur.

12.3 Dust Control

Water is to be made available at the remediation site with operators available and should be used to keep the dust emissions to an acceptable level to protect human health as required.

All vehicles transporting soils will use tarpaulins to prevent dust emissions if required.

12.4 Occupational Safety and Health Issues and Measures

The contractor shall prepare a site-specific Health and Safety Plan covering all relevant matters and all workers will be inducted prior to site works beginning. As a minimum, the following matters will need to be included:

- Appropriate personal protection gear which should include as a minimum, head to toe clothing, the use of gloves for any worker handling soil, dust masks to be available to prevent ingestion of contaminated dust particles, safety footwear, hard hats and hi-vis vests.

- Appropriate hand washing measures to prevent ingestion of contaminated soil particles.
- Truck loading procedures and spill prevention.
- Decontamination measures for all equipment.

12.5 Unexpected Contamination Discovery Protocols

During the excavation works if any other hazardous material is encountered in significant volumes that pose a threat to the health of workers on site, all works should cease until the hazardous material has been assessed by a suitably qualified and experienced practitioner (SQEP) in accordance with MfE guidelines.

Signs that would indicate further assessment is required include visually discoloured soils, olfactory evidence of hydrocarbons or other potential contaminants, oily greasy soils, asbestos containing materials or significant rubbish items.

13 Site Validation Strategy

Following remediation excavation works, the excavated areas including walls (if applicable) and base, shall be tested by XRF to confirm the extent of any remaining contamination or to confirm remediation has been successful. Laboratory sampling will be required to support the XRF readings.

Where sampling reveals the goals have not been achieved, further remediation works shall be carried out by further excavation.

A Site Validation Report will be produced and provided to Selwyn District Council and ECan. Where contaminated soils extend beyond the vegetable garden and the decision is made to manage the soils in-situ, an Ongoing Site Management Plan will be produced and provided to Selwyn District Council and ECan.

14 Conclusions

A previous Preliminary Site Investigation identified multiple potential sources of contamination within proposed Lot 1 that warranted further investigation in the form of a Detailed Site Investigation (DSI). The DSI was restricted to the residential curtilage area.

Soil sampling undertaken as part of this DSI has shown one area of lead contamination within soils adjacent to and within the existing vegetable garden. The highest lead concentration identified was 519mg/kg and was from a sample collected within the existing vegetable garden. The remaining sample results have shown contaminant concentrations are below the 'residential 10% produce' SGV and no asbestos was detected in the soil samples collected from the site.

Based on the moderate risk to human health associated with the lead contamination, it is recommended the soils adjacent to and within the vegetable garden are remediated prior to the reoccupation of the dwelling and ongoing use of the area for residential purposes. The recommended remediation option is excavation and relocation on-site within an area of Lot 1 outside of the residential curtilage area, or Lot 5. The lead contamination has not been fully delineated to the north of the vegetable garden; however this can be undertaken during the remediation process, using the portable XRF. Where contaminated soils extend beyond the vegetable garden, implementing an OSMP for those areas may be suitable.

Resource consent is not required under the NESCS for the remediation works as the expected volume is within the permitted activity volumes. Resource consent under the NESCS for the future subdivision of the site will be required as a 'restricted discretionary' activity.

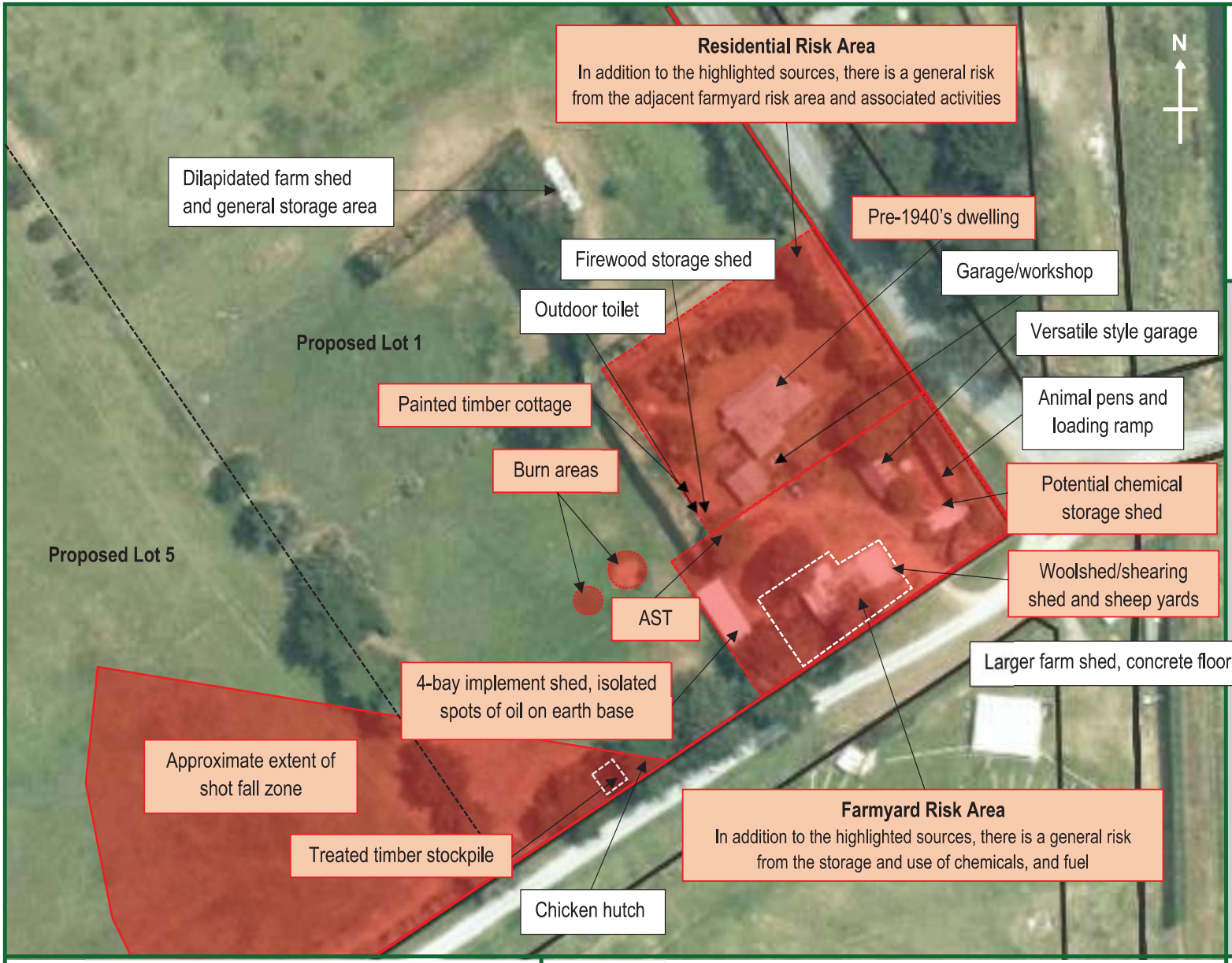
15 Limitations

Momentum Environmental Limited has performed services for this project in accordance with current professional standards for environmental site assessments, and in terms of the client's financial and technical brief for the work. Any reliance on this report by other parties shall be at such party's own risk. It does not purport to completely describe all the site characteristics and properties. Where data is supplied by the client or any third party, it has been assumed that the information is correct, unless otherwise stated. Momentum Environmental Limited accepts no responsibility for errors or omissions in the information provided. Should further information become available regarding the conditions at the site, Momentum Environmental Limited reserves the right to review the report in the context of the additional information.

Opinions and judgments expressed in this report are based on an understanding and interpretation of regulatory standards at the time of writing and should not be construed as legal opinions. As regulatory standards are constantly changing, conclusions and recommendations considered to be acceptable at the time of writing, may in the future become subject to different regulatory standards which cause them to become unacceptable. This may require further assessment and/or remediation of the site to be suitable for the existing or proposed land use activities. There is no investigation that is thorough enough to preclude the presence of materials at the site that presently or in the future may be considered hazardous.

This report does not attempt to describe all risks or possible outcomes resulting from carrying out remediation works. Any party carrying out remediation works shall be responsible for all such works, including implementing all health and safety precautions as appropriate. Momentum Environmental Limited disclaims all liability whatsoever for any loss or damages, if any, suffered by any party as a result of any remediation works undertaken.

Appendix A – PSI Site Inspection Plan



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LEGEND

- text — Potential source of contamination
- text — Description of structures/areas not considered to pose a risk
- Approx. extent of risk areas

Graphic scale is approximate only

0 10 20 30 40 50m

Date: 28 June 2022 **Drawing No:** 681/1

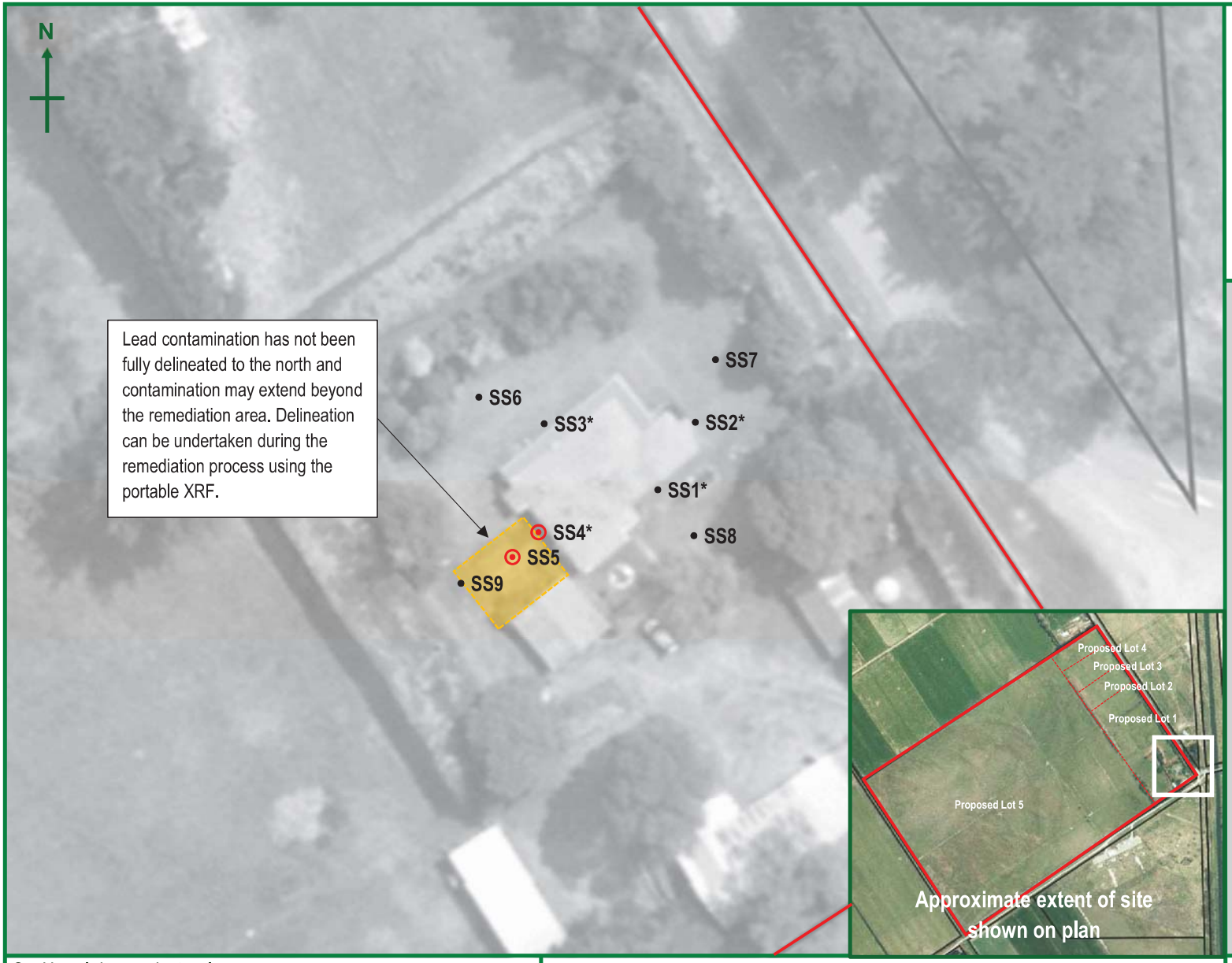
606 Ridge Road, Motukarara

Site Inspection Plan

Notes:

1. This plan has been prepared for soil contamination risk assessment purposes only. No liability is accepted if the plan is used for any other purposes.
2. Any measurements taken from this plan which are not dimensioned on the electronic copy are at the risk of the user.
3. Soil sample locations are approximate only

Appendix B – Sample Location Plan



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LEGEND

• SS1	Soil sample location
• SS1*	Soil sample location tested for asbestos
⊙ SS1	Soil sample location exceeds residential SGV for lead
	Approximate extent of remediation area

PLAN MUST BE PRINTED IN COLOUR

Graphic scale is approximate only

0 5 10 15 20 25m

Date: 31 August 2022 **Drawing No:** 681/2

Sample Location Plan

606 Ridge Road, Motukarara (Residential Area)

Notes:

1. This plan has been prepared for soil contamination risk assessment purposes only. No liability is accepted if the plan is used for any other purposes.
2. Any measurements taken from this plan which are not dimensioned on the electronic copy are at the risk of the user.
3. Soil sample locations are approximate only

Appendix C – Table of Laboratory Results

Table of Laboratory Results - 606 Ridge Road, Motukarara (Residential Area)

Date of sampling: 22 August 2022

Asbestos in Soils			Qualitative		
			Fibre Types	Asbestos in ACM	Fibrous Asbestos + Asbestos Fines
Sample Name:	Lab Number	Depth		% w/w	% w/w
SS1.1 PA/SQ	22-30681-1	0-50	Asbestos NOT Detected,Organic Fibres	-	-
SS2.1 PA/SQ	22-30681-2	0-50	Asbestos NOT Detected,Organic Fibres	-	-
SS3.1 PA/SQ	22-30681-3	0-50	Asbestos NOT Detected,Organic Fibres	-	-
SS4.1 PA/SQ	22-30681-4	0-50	Asbestos NOT Detected,Organic Fibres	-	-
Soil Guideline Values	Residential		-	0.01	0.001
	Reference		-	NZ GAMAS	NZ GAMAS

Indicates asbestos is present
Indicates result exceeds 'residential' guideline value
NZGAMAS - New Zealand Guidelines for Assessing and Managing Asbestos in Soils, BRANZ, Nov. 2017

Table of Laboratory Results - 606 Ridge Road, Motukarara (Residential Area)

Date of sampling: 22 August 2022

Analyte	Sample Name:	SS1.1	SS1.2	SS2.1	SS3.1	SS4.1	SS5.1	SS6.1	SS7.1	SS8.1	SS9.1	RPD	Soil Guideline Values					
Soil Results	Lab Number:	22-30724	22-30724	22-30724	22-30724	22-30724	22-30724	22-30724	22-30724	22-30724	22-30724	SS1.1 & SS1.2	Residential 10% Produce	Commercial/ Industrial	Reference	Ecological Receptors	Reference	Background$_1$
	Depth (mm)	0-50	0-50	0-50	0-50	0-50	0-50	0-50	0-50	0-50	0-50							
Heavy Metals																		
Arsenic	mg/kg dry wt	2.1	2.2	2	2.4	5.9	5.1	3.2	1.6	1.9	2.2	5%	20	70	NES	70	ANZWQ	8.8
Cadmium	mg/kg dry wt	0.099	0.084	0.064	0.097	0.3	0.43	0.13	0.045	0.081	0.25	16%	3	1,300	NES	10	ANZWQ	0.11
Chromium	mg/kg dry wt	12	12	12.6	13.1	17.6	18.4	13.2	12	12	12.9	0%	460	6,300	NES	370	ANZWQ	14.6
Copper	mg/kg dry wt	7.2	7.2	6.6	7.95	31.4	31.9	7.58	3.8	11.3	13.5	0%	>10,000	>10,000	NES	270	ANZWQ	14.7
Lead	mg/kg dry wt	115	111	65.8	162	**323**	**519**	43.5	15.8	43.5	124	4%	210	3,300	NES	220	ANZWQ	53.1
Nickel	mg/kg dry wt	8.17	8.18	8.52	8.78	16.5	10.9	8.71	8.52	8.25	9.95	0%	400	6,000	NEPM	52	ANZWQ	10.6
Zinc	mg/kg dry wt	124	121	212	120	301	246	71.2	43.7	68.6	154	2%	7,400	400,000	NEPM	410	ANZWQ	52.1

Indicates result exceeds 'residential' guideline value
Indicates result exceeds ecological guideline value
Indicates result exceeds background value for soil type

NES - National Environmental Standard for Assessing and Managing Contaminants in Soils, MfE
NEPM - National Environmental Protection Measures 2013, Formerly NEPC, Australia
ANZWQ - Australian and New Zealand - Guidelines for Fresh and Marine Water Quality (online)- Sediment GV-high
$_1$ Concentrations for "Regional, Sagyre" soil group from Background concentrations in Canterbury soils, Tonkin and Taylor, July 2007

Appendix D – Table of XRF Results

Table of XRF Results - 606 Ridge Road, Motukarara (Residential Area)

Date of testing: 22 August 2022

Units: ppm

Sample ID (Lab tested samples in BOLD)	Sample Depth	XRF Reading No	Date & Time	Test Duration (secs)	Total Recoverable Arsenic		Total Recoverable Lead	
					Result	Error	Result	Error
SS1.1	0-50	1344	22/08/2022 9:03	30.08	<LOD	10.2	80.67	9.51
SS1.1	0-50	1345	22/08/2022 9:03	30.54	<LOD	9.88	97.36	9.29
SS1.1	0-50	1346	22/08/2022 9:04	30.16	<LOD	11.25	115.89	10.35
SS1.3	250	1350	22/08/2022 9:08	30.08	<LOD	6.45	<LOD	9.25
SS1.3	250	1351	22/08/2022 9:09	30.08	<LOD	6.46	<LOD	9.16
SS1.3	250	1352	22/08/2022 9:10	30.07	<LOD	6.9	<LOD	9.39
SS2.1	0-50	1347	22/08/2022 9:04	30.07	<LOD	8.53	58.48	8.05
SS2.1	0-50	1348	22/08/2022 9:05	30.07	<LOD	7.69	39.13	7.23
SS2.1	0-50	1349	22/08/2022 9:06	30.08	<LOD	8.39	40.48	7.84
SS2.2	250	1353	22/08/2022 9:10	30.07	<LOD	8.33	25.77	7.72
SS2.2	250	1354	22/08/2022 9:11	30.08	<LOD	10.26	23.2	9.48
SS2.2	250	1355	22/08/2022 9:12	30.07	<LOD	7.21	24.92	6.88
SS3.1	0-50	1359	22/08/2022 9:26	31.75	<LOD	11.72	**135.52**	10.84
SS3.1	0-50	1360	22/08/2022 9:26	30.08	<LOD	11.09	118.29	10.27
SS3.1	0-50	1361	22/08/2022 9:27	30.57	<LOD	12.11	130.84	11.2
SS3.2	250	1365	22/08/2022 9:32	30.07	<LOD	10.94	101.67	10.52
SS3.2	250	1366	22/08/2022 9:33	30.16	<LOD	11.83	128.54	11.26
SS3.2	250	1367	22/08/2022 9:34	30.07	<LOD	11.93	134.55	11.35
SS4.1	0-50	1356	22/08/2022 9:23	30.08	<LOD	14.64	**229.39**	13.67
SS4.1	0-50	1357	22/08/2022 9:24	30.08	<LOD	15.19	**222.12**	13.95
SS4.1	0-50	1358	22/08/2022 9:24	30.08	<LOD	16.47	**208.71**	14.85
SS4.2	250-300	1362	22/08/2022 9:30	30.07	<LOD	16.57	**157.85**	15.04
SS4.2	250-300	1363	22/08/2022 9:30	30.08	<LOD	13.66	**151.52**	12.68
SS4.2	250-300	1364	22/08/2022 9:31	30.08	<LOD	16.56	**176.97**	15.21
SS4.3	400	1368	22/08/2022 9:35	30.08	<LOD	10.26	78.83	9.69
SS4.3	400	1369	22/08/2022 9:35	30.07	<LOD	8.05	33.41	7.49
SS4.3	400	1370	22/08/2022 9:36	30.05	<LOD	7.98	14.94	7.07
SS5.1	0-50	1372	22/08/2022 9:54	30.07	<LOD	15.42	**259.45**	14
SS5.1	0-50	1373	22/08/2022 9:54	30.08	<LOD	18.96	**264.86**	17.18
SS5.1	0-50	1374	22/08/2022 9:55	30.08	<LOD	17.51	**310.06**	16.27
SS5.2	250	1375	22/08/2022 10:00	30.08	<LOD	17.3	**329.27**	15.97
SS5.2	250	1376	22/08/2022 10:00	30.08	<LOD	17.93	**323.52**	16.31
SS5.2	250	1377	22/08/2022 10:01	30.07	<LOD	17.16	**331.89**	15.82
SS6.1	0-50	1378	22/08/2022 10:03	30.17	<LOD	7.46	30.34	6.95
SS6.1	0-50	1379	22/08/2022 10:03	30.17	<LOD	7.6	23.54	6.92
SS6.1	0-50	1380	22/08/2022 10:04	32.57	<LOD	7.6	28.2	7.01
SS6.2	250	1381	22/08/2022 10:08	30.08	<LOD	7.24	22.56	6.89
SS6.2	250	1382	22/08/2022 10:09	30.08	<LOD	7.43	<LOD	10.15
SS6.2	250	1383	22/08/2022 10:09	30.17	<LOD	7.16	10.26	6.65
SS7.1	0-50	1391	22/08/2022 10:34	30.08	<LOD	5.86	<LOD	8.44
SS7.1	0-50	1392	22/08/2022 10:35	31.36	<LOD	4.5	<LOD	6.57
SS7.1	0-50	1393	22/08/2022 10:36	30.07	<LOD	5.75	<LOD	8.31
SS7.2	250	1394	22/08/2022 10:39	30.08	<LOD	6.59	<LOD	9.69
SS7.2	250	1395	22/08/2022 10:39	30.17	<LOD	7.58	<LOD	10.95
SS7.2	250	1396	22/08/2022 10:40	30.08	<LOD	7.14	<LOD	9.96
SS8.1	0-50	1397	22/08/2022 10:42	30.07	<LOD	8.19	38.22	7.43
SS8.1	0-50	1398	22/08/2022 10:42	30.07	<LOD	7.09	30.84	6.75
SS8.1	0-50	1399	22/08/2022 10:43	30.07	<LOD	7.15	23.74	6.67
SS8.2	250	1400	22/08/2022 10:47	30.07	<LOD	7.53	26.33	7.19
SS8.2	250	1401	22/08/2022 10:48	30.08	<LOD	7.56	28.38	7.19
SS8.2	250	1402	22/08/2022 10:49	30.07	<LOD	6.35	20.41	6.23
SS9.1	0-50	1384	22/08/2022 10:12	30.08	<LOD	9.67	94.12	9.15
SS9.1	0-50	1385	22/08/2022 10:13	30.07	<LOD	10.59	98.17	9.97
SS9.1	0-50	1386	22/08/2022 10:14	30.08	<LOD	10.42	95.65	9.76
SS9.2	250	1387	22/08/2022 10:18	30.08	<LOD	10.82	70.3	10.28
SS9.2	250	1388	22/08/2022 10:19	30.07	<LOD	11.91	73.82	10.91
SS9.2	250	1389	22/08/2022 10:19	30.08	<LOD	11.72	95.08	10.96
Soil Guideline Values	Residential 10% Produce				20		210	
	SGV based on regression analysis				-		135	
	Reference				NES		NES	

Result exceeds 'residential 10% produce' SGV
Result exceeds SGV based on regression analysis

Appendix E – Laboratory Reports

Analytica Laboratories Limited
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Sydenham
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www.analytica.co.nz

Certificate of Analysis

Momentum Environmental Ltd
19 Robertsons Road, Kirwee
Christchurch 7671
Attention: Nicola Peacock
Phone: 027 513 4057
Email: hollie@momentumenviro.co.nz

Lab Reference: 22-30681
Submitted by: Hollie Griffith
Date Received: 22/08/2022
Testing Initiated: 23/08/2022
Date Completed: 23/08/2022
Order Number:
Reference: 681

Sampling Site: 606 Ridge Road
Description of Work: Combo - 681

Report Comments

Samples were collected by yourselves (or your agent) and analysed as received at Analytica Laboratories. Samples were in acceptable condition unless otherwise noted on this report.
Specific testing dates are available on request.

Asbestos in Soil (Qualitative)

Sample Details

Laboratory ID	Client Sample ID	Sample Location	Sample Description	Date Sampled	Date Analysed
22-30681-1	SS1.1 0-50		Soil	22/08/2022	23/08/2022
22-30681-2	SS2.1 0-50		Soil	22/08/2022	23/08/2022
22-30681-3	SS3.1 0-50		Soil	22/08/2022	23/08/2022
22-30681-4	SS4.1 0-50		Soil	22/08/2022	23/08/2022

Information in the above table supplied by the client: Client Sample ID, Sample Location, Date Sampled.

Laboratory ID	Client Sample ID	Fibre Types	Trace Asbestos (Presence / Absence)	Asbestos (Presence / Absence)
	Units			
22-30681-1	SS1.1 0-50	Asbestos NOT Detected. Organic Fibres	Absent	Absent
22-30681-2	SS2.1 0-50	Asbestos NOT Detected. Organic Fibres	Absent	Absent
22-30681-3	SS3.1 0-50	Asbestos NOT Detected. Organic Fibres	Absent	Absent
22-30681-4	SS4.1 0-50	Asbestos NOT Detected. Organic Fibres	Absent	Absent

Information in the above table supplied by the client: Client Sample ID.

Asbestos in Soil (Qualitative) Approver:

Aleesha van Eeden, M.Sc.
Technician

Method Summary

Asbestos Fibres in Soil (Qualitative)	Sample analysis was performed using polarised light microscopy with dispersion staining in accordance with AS4964-2004 Method for the qualitative identification of asbestos in bulk samples. Note 1: The reporting limit for this analysis is 0.1g/kg (0.01%) by application of polarised light microscopy, dispersion staining and trace analysis techniques. Note 2: Trace asbestos is indicative that freely liberated respirable fibres are present and dust control measures should be implemented or increased on site. This is not the sole indicator for the friable nature of the asbestos present. Note 3: If mineral fibres of unknown type are detected, by PLM and dispersion staining, these may or may not be asbestos fibres. To confirm the identity of this fibre, another independent analytical technique such as XRD analysis is advised. Note 4: The laboratory does not take responsibility for the sampling procedure or accuracy of sample location description.

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Certificate of Analysis

Momentum Environmental Ltd
19 Robertsons Road, Kirwee
Christchurch 7671

Attention: Nicola Peacock
Phone: 027 513 4057
Email: hollie@momentumenviro.co.nz

Sampling Site: 606 Ridge Road

Lab Reference: 22-30724
Submitted by: Hollie Griffith
Date Received: 22/08/2022
Testing Initiated: 23/08/2022
Date Completed: 25/08/2022
Order Number:
Reference: 681

Report Comments

Samples were collected by yourselves (or your agent) and analysed as received at Analytica Laboratories. Samples were in acceptable condition unless otherwise noted on this report.
Specific testing dates are available on request.

Heavy Metals in Soil

	Client Sample ID		SS1.1 0-50	SS1.2 250	SS2.1 0-50	SS3.1 0-50	SS4.1 0-50
	Date Sampled		22/08/2022	22/08/2022	22/08/2022	22/08/2022	22/08/2022
Analyte	Unit	*Reporting Limit*	22-30724-1	22-30724-2	22-30724-4	22-30724-6	22-30724-8
Arsenic	mg/kg dry wt	*0.125*	2.1	2.2	2.0	2.4	5.9
Cadmium	mg/kg dry wt	*0.005*	0.099	0.084	0.064	0.097	0.30
Chromium	mg/kg dry wt	*0.125*	12	12	12.6	13.1	17.6
Copper	mg/kg dry wt	*0.075*	7.2	7.2	6.6	7.95	31.4
Lead	mg/kg dry wt	*0.25*	115	111	65.8	162	323
Nickel	mg/kg dry wt	*0.05*	8.17	8.18	8.52	8.78	16.5
Zinc	mg/kg dry wt	*0.05*	124	121	212	120	301

Heavy Metals in Soil

	Client Sample ID		SS5.1 0-50	SS6.1 0-50	SS7.1 0-50	SS8.1 0-50	SS9.1 0-50
	Date Sampled		22/08/2022	22/08/2022	22/08/2022	22/08/2022	22/08/2022
Analyte	Unit	*Reporting Limit*	22-30724-11	22-30724-13	22-30724-15	22-30724-17	22-30724-19
Arsenic	mg/kg dry wt	*0.125*	5.1	3.2	1.6	1.9	2.2
Cadmium	mg/kg dry wt	*0.005*	0.43	0.13	0.045	0.081	0.25
Chromium	mg/kg dry wt	*0.125*	18.4	13.2	12	12	12.9
Copper	mg/kg dry wt	*0.075*	31.9	7.58	3.8	11.3	13.5
Lead	mg/kg dry wt	*0.25*	519	43.5	15.8	43.5	124
Nickel	mg/kg dry wt	*0.05*	10.9	8.71	8.52	8.25	9.95
Zinc	mg/kg dry wt	*0.05*	246	71.2	43.7	68.6	154

Method Summary

Elements in Soil Samples dried and passed through a 2 mm sieve followed by acid digestion and analysis by ICP-MS. In accordance with in-house procedure based on US EPA method 200.8.

Sharelle Frank, B.Sc. (Tech)
Technologist

Brent Boynes
Lab Technician

Statement of Professional Opinion on the Suitability of Land for Subdivision

Issued by: GEOCONSULT

(Geotechnical engineering firm or suitably qualified engineer)

To: LOCHLEA FARMING CO LTD

(Owner/Developer)

To be supplied to: SELWYN DISTRICT COUNCIL

(Territorial authority)

In respect of: SUBDIVISION

(Description of proposed infrastructure/land development)

At: 606 RIDGE ROAD, MOTUKARARA

(Address)

I Philip Walter Matthew Williams on behalf of GEOCONSULT

(Geotechnical engineer) (Geotechnical engineering firm)

hereby confirm:

1. I am a suitably qualified and experienced geotechnical engineer and was retained by the owner/developer as the geotechnical engineer on the above proposed development.
2. My/the geotechnical completion report, dated 26-08-2022 has been carried out in accordance with the Department of Building and Housing Guidelines for geotechnical investigation and assessment of subdivisions and includes:

(i) Details of and the results of my/the site investigations.
(ii) A liquefaction assessment.
(iii) An assessment of rockfall and slippage, including hazards resulting from seismic activity.
(iv) An assessment of the slope stability and ground bearing capacity confirming the location and appropriateness of building sites.
(v) Recommendations proposing measures to avoid, remedy or mitigate any potential hazards on the land subject to the application, in accordance with the provisions of Section 106 of the Resource Management Act 1991.

3. In my professional opinion, I consider that Council is justified in granting consent incorporating the following conditions:

Adherence to recommendations in Geoconsult Geotechnical Investigation Report; Ref: CO124; dated 26-08-2022

4. This professional opinion is furnished to the territorial authority and the owner/developer for their purposes alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building.
5. This certificate shall be read in conjunction with my/the geotechnical report referred to in Clause 2 above, and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.
6. The geotechnical engineering firm issuing this statement holds a current policy of professional indemnity insurance of no less than $ 5M (Minimum amount of insurance shall be commensurate with the current amounts recommended by IPENZ, ACENZ, TNZ, INGENIUM.)

P Way Wills. Date: 01 SEPTEMBER 2022

(Signature of Engineer)

Qualifications and experience:

ME BE CMEngNZ CPEng IntPE

51 yrs