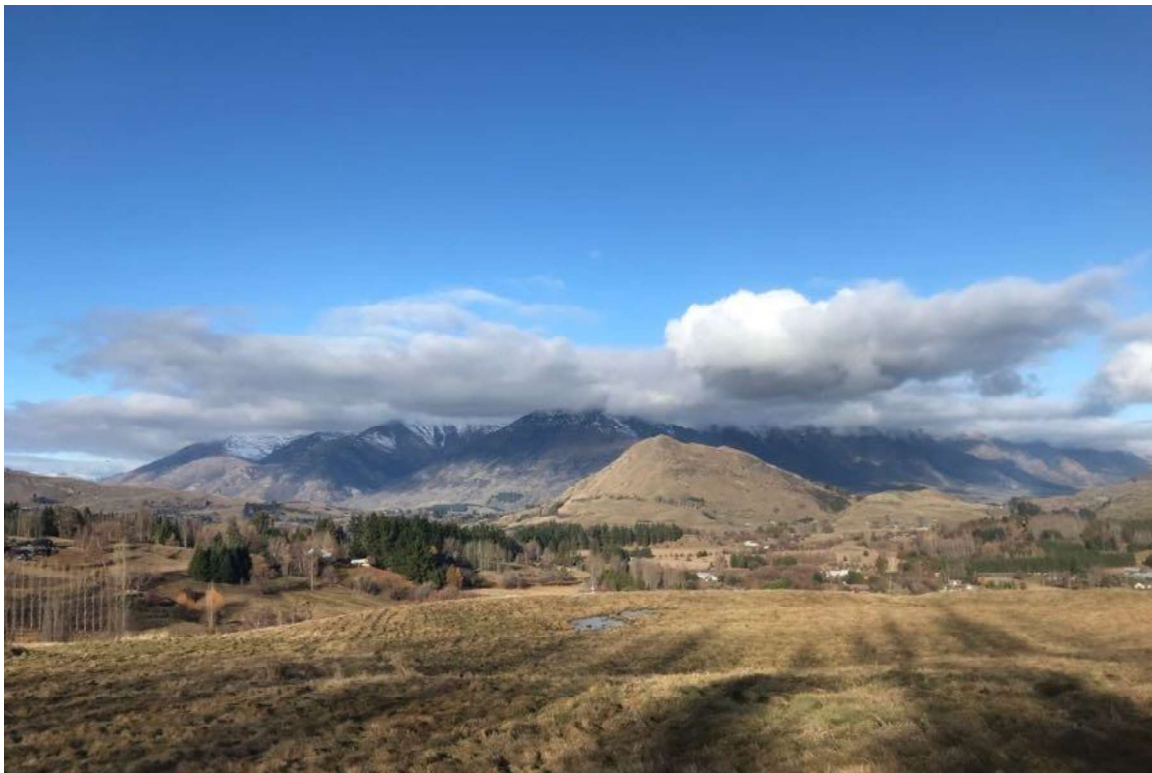


KA Woolshed Limited Partnership

PATERSON BLOCK, WOOLSHED RD, JACKS POINT, QUEENSTOWN PRELIMINARY SITE INVESTIGATION

7 MARCH 2023






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PATERSON BLOCK, WOOLSHED RD, JACKS POINT, QUEENSTOWN PRELIMINARY SITE INVESTIGATION

KA Woolshed Limited Partnership

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REV	DATE	DETAILS
01	30/06/2022	Revision 1.
02	07/03/2023	Finalise for issue.

	NAME	DATE	SIGNATURE
Prepared by:	Tara Verhulst	07/03/2023	
Reviewed by:	Greg Coffin	07/03/2023	
Approved by:	Lisa Bond	07/03/2023	



REPORT CHECKLIST

SUMMARY CONTAMINATED SITES REPORT CHECKLIST					
Report contained in this document	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Report sections and information to be presented	PSI	DSI	RAP	SVR	MMP
Executive summary	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scope of work	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site identification	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site history	<input checked="" type="checkbox"/>	S	S	S	S
Site condition and surrounding environment	<input checked="" type="checkbox"/>	S	S	S	S
Geology and hydrology	A	<input type="checkbox"/>	S	S	S
Sampling and analysis plan and sampling methodology	A	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>
Field quality assurance and quality control (QA/QC)	N	<input type="checkbox"/>	X	<input type="checkbox"/>	S
Laboratory QA/QC	N	<input type="checkbox"/>	X	<input type="checkbox"/>	X
QA/QC data evaluation	N	<input type="checkbox"/>	X	<input type="checkbox"/>	X
Basis for guideline values	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Results	A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	S
Site characterisation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Remedial actions	X	X	<input type="checkbox"/>	S	S
Validation	X	X	X	<input type="checkbox"/>	S
Contaminated materials management plan (CMMP)	X	X	<input type="checkbox"/>	S	S
Ongoing site monitoring	X	X	X	N	<input type="checkbox"/>
Conclusions and recommendations	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

KEY:

PSI - preliminary site investigation report

DSI detailed site investigation report

RAP - site remedial action plan

SVR - site validation report

MMP - ongoing monitoring and management plan

A - Readily available information should be included

S - A summary of this section's details will be adequate if detailed information has been included in an available referenced report

N - Include only if no further site investigation is to be undertaken

X - Not applicable and can be omitted.

(MfE. *Contaminated Land management guidelines No. 1*. (Ministry for the Environment, 2021a)

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B	SITE PHOTOGRAPHS
C	PROPOSED DEVELOPMENT PLANS

ABBREVIATIONS

CLMG 1	Contaminated Land Management Guideline No. 1: Reporting on Contaminated Sites in New Zealand
CLMG 5	Contaminated Land Management Guideline No. 5: Site investigation and analysis of soils
CMMP	Contaminated Materials Management Plan
CoC	Chain of Custody
CSM	Conceptual Site Model
CSMP	Contaminated Site Management Plan
DSI	Detailed Site Investigation
H&S	Health and Safety
HAIL	Hazardous Activities and Industries List
IANZ	International Accreditation New Zealand
ILAC	International Laboratory Accreditation Cooperation
ILAC-MRA	ILAC Mutual Recognition Arrangement
IRB	International Risk Based
LINZ	Land Information New Zealand
LRIS	Land Resource Information Systems
m bgl	meters below ground level
MfE	Ministry for the Environment
MMP	Ongoing Monitoring and Management Plan
N/A	Not applicable
ND	Not derived
NES	National Environmental Standards
NES-CS	National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health
NL	No limit - derived value exceeds 10,000mg/kg
NZRB	New Zealand Risk Based
ORC	Otago Regional Council
PoL	Piece of Land
PSI	Preliminary Site Investigation
PSSP	Project Site Safety Plan
QA/QC	Quality assurance and Quality Control
QLDC	Queenstown Lakes District Council

RAP	Remedial Action Plan
SCS <small>(health)</small>	Soil Contaminant Standards for Health
SGV	Soil Guideline Value
SID	Safety in Design
SQEP	Suitable Qualified and Experienced Practitioner
SSL	Soil Screening Level
SVR	Site Validation Report
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxicity Equivalent – indication of the toxicity of a mixture of compounds

EXECUTIVE SUMMARY

WSP New Zealand Ltd (WSP) was engaged by KA Woolshed Limited Partnership to complete a Preliminary Site Investigation (PSI) at Paterson Block, Woolshed Rd, Jacks Point, Queenstown (herein referred to as 'the site').

The site is located approximately 7.5 kilometres southeast of Queenstown town centre and covers approximately 21.2 hectares. It is understood that the site is currently vacant and grassed. The site is to be subdivided into approximately 405 lots for subsequent residential development. As the proposed development would incur future soil disturbance, the completion of a PSI is required under the *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (NESC) in order to assess the likelihood of Hazardous Activities and Industries List (HAIL) activities and the associated potential risks to human health from contaminants in the soil.

As HAIL activities are considered not to have been or be occurring on site and contaminant migration pathways onto the site are highly unlikely, the **NESC does not apply** to the site. Through the desktop study and site walkover the risks to human health associated with potential soil borne contaminants has been assessed as LOW.

Taking into account development proposals along with the end use for residential purposes, it is considered highly unlikely that there will be a risk to human health associated with the proposed development of the site.

RECOMMENDATIONS

Based on the findings of this PSI report WSP recommends the following:

- This PSI report is submitted to the consenting authority;
- This PSI report is submitted to the regional authority to facilitate updating of the HAIL database; and
- Should any other ground conditions be encountered that are not covered herein, a Suitably Qualified and Experienced Practitioner (SQEP) specialising in contaminated land assessment should be consulted in order to assess the risks to human health and sensitive receptors.

1 INTRODUCTION

A Preliminary Site Investigation (PSI) has been undertaken on behalf of KA Woolshed Limited Partnership at Paterson Block and 436 Woolshed Rd, Woolshed Rd, Jacks Point, Queenstown (herein referred to as 'the site'). The site is located approximately 4 kilometres (km) south of Frankton, 7.5km southeast of Queenstown and covers approximately 21.2 hectares.

The site lies within the Urban Growth Boundary Zone situated in the Jacks Point Resort. The proposed development plans comprise subdivision and residential development of approximately 405 standalone houses with areas of 250 to 400 m². The Paterson Block subdivision would link the Coneburn and Woolshed Rd developments.

As the proposed development would incur future soil disturbance, the completion of a PSI is required in order to assess the potential risks to human health from contaminants in the soil.

1.1 OBJECTIVE

Preparation of a PSI under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Regulations 2011 (NESCSC) (New Zealand Government, 2011) will provide information as to whether soil contamination from historical or current day hazardous activities and industries list (HAIL) activities are likely to be present, and if so, whether they are at levels that could adversely impact human health.

This PSI report addresses these requirements in relation to any resource consent application in order to satisfy Queenstown Lakes District Council (QLDC) and Otago Regional Council (ORC) requirements under the NESCSC relating to human health impacts from potentially contaminated land.

As such, the following objectives have been identified:

- Determine whether potentially contaminating activities have been undertaken on the site or its surrounds;
- Assess the risk associated with these potential contaminants to affect human health or the environment;
- Determine the likely impact upon sensitive receptors including site users, occupiers and construction workers on the site; and
- Give details of future investigations, if required.

1.2 SCOPE OF WORK

This PSI has been prepared in general accordance with the requirements for a PSI referred to in the Users' Guide: National Environment Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (Ministry for the Environment, 2012), The Ministry for the Environment's Contaminated Land Management Guidelines No.1: Reporting on Contaminated Sites in New Zealand and No.5: Site Investigation and analysis of soils (Ministry for the Environment, 2021a) (Ministry for the Environment, 2021c).

This PSI included the following:

- A site walkover to assess the current condition of the site and its surrounding environment;
- Discussions with the current site owner or relevant personnel with knowledge of the site history (if available);
- An assessment of information relating to the site and its surroundings (this may be from documented or anecdotal evidence), including the review of historical aerial photographs;
- A review of information regarding previous investigations, resource consents and the HAIL status of the site from council records, including searches of the ORC Land Use Register;
- A review of information relating to geological conditions and hydrogeology of the site; and
- Site characterisation indicating the potential health and environmental risks associated with the site development, including recommendations for further assessment should it be required.

This PSI report has been reviewed by a Suitably Qualified and Experienced Practitioner (SQEP), as required by the NESCS.

2 SITE IDENTIFICATION

The site (referred to as Paterson Block) comprises part of Lot 3 DP 553950 and Lot 1 DP 475609 436 Kingston Road, Jacks Point. The site is located along Kingston Road at Jacks Point and is divided by Woolshed Road. The site layout and site details are provided in Figure 1 and Table 1 respectively.

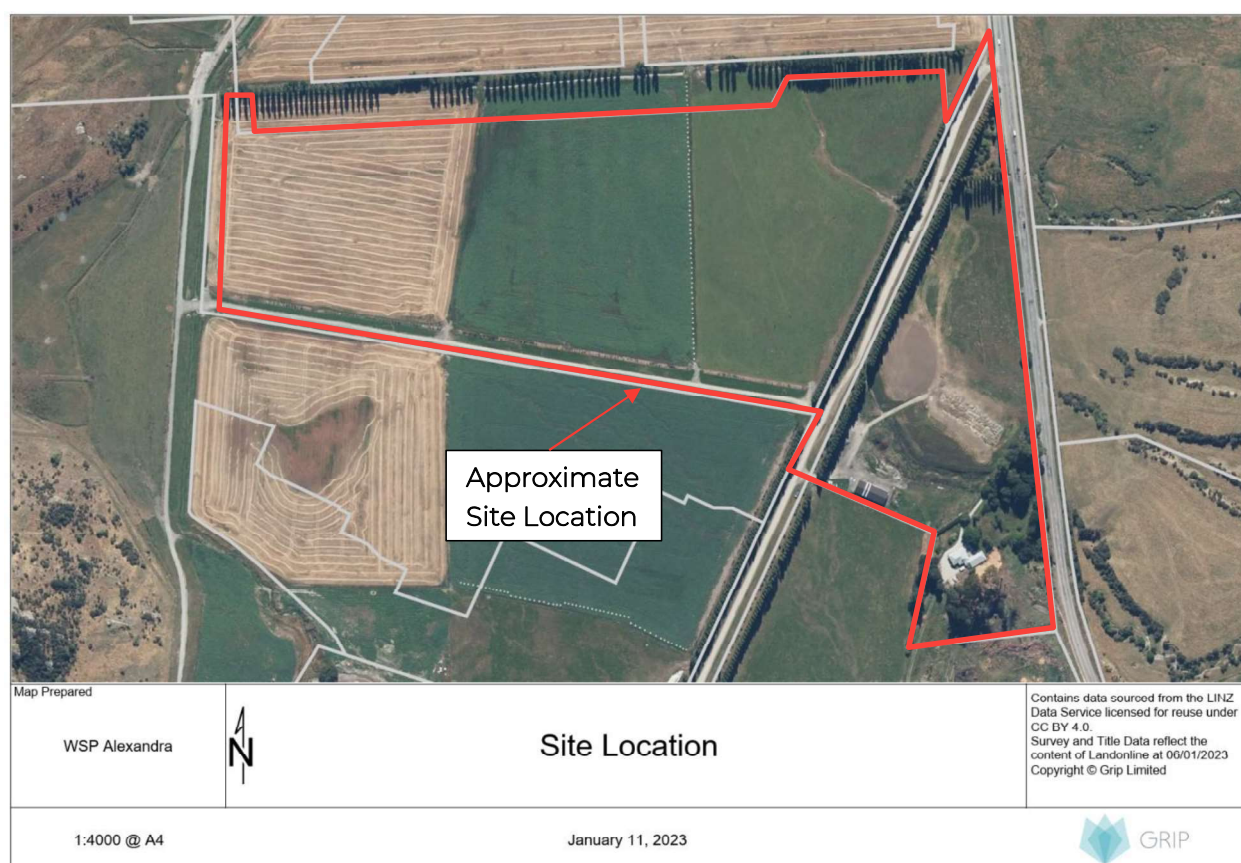


Figure 1: Site location

Table 1: Site details

Site Address	Woolshed Rd, Jacks Point, Queenstown	
Territorial Authority	Queenstown Lakes District Council	
Legal Description	Lot 3 DP 553950 & Lot 1 DP 475609	
Title	963019	
Approximate total site area	212,217m ²	21.2ha
NES Permitted Activity threshold volumes:		
1) total site disturbance, and	10,611m ³	
2) yearly off-site movement of soil based on the approximate total site area	2,122m ³	

3 ENVIRONMENTAL SETTING

3.1.1 GEOLOGY

The geology of the site is shown on the 1:250,000 scale GNS Geology Web Map extract (accessed January 2023) as shown in Figure 2.

This map indicates the site to be underlain by Holocene river deposits. The deposits generally comprise loose, commonly angular, boulders, gravel, sand, and silt forming alluvial fans; grades into scree (upslope) & valley alluvium.

The geology east and west of the site comprises Late Pleistocene glacier deposits and Basement metamorphic rocks.

A review of the GNS Active Faults Database indicates that the nearest active fault is the Cardrona Fault (#8372), as part of the Nevis-Cardrona fault system, approximately 14km east of the site. The Cardrona fault is reverse with a recurrence interval of >5,000 to <=10,000 years (IV) and a low slip rate.

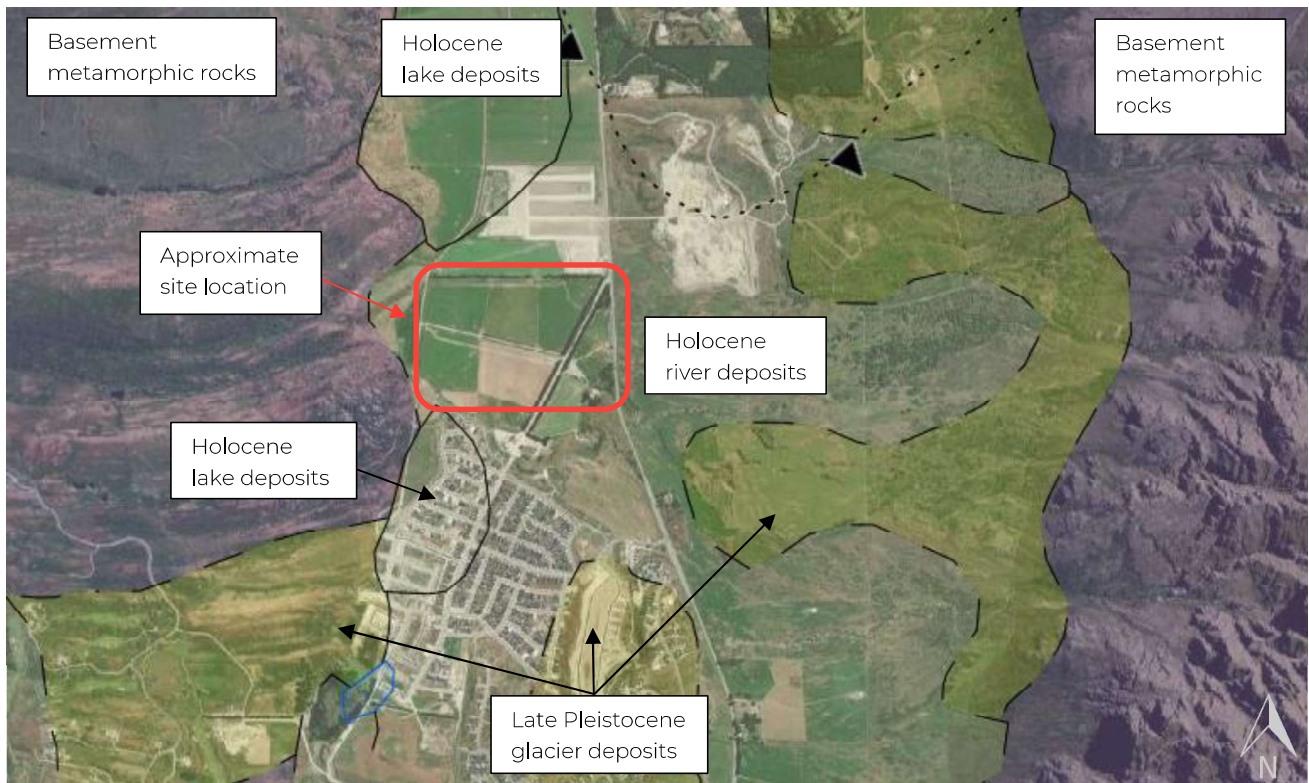


Figure 2: Geology of the site area

3.1.2 TOPOGRAPHY, HYDROLOGY AND HYDROGEOLOGY

Details of the site hydrology and hydrogeology have been obtained from a review of sources including Google Earth and a search of council records¹, refer to Table 2.

The NZ LINZ topographic map obtained from QLDC webmaps shows several creeks around the site flowing in a westerly direction towards a main tributary of the Kawarau River. As such, the general groundwater flow is inferred to be in a westerly direction across the site to join the tributary northwards towards the Kawarau River. The QLDC natural hazards and HAIL data describe the liquefaction susceptibility as Possible Moderate Risk (nearest subsurface investigations are inadequate to establish a reliable category).

The New Zealand Geotechnical Database notes no known wells within the vicinity of the site.

The site is situated approximately 340m above mean sea level (amsl), with a slight slope downwards towards the west.

Table 2: Summary of topographical, hydrological and hydrogeological data

Topography	Slight westward slope
Nearest Surface Water Body	Tributary of Kawarau River
Height above Mean Sea Level	Approximately 340m amsl
General Groundwater Flow Direction	West towards tributary Kawarau River
No. of known Boreholes and wells within 1.5km	None

¹ QLDC webmaps, obtained from

https://experience.arcgis.com/experience/80c97d34e5764669bb9aab99e40d5b8d/page/Map-Navigator/?data_id=dataSource_1-Land_Parcels_and_Properties_Data_6342%3A562814&views=Hazards.

4 SITE HISTORY

4.1.1 PREVIOUS INVESTIGATIONS

A previous PSI has been undertaken on the northern part of the site (Paterson Block), as part of the Coneburn Residential Special Housing Area (WSP, 2019). The investigation found that the site has been used for stock grazing and has been subject to superphosphate application annually over the past 5 years only at a rate of approximately 200kg/ha (i.e., 20g/m²).

The PSI concluded that it is highly unlikely for there to be a risk to human health should the proposed land use change, subdivision and future residential development be undertaken. As such, the proposed land use change and subdivision was considered a permitted activity under the NESCS.

4.1.2 HISTORICAL AERIAL IMAGERY

Details of the site history have been obtained from a review of multiple sources including historical aerals sourced from Google Earth (Google, 2022) and Retrolens (LINZ, 2022), historical topographical maps from Maps Past (MapsPast, 2022) and a review of the QLDC database.

Seven historical aerals (1956-2001) were available to view on Retrolens, four maps (1978, 1996, 2009, 2016) were extracted from Maps Past and ten aerial images were available from Google Earth (2004-2022).

A summary of the observations made following the review of historical aerals is presented in Table 3. The maps and aerial imagery are presented in Appendix A.

Table 3: Summary of historical aerial imagery

YEAR	OBSERVATIONS
1956 Retrolens	The site comprises vacant pastoral land. The eastern boundary aligns the main road with a gravel road dividing the site in two parts. Signs of general surface water flow are noted in a northwesterly direction and a creek is seen in the northeastern corner of the site. A shed can be seen near the centre of the site and a dwelling is located in the southeastern corner.
1959 Retrolens	No notable changes are seen on the site.
1964 Retrolens	Only part of the site is shown on the aerial. The creek in the northeastern corner originates east at the Remarkables Mountain Range. Several trees are planted in the vicinity of the dwelling.
1976 Retrolens	The sheds in the centre of the site have been removed. No discerning changes are noted to the site.
1978 Maps Past	Topographic map of the site and surrounding area showing the site at approximately 1100 feet amsl. State Highway 6 is shown along the eastern boundary of the site and Woolshed Rd is an established road through the site.
1983 - 1984 Retrolens	No notable changes are seen on the site or to the surrounding area.

YEAR	OBSERVATIONS
1996 Maps Past	Topographic map of the site, showing the site is located at approximately 340m amsl. Woolshed Rd can be seen as an unofficial road linking into a road off Kingston Rd, south of the site.
2001 Retrolens	Colour aerial of the site. The site comprises vacant paddocks with a residential dwelling in the southeastern corner. The dwelling is surrounded by trees. The surrounding area comprises vacant land with hills to the east and west of the site.
2004 - 2006 Google Earth	Two lines of trees align Woolshed Rd. Some development can be seen occurring south of the site.
2009 Maps Past	Topographic map of the site, no notable changes are seen compared to the 1996 map. Several creeks flow from the surrounding hills towards the site and eventually northwards via a tributary towards the Kawarau River.
2010 - 2015 Google Earth	No notable changes are seen on the site. The quarries to the north-east of the site have been expanded.
2016 Google Earth	No discerning changes are noted on the site. Earthworks for the development of a residential subdivision are noted south of the site.
2016 Maps Past	The topographic map shows a realignment of Woolshed Rd, with the established road starting off Kingston Rd, cutting through the site to the main residential subdivision at Jacks Point.
2018 Google Earth	Earthworks have occurred between the dwelling and Woolshed Rd. Some trees have been planted at the Woolshed Rd turnoff from Kingston Rd.
2019 – 2021 Google Earth	A concreted area has been developed between the dwelling and Woolshed Rd, south-east of the site. Residential subdivision south of the site is continuing and expanding.
2022 Google Earth	Most recent aerial available. Ground disturbance has been undertaken north of the site for residential development. A swale has been created along the northern boundary of the site.

4.1.3 HERITAGE NZ

The Heritage New Zealand Pouhere Taonga Act 2014 makes it unlawful for any person to modify or destroy, or cause to be modified or destroyed, the whole or any part of an archaeological site without the prior authority of Heritage New Zealand.

In order to establish the heritage status of the site, the Heritage New Zealand database was consulted. The site was not found on the database.

4.1.4 COUNCIL RECORDS

A review of the public information held by the QLDC has revealed that the site is zoned as an Urban Growth Boundary at the Jacks Point Resort. Four resource consents were found for the site and are summarised in Table 4 below.

Table 4: Summary of council records.

CONSENT NUMBER AND YEAR	DETAILS
RM220147 – Park Ridge Limited (2022)	To change condition 4 to include a timeframe for the excavation borrow area period at Woolshed Road, Jacks Point, Queenstown.
RM220182 – Classic Developments Limited, J&J Paterson (2022)	Application under section 88 of the Resource Management Act 1991 (RMA) for a four-lot subdivision and a road to vest at Woolshed Road, Jack's Point, Queenstown.
RM220006 – J&J Paterson (2022)	Application under Section 221 of the Resource Management Act 1991 to cancel consent notice 7919701.16 in its entirety, as it related to Lot 1 Deposited Plan 475609 and Lot 2-4 Deposited Plan 553950 at 436 Kingston Road, Jacks Point, Queenstown.
RM210567 – Queenstown Housing Limited (2021)	Mining activities at Woolshed Road, Jacks Point, Kingston.

4.2 LAND USE REGISTER

A review of the online Land Use Register held by ORC indicates that a PSI was carried out for the Coneburn Housing Development, including part of the site (WSP, 2019). The PSI concluded that it is highly unlikely that there is a risk to human health.

Several properties located within a 1km radius of the site are listed on the ORC Land Use Register as HAIL sites. A summary is shown in Table 5 below with an overview in Figure 3.

Table 5: Summary of HAIL sites in the surrounding area.

HAIL ID	APPROXIMATE LOCATION	HAIL CATEGORIES	CONTAMINATION STATUS	SUMMARY
HAIL.01977.01 – Coneburn Housing Development	Northern part of the site.	A10. Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds.	Verified non-HAIL Not investigated	The preliminary site investigation concludes that it is highly unlikely that there is a risk to human health.
HAIL.01995.02 – 338 Kingston Road, Lot 1 DP 392270 and HAIL.01995.01 – 338 Kingston Road, Lot 3 DP 392270	500m northeast of site	G5. Waste disposal to land (excluding where biosolids have been used as soil conditioners). G3. Landfill sites.	Verified HAIL Not investigated	Potential contamination associated with the burial of sheep carcasses within a quarry site and the use of non-permitted waste for backfilling purposes.
HAIL.01294.05 – Hanley Downs Wastewater Retention Basin	500m south of site	A10. Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds.	Verified HAIL Not investigated	No specific HAIL activities other than broadacre pesticide use.
HAIL.01294.09 – Hanley Farm DP5A	500m south of site	A10. Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds.	Verified HAIL Not investigated	A Preliminary Site Investigation stated that broadacre applications of superphosphate may have occurred across the site's pasture.
HAIL.01294.10 – Hanley Farm Infrastructure	450m south of site	A18. Wood treatment or preservation including the commercial use of anti-sapstain chemicals during milling, or bulk storage of treated timber outside.	Verified HAIL At or Below Background Concentrations	Remedial action included the removal disposal of contaminated soil.

HAIL ID	APPROXIMATE LOCATION	HAIL CATEGORIES	CONTAMINATION STATUS	SUMMARY
		A17. Storage tanks or drums for fuel, chemicals or liquid waste.		
HAIL.01294.08 – Hanley Farm Former Landfill	700m south of site	G3. Landfill sites.	Verified HAIL Acceptable	Remedial action included the removal and appropriate disposal of approximately 250 cubic metres of landfill waste and contaminated soil.
HAIL.01294.01 – Hanley Downs Farm Hub	400m south of site	A8. Livestock dip or spray race operations. A17. Storage tanks or drums for fuel, chemicals, or liquid waste.	Verified HAIL Not investigated	Sheep dusting yards, cattle wash, above ground fuel storage identified in PSI.
HAIL.01294.07 – Hanley Downs DP3 Area	800m south of site	A10. Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds.	Verified HAIL Acceptable	All results acceptable for residential land use.
HAIL.01294.06 – Hanley Downs Stage 1 Subdivision	800m south of site	A10. Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds.	Verified HAIL Acceptable	Low level DDT detected, but all results meet relevant guideline values.

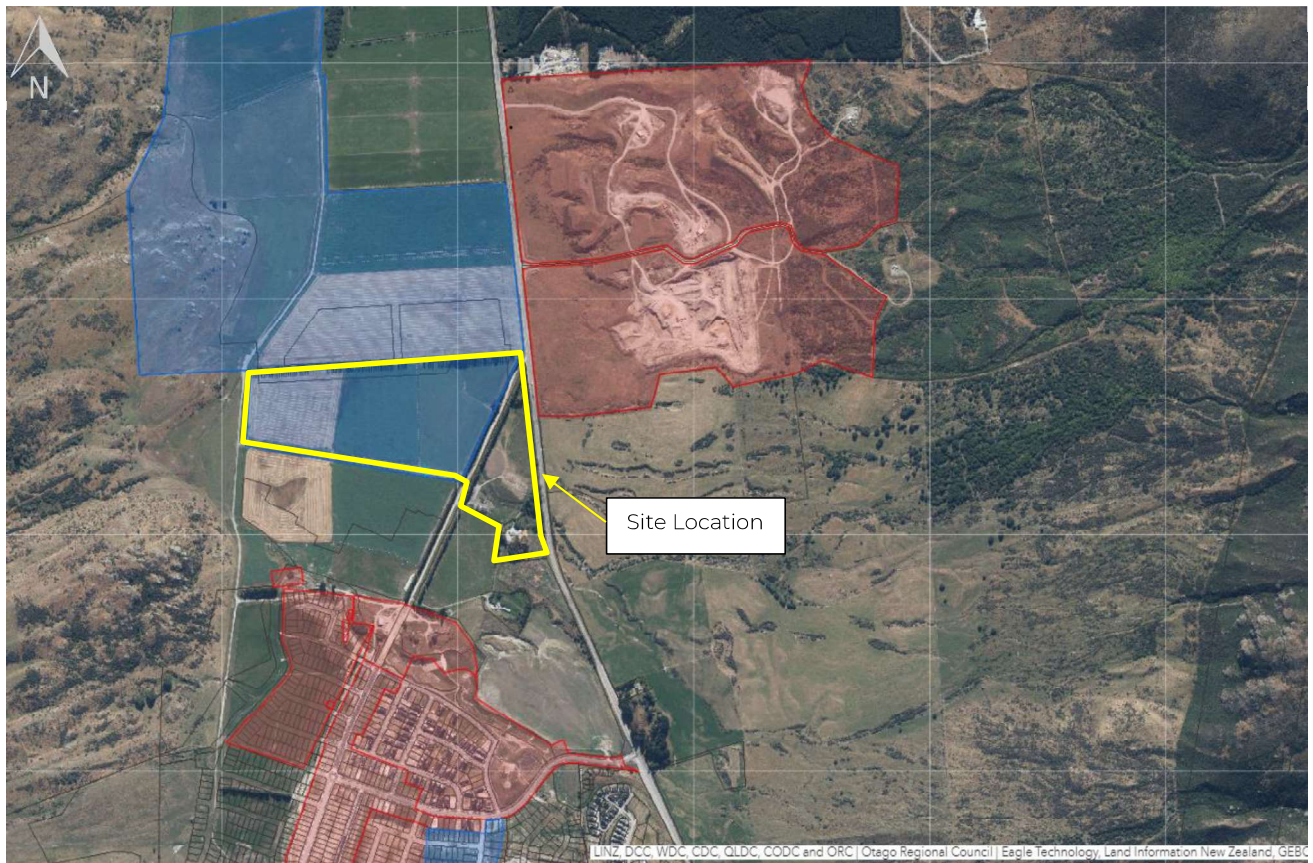


Figure 3: Extract from ORC Land Use Register showing an overview of HAIL sites surrounding the site, with blue and red shading indicating respectively a verified non-HAIL site and a verified HAIL site.

5 CURRENT SITE CONDITION AND SURROUNDING ENVIRONMENT

A site inspection was carried out by a WSP Environmental Engineer on 13 February 2023. Photos were taken of the site and its surrounds. A selection of these can be seen within Appendix B. A summary of the site conditions is given in Table 6 below.

Access to the site is via Woolshed Road. The site is generally divided into two main areas, being the grazing land on the western side of Woolshed Road (Paterson Block) and 436 Woolshed Road on the eastern side.

The western section of the site is bordered by a gravel access road and adjacent tree hedges to the south. The northern and western boundary is comprised of a drainage channel and tree hedges. The site is surrounded by pastoral land. Further to the north, the Coneburn subdivision was in development at the time of writing this report.

The western section of the site is overlain with grass and comprises a generally flat landscape. There is an additional drainage channel that has been excavated in the northern area of the site, generally running east to west. A small area of concrete debris was noted during the site walkover; however, no evidence of further landfill activity was observed. No evidence of contamination was noted.

The eastern section of site (436 Woolshed Road) has a more variable land use. This area is characterised by a grassed area and general equipment storage to the north, and a gravelled area, 2 farm sheds, storage sheds and a residential dwelling to the south.

The materials stored on this area of the site generally comprise farm equipment and machinery, including feeding troughs, tractors, historic lamp posts, trailers, and PVC piping. Two large grain silos were noted on-site. Historic fencing equipment was also noted, including timber posts stored on the surface of the ground. An above ground fuel storage tank was noted adjacent to the farm shed.

The residential dwelling is surrounded by grass and foliage. It is accessed via a gravel driveway from both SH6 and Woolshed Road.

Table 6: Summary of site conditions.

Site access	Woolshed Road
Current site use	Fallow pasture
Existing structures	2 x Farm sheds, one single storey residential dwelling
Existing vegetation	Grass, tree hedges
Adjoining site uses	Rural residential and pasture
Site observations	The site comprises a generally flat landscape with open fields and livestock. Some farm machinery is present nearby the residential dwelling.
HAIL activities that are considered under NES guidance	None noted on site.

6 DEVELOPMENT PROPOSALS

It is understood that the site is currently zoned as an Urban Growth Area. Due to the current nature of the site, a change of use of the site from rural to residential is anticipated.

The site is proposed to be subdivided with residential development of approximately 405 dwellings. The client proposes to build standalone houses with areas of 250 to 400m². Several access roads will be developed, linking the subdivision to the Coneburn Development to the north and the Woolshed Development south. As such, significant ground disturbance is likely to occur as part of the development of the site.

The proposed development plans are provided in Appendix C.

7 CONCEPTUAL SITE MODEL

7.1 PROPOSED LAND USE

For contaminated site assessments the hierarchy of reference documents containing guidelines for soils and waters, the MfE Contaminated Land Management Guidelines No 2 (Ministry for the Environment, 2011b) is referred to.

The site is currently used as a rural and rural residential end use. The proposed development would include a change in use to residential.

The proposed development plans comprise subdivision and residential development of 405 dwellings. As such, a residential land use defined in the NESCS is considered the most appropriate and conservative end use of the site as detailed within Table 7. The recommendations outlined in this report must therefore be considered when developing this land.

The primary human health receptors have been determined to be site workers, along with residential users and visitors following any future development of the site.

Table 7. Land use scenario

Scenario	Description
Rural / lifestyle block	Rural residential land use, including home-grown produce consumption (25 per cent). Applicable to the residential vicinity of farm houses for protection of farming families, but not the productive parts of agricultural land. Note: Consumption of eggs, milk and meat from animals raised on site is excluded. Produce consumption is limited to home-grown vegetables. Sites for which consumption of home-grown eggs, milk or meat is important will need to be evaluated on a site-specific basis.
Residential	Standard residential lot, for single dwelling sites with gardens, including home-grown produce consumption (10 per cent).
High-density residential	Urban residential with limited soil contact, including small ornamental gardens but no vegetable garden (no home-grown produce consumption); applicable to urban townhouses, flats and ground-floor apartments with small ornamental gardens, but not high-rise apartments.
Parks / recreational	Public and private green areas and reserves used for active sports and recreation. This scenario is intended to cover playing fields and suburban reserves where children play frequently. It can also reasonably cover secondary school playing fields but not primary school playing fields.
Commercial / industrial outdoor worker (unpaved)	Commercial / industrial site with varying degrees of exposed soil. Exposure of outdoor workers to near-surface soil during routine maintenance and gardening activities with occasional excavation as part of maintaining subsurface utilities (ie, a caretaker or site maintenance personnel). Also conservatively applicable to outdoor workers on a largely unpaved site.

7.2 ASSESSMENT OF HAIL ACTIVITIES

The Ministry for the Environment (MfE) created a list of potentially contaminating activities and industries (Ministry for the Environment, 2021b). This Hazardous Activities and Industries List (HAIL) is a compilation of the activities and industries likely to cause land contamination resulting from hazardous substance use, storage or disposal.

The desk study found that the potential contaminants of concern may include heavy metals derived from the application of fertilisers to the former pasture. No evidence or anecdotal

knowledge of bulk storage of fertilisers is known to have occurred on the site, however, and fertiliser application on the site during the 1950's is considered to have been minimal.

In addition, due to nearby HAIL sites, HAIL category *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*, should be considered.

7.3 SITE-SPECIFIC CONCEPTUAL SITE MODEL

Based on the site history and desk-based information presented, the following conceptual site model (CSM) was produced. The CSM, presented in Table 8, is used to support the decision-making process for contaminated land management.

The five basic activities associated with developing a conceptual site model are:

- Identification of potential contaminants;
- Identification and characterisation of the source(s) of contamination;
- Identification of potential migration pathways through environmental media, such as groundwater, surface water, soils sediment, biota, air, service lines;
- Identification and characterisation of potential receptors (human, ecological or building infrastructure); and
- Determination of the limits of the study area or system boundaries.

Data gaps and uncertainties are identified during the preparation of the conceptual site model, which assists in designing any detailed investigation that may follow.

For there to be an effect on receptors there must be a contamination source and a mechanism (pathway) for contamination to affect human health or the environment (receptor).

A possible pollutant linkage between the contaminant source and receptor is defined as one that has the potential to represent unacceptable risks to human health or the environment but has not been identified through risk assessment.

The following conceptual site model has been identified based on land use of residential. This may need to be amended in light of any further development proposals in the future.

Table 8: Conceptual Site Model

Likely sources of impact	A review of all data sources and anecdotal evidence indicates that the site may have been subject to low intensity agricultural activities. As such, potential sources of contamination include heavy metals associated with the application of fertiliser across the site. In addition, migration from nearby HAIL sites may cause contamination on site. During the site walkover some timber posts were seen stored on site and an overhead fuel storage tank was noted.
Potentially impacted media	Impacts are likely to be limited to shallow soils (the upper metre).
Contaminants of concern	<p>The potential contaminants of concern associated with the identified sources comprise:</p> <ul style="list-style-type: none"> — Heavy metals, including cadmium; — Organochlorine pesticides (OCPs); — Total Petroleum Hydrocarbons (TPHs); and — Polycyclic Aromatic Hydrocarbons (PAH).
Migration pathways	<p>Potential migration pathways for the contaminants of concern comprise:</p> <ul style="list-style-type: none"> — Surface runoff containing impacted soil or dissolved contaminants; — Infiltration of contaminants in soil; and — Groundwater transport through soil, including in preferential pathways (service trenches, through higher permeability soils and/or high groundwater levels).
Potential exposure pathways	<p>Potential exposure pathways comprise:</p> <ul style="list-style-type: none"> — Ingestion or dermal contact with impacted soil, including surface soils including during excavation work; and — Ingestion or dermal contact with impacted surface water or groundwater during excavation work.
Potential sensitive receptors	<p>Identified sensitive receptors comprise:</p> <ul style="list-style-type: none"> — Workers and visitors at the site during the proposed site works; — Residents and visitors following the development of the site; — Groundwater; and surface water ecosystems.

7.4 DISCUSSION

Site history, council records, historical aerial photography and a site inspection indicate that potential HAIL activities have been or are currently present at the site, namely:

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, due to verified HAIL sites identified in the vicinity of the site.

Taking into consideration likely migration pathways towards the east, the contamination status, distance (>400m) and nature of the adjacent HAIL sites; migration of contaminants on to the site **in sufficient quantity** is considered highly unlikely.

Although not a HAIL activity per se, potential application of fertilisers across the site may have occurred historically.

During the site walkover or desktop study, no evidence of bulk storage, manufacture or disposal of fertilizers was noted. Fertiliser application on the site is not considered to have occurred **in sufficient quantity** to be considered a HAIL activity.

In addition, several timber posts were noted on site. Timber treated with chromated copper arsenate(CCA) could be associated with HAIL A18. *Wood treatment or preservation including the commercial use of anti-sapstain chemicals during milling, or bulk storage of treated timber outside.*

As historical aerials did not show the presence of the timber posts on-site and these have only been noted during the site walkover, it is considered acceptable to assume the posts have only recently been stored on site and leaching of chemicals into the soils will be limited. Taking into account the small number of posts, the presence of contaminants of concern on site **in sufficient quantity** to cause a risk to human health is considered to be highly unlikely.

Lastly, an overhead fuel storage tank was seen, however, it seemed to be in new condition and no signs of spillage were noted. It is likely the fuel tank was recently placed on site for ongoing development works in the area. As such, it is considered to be highly unlikely for there to be soil contamination associated with hydrocarbons from the tank.

8 SITE CHARACTERISATION

The purpose of this preliminary site investigation was to provide an assessment of the historical and current land uses to determine whether activities have more likely than not resulted in contamination of the soil that may be hazardous to human health.

Based on a review of information currently available, as well as observations made during the site inspection, our assessment of the site is as follows:

- The site is classified as rural and rural residential;
- The site is surrounded by rural land and residential subdivisions;
- The site is proposed for subdivision and subsequent residential development of 405 lots;
- The underlying geology comprises Holocene river deposits.
- No obvious signs of vegetation dieback were noted in any location across the proposed development; and
- No HAIL activities were noted to be or have been occurring on-site to likely cause contaminants on site in sufficient quantity to be a risk to human health or the environment.

Potential human health risks have been evaluated using the Likelihood and Consequence scales tabulated in Table 9, to determine a risk level – low, moderate, high, very high or extreme. The assessed risk level allows prioritisation of investigations and assessment measures.

Table 9: Likelihood and consequences scale

	Consequence				
Likelihood	Insignificant	Minor	Medium	Major	Catastrophic
Almost certain	Moderate	Moderate	Very High	Extreme	Extreme
Likely	Low	Moderate	High	Very High	Extreme
Possible	Low	Moderate	Moderate	Very High	Very High
Unlikely	Low	Low	Moderate	High	Very High
Rare	Low	Low	Low	Moderate	High

The risks to human health have been assessed based on the historical activities which may have occurred on specific areas on or off the site:

- **Production Land:** The site may have historically been used for low intensity agriculture. The broadacre application of agrochemicals has not occurred recently and is considered highly unlikely to have been undertaken regularly historically. No evidence of bulk storage, manufacture or disposal of fertilizers was noted during the site walkover. The consequence corresponding to contaminants of concern associated with broadacre application of fertilisers is considered to be insignificant to minor.

- **Migration from nearby HAIL sites:** Based on the site topography, contamination status, distance from site and nature of the nearby HAIL activities, migration of contaminants from adjacent sites is considered highly unlikely with consequences considered to be minor.
- **CCA leaching from treated timber:** The storage of the timber posts on site is considered to be recent and temporary. As such, the presence of contaminants in soil in sufficient quantity to cause harm to human health is considered to be highly unlikely. In addition, the extensive ground disturbance for development would dilute any possible contaminant hotspots. The consequences are considered to be insignificant to minor.
- **Above ground fuel storage:** A small above ground fuel storage tank was noted during the site walkover. No signs of hydrocarbon spillage were noted, and the tank appeared to be in new condition. As such, the likelihood of hydrocarbon contamination of the soils beneath the tank is considered to be highly unlikely and the consequences insignificant to minor.

The risk to human health, based on the likelihood and consequence of potential contaminants, is considered to be LOW.

9 CONCLUSION AND RECOMMENDATIONS

A Preliminary Site Investigation was undertaken for the proposed subdivision and subsequent residential development of Paterson Block and 436 Woolshed Rd.

As HAIL activities are not considered to have been or be occurring on the site, the **NESCS does not apply** to the site. Through the desktop study and site walkover, the risks to human health associated with potential soil borne contaminants has been assessed as LOW.

Taking into consideration development proposals along with the end use for residential purposes, it is considered highly unlikely that there will be a risk to human health associated with the proposed development of the site.

RECOMMENDATIONS

Based on the findings of this PSI report, WSP recommends the following:

- This PSI report is submitted to the consenting authority as part of any resource consent application;
- This PSI report is submitted to the regional authority to facilitate updating of the HAIL database; and
- Should any other ground conditions be encountered that are not covered herein, a Suitably Qualified and Experienced Practitioner (SQEP) specialising in contaminated land assessment should be consulted in order to assess the risks to human health and sensitive receptors.

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11 SQEP CERTIFICATION OF REPORT

National Environmental Standard for assessing and managing contaminants in soil to protect human health

PRELIMINARY SITE INVESTIGATION CERTIFYING STATEMENT

I, Lisa Bond, of WSP New Zealand Ltd certify that:

- 1 this preliminary site investigation meets the requirements of the Resource Management (National Environmental Standard for assessing and managing contaminants in soil to protect human health) Regulations 2011 because it has been:
 - a done by a suitably qualified and experienced practitioner, and
 - b reported on in accordance with the current edition of Contaminated land management guidelines No 1 – Reporting on contaminated sites in New Zealand, and
 - c the report is certified by a suitably qualified and experienced practitioner (SQEP).

For activities under R8(4) of the NES-CS this preliminary site investigation concludes it is highly unlikely that there will be a risk to human health if the activity is done to the piece of land.

The activity to be undertaken as defined in R 5(5) and R5(6) is described in Section 1 and Section 6 of this preliminary site investigation report.



Bond, Lisa (allab0)
2023.03.08
08:58:33 +13'00'

Signed and dated:

Should evidence of qualifications or experience of the SQEP be required please contact:

WSP
69 Tarbert Street,
Alexandra
9320
s 9(2)(a)

12 LIMITATIONS

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for KA Woolshed Limited Partnership ('Client') in accordance with the Short Form Agreement with the Client dated 19 December 2022 ('Agreement').

Permitted Purpose

This Report has been prepared expressly for the purpose of assessing the potential risks to human health from contaminants in the soil for any future soil disturbance associated with the development of residential units on the site ('Permitted Purpose'). WSP accepts no liability whatsoever for the use of the Report, in whole or in part, for any purpose other than the Permitted Purpose. Unless expressly stated otherwise, this Report has been prepared without regard to any special interest of any party other than the Client.

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Appendix A

Historical Imagery



1956



□ Approximate Site Location

1959



 Approximate Site Location

1964



Approximate Site Location
Note: Full site isn't shown



1976

 Approximate Site Location



1983



 Approximate Site Location



 Approximate Site Location