112 McDonnell Road, Arrowtown

Preliminary Site Investigation Report
Richard Newman

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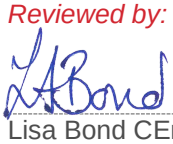

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SQEP Statement

- My name is Lisa Anne Bond. I am a suitably qualified and experienced practitioner (SQEP) in land contamination matters as defined in the Users' Guide for the Ministry for the Environment National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS), April 2012.
- I am a contaminated land specialist holding a BSc (Hons) in Applied Environmental Geology from the University of Portsmouth (UK). I am a Certified Environmental Practitioner (CEnvP), gaining accreditation in 2014, and am a member of the Australasian Land and Groundwater Association (ALGA) and Environment Institute of Australia and New Zealand (EIANZ) as well has having been admitted as a Fellow of the Geological Society (UK).
- I have over 20 years' experience in assessing and investigating contaminated land having worked with local authorities and regulatory bodies in developing management strategies and investigation programmes for landfill sites, brownfield sites and heavily contaminated industrial sites. I have worked as both a contractor and advising consultant for the investigation, assessment and reclamation of contaminated land sites in the UK and New Zealand.
- I am currently the Chair for the Opus Contaminated Land Networking Group and the Registrar for general applications to the Certified Environmental Practitioner (CEnvP) accreditation scheme.
- As a SQEP I am willing to certify by signature below that the content of the report complies with good practice and professional standards, and stand by the conclusions of the report.

Lisa A Bond

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Executive Summary

A Preliminary Site Investigation (PSI) has been undertaken on a piece of land 112 McDonnell Road, Arrowtown; associated with a proposed subdivision, change of land use and potential development.

It is understood that the site area is currently used as production or pastoral land, with the potential for activities which may be deemed HAIL having occurred on areas of the site. As such the site may have undergone activities listed on the Hazardous Activities and Industries List (HAIL) as part of the National Environmental Standards (NES).

The purpose of this preliminary site assessment, in general accordance with CLMG No1 and the NES for Assessing and Managing Contaminants in the Soil to Protect Human Health (2011), is to provide an assessment of the historical and intended land uses. Subsequently determining whether or not the activities have, more likely than not, resulted in contamination of the soil that may be hazardous to human health.

On this basis, and on a review of the information currently available; as well as observations made during the site inspection, through the compilation of a conceptual site model, our assessment of the site is as follows:

- The site is currently utilised as a residential dwelling, associated ancillary buildings and gardens, a small apple orchard or pastoral land.
- No bulk storage of chemicals is known to have occurred on the site.
- There are several sheds/ ancillary buildings noted in the south of the site, these include some animal pens. Bee hives are noted in the centre of the site
- Anecdotal evidence indicates that orchard spraying activities were undertaken on the site within the orchard area, between 1994 and 2001.
- Development proposals indicate that the site is to undergo a thirteen lot subdivision (with approved potential development platforms on each lot), with an associated a change of land use and future potential development;
- No obvious signs of vegetation dieback were noted across the site during the site walkover; and
- The underlying geology comprises Late Pleistocene Glacier Deposits beneath the south-eastern portion of the site; the remainder of the site is underlain by the Wanaka Lithologic Association TZIV Pelitic Schist (Rakaia Terrane).

Although there is a small orchard, which anecdotal evidence suggests has been sprayed, the results of the chemical testing prove that the risk to human health associated with potential contamination in the near surface soils across this part of the site is considered to be **low**. Based upon these findings, the risk to human health associated with potential contamination in the near surface soils across the remainder of the site is also considered to be **low**

Taking into consideration the information herein, it is considered more likely than not that the risk to human health associated with potential contamination associated with the subdivision, change of land use and potential development on the site is **low**. As such it is considered **highly unlikely** that there will be a risk to human health associated with the proposed development activity within the specified building platforms on the site.

Although not a requirement of the NES an assessment of risk to environmental receptors has been undertaken. It is considered that any migration of potential contaminants to groundwater from the site is highly unlikely, with any contaminants which may have leached through near surface soils more likely than not readily diluted and dispersed over time. As such the risk to environmental receptors from potential contaminants on the site is considered to be **low**.

Based on the results of this investigation, Opus recommends that:

- Any ground disturbance undertaken on the site is considered to be a permitted activity providing that the works undertaken comply with clause 8(3) of the NES. Should volumes in excess of those detailed in clause 8(3) be disturbed on the site a resource consent application may be required as the site as a whole is considered to be HAIL;
- Should any ground conditions be encountered across the site which are not anticipated from the findings of this report a Suitably Qualified and Experienced Practitioner (SQEP) should be consulted in order to reassess the risks to human health;
- This PSI report is included with any Resource Consent application for the proposed development; and
- This Preliminary Site Investigation report is submitted to the regional authority in order to facilitate updating the HAIL database.

1 Introduction

1.1 Background

Opus International Consultants Ltd (Opus) were commissioned by Richard Newman, (herein referred to as 'the Client') to undertake a Preliminary Site Investigation (PSI) for a parcel of land located at 112 McDonnell Road, Arrowtown (herein referred to as 'the site'). It is understood the client proposes a subdivision, change of land use to part of the site and potential residential development, with associated ground disturbance.

A site layout plan is presented in Appendix A, with the Proposed Development Plan presented in Appendix C.

1.2 Objective

This PSI report has been prepared in order to assess the potential for ground contamination to be present across the site. It is understood that the site is currently used as production or pastoral land, with there being a potential for activities which may be deemed HAIL having occurred on areas of the site. As such the site may have undergone activities listed on the Hazardous Activities and Industries List (HAIL) as part of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health, (NES).

As such the following objectives have been identified:

- Determine whether potentially contaminating activities have been undertaken on the site or its surrounds;
- Assess the potential risk of these activities to affect human health or the environment;
- Assess whether further assessment or action is required with respect to the risks assessed; and
- Determine the likely impact upon sensitive receptors including site users, occupiers and construction workers on site.

1.3 Scope of Work

In order to achieve the objectives, set out above, the following scope of works has been undertaken:

- A site walkover to assess the current site condition and its surrounding environment;
- An assessment of historical 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 relating to resource consents, geological conditions and hydrology of the site;
- An assessment of any existing analytical information regarding soil quality if available;
- A review of local authority records and searches of ORCs HAIL register; and
- A site characterisation indicating the potential environmental risk associated with the site.

2 Site Identification and Description

2.1 Site Identification

The site is located on a piece of land located at 112 McDonnell Road, Arrowtown, approximately 1.2km south of Arrowtown Town centre as shown on Figure 1.

The proposed development site is located on a property legally described as Pt Section 1 Survey Office Plan 23541 (Certificate of Title OT14A/295) ~ 6.5ha. It is currently owned by Ernest John Leslie Guthrie, Leanne Kaye Newman, Rickard Morris Newman, Banco Trustees Limited and MuCulloch Trustees 2004 Limited.

A Quickmap diagram detailing the current legal site boundaries, and appellations of properties nearby are shown in Figure 2**Error! Reference source not found.**.

The current Proposed Development plan is attached as Appendix C, with photographs taken during the site investigation presented in Appendix D.

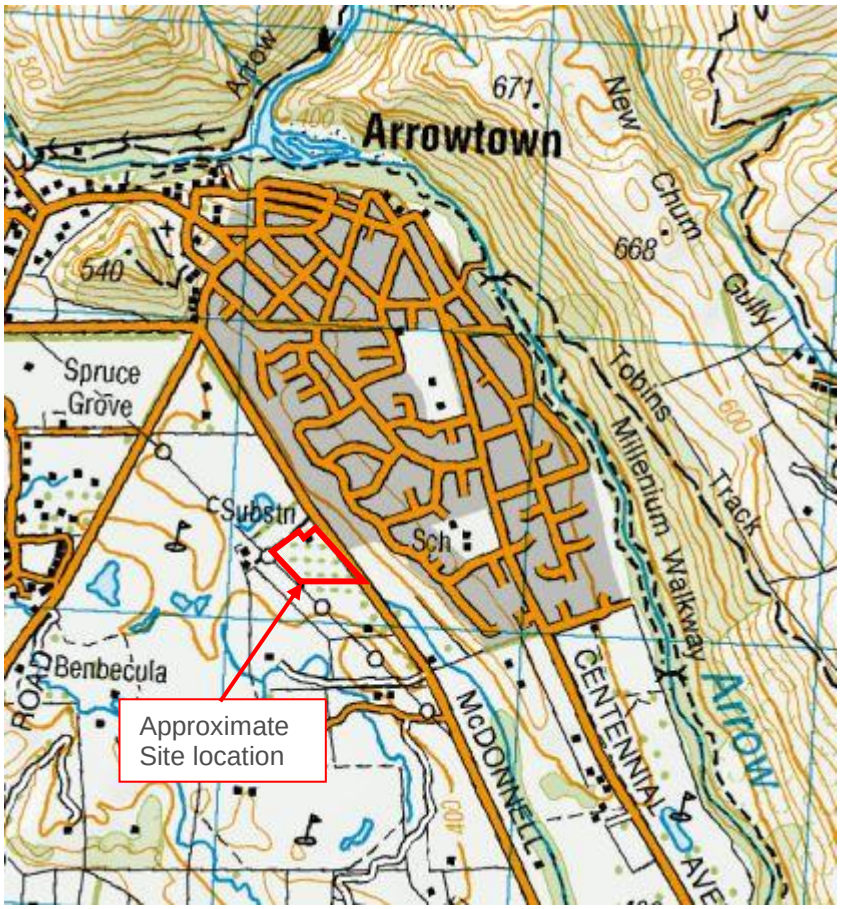


Figure 1: Site Location Plan

Figure 2: Quickmap extract for site and surrounds

2.2 Site History

Details of the site history have been gained from a review of sources including historical aerial photographs from Google Earth and Retrolens, historical topographical maps from Maps Past, a review of Opus's Quickmap ArcGIS database and a search of council records. Historical information is presented in Appendix B.

The conditions on the site over the timeframe searched are summarised in Table 1.

Table 1: Site History

DATE	SOURCE	NOTES
1929	Maps Past	The site is shown to be within a section labelled 19. There appears to be a stream or a river situated on the eastern part of the site. The site is bounded to the east by McDonnell Road. Along the western site boundary there appears to be a dwelling and associated ancillary buildings.
1959	Aerial Photograph SN1219 2824_14 Scale: 44,500 Retrolens	The site appears to be rough pasture, with a number of mature trees and two water courses running through it.

DATE	SOURCE	NOTES
1960	Aerial Photograph SN1053 L_2 Scale: 44,500 Retrolens	No significant changes had occurred to the site and layout of the area at this time.
1966	Aerial Photograph SN2016 3972_34 Scale: 87,500 Retrolens	No significant changes had occurred to the map and layout of the area at this time. However in the western section of the site their appears to be a pond feature at the head of one of the onsite water cources.
1979	Maps Past	No significant changes had occurred to the map at this time.
1983	Aerial Photograph SN8180 G_4 Scale: 50,000 Retrolens	No significant changes had occurred to the site at this time, however the streams crossing the site can no longer be seen. To the east of the site, across the road, residential housing development is now evident.
1984	Aerial Photograph SN8180 G_4 Scale: 50,000 Retrolens	No significant changes had occurred to the map and layout of the area at this time.
1999	Maps Past	No significant changes had occurred to the map at this time.
2004	Google Earth	There is now a residential dwelling and ancillary buildings on the central southern portion of the site. There is also a building adjoining the north-eastern corner of the site. A pond or irrigation dam looks to be present in the western part of the site.
2006	Google Earth	An area of the site to the west and slightly to the east of the buildings on the site appears to be used for growing crops as there are lines of vegetation/soil. The area near the buildings has also been planted with mature trees. No further significant changes had occurred to the layout of the area at this time.
2009	Maps Past	The building noted to the north east of site is identified as a substation.
2010	Google Earth	There are further ancillary buildings evident close to the residential dwelling on the site. The western area that looked to be used for growing crops no longer appears to be used and a building is in the middle of this area, with a number of trees. No significant changes had occurred to the layout of the area at this time.

DATE	SOURCE	NOTES
2015	Google Earth	There appears to be an area of disturbed ground, potentially a waste pit, in the north western portion of the site. No significant changes had occurred to the layout of the area at this time.

During initial conversations with the Client, Opus were made aware that the central portion of the site had been used as an orchard which ceased 16 years previous. Pesticide use on the site was thought to have taken place between 1994 and 2001. No other information has been sourced that relates to orchard activities on the site.

Council Records

A review of QLDC's District Plan Maps indicates that the piece of land lies in an area which is currently zoned as Rural General Zone.

A review of the HAIL database held by Otago Regional Council has revealed that the site does not currently appear on the database. The absence of available information does not necessarily mean that the property is uncontaminated, rather no information exists on the database.

2.2.1 Certificates of Title

A search for relevant certificates of title was undertaken for the site along with any associated survey plans in order to help determine the historical ownership and layout of the site. These details may give an indication as to past uses on the site and the potential for HAIL activities. Relevant certificates of title and survey plans are also presented within Appendix B.

2.3 Geology and Hydrology

The geology of the site is shown on the 1:250,000 scale GNS Geology Web Map extract (accessed December 2017) as shown in Figure 3.

This map indicates the south east of the site to be underlain by Late Pleistocene Glacier Deposits, generally comprising unweathered to slightly weathered, loose, poorly sorted, boulder gravel, sand, silt (till) often with contorted bedding [1]. Under the north eastern portion of the site the underlying deposits are Aspiring Lithologic Association TZIV Pelitic Schist (Rakaia Terrane). The schist generally comprises very well segregated and laminated, abundant pelitic and subordinate psammitic grayschist; minor greenschist and metachert.

A review of the GNS Active Faults Database indicates that the nearest active fault, Cardrona Reverse Fault (#8365), lies approximately 9.25km west of the site, as shown in Figure 4 The fault has a recurrence interval of >5,000 to <=10,000 years (IV) and a low slip rate. No further information is known about this fault.

There is an unnamed spring located in the eastern porton of the site. Historicaly the water arrising from this spring flowed south, currently the spring is contained within a pumping house and as such there is no free flowing water on the site. The pumping of spring water on the site is subject to an irrigation consent that expires in 2026. The site is located within the confines of the Wakatipu Basin Aquifer[2].

Grow Otago[3] rainfall data indicated an annual median rainfall of 775mm/yr in the vicinity of the site with a median annual potential evaporation of around 610mm.

[1] http://data.gns.cri.nz/geology/

[2] https://www.orc.govt.nz/media/3798/wakatipu-aquifers-groundwater-investigation-report-web.pdf/

[3] http://growotago.orc.govt.nz/

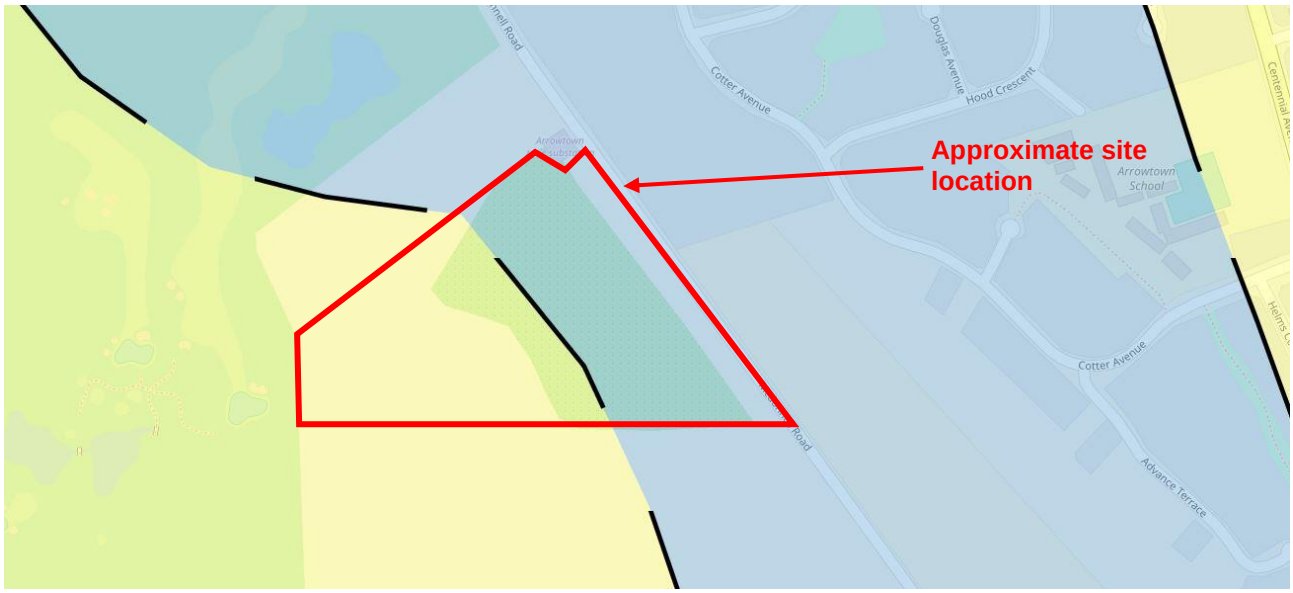


Figure 3: GNS Geological Extract

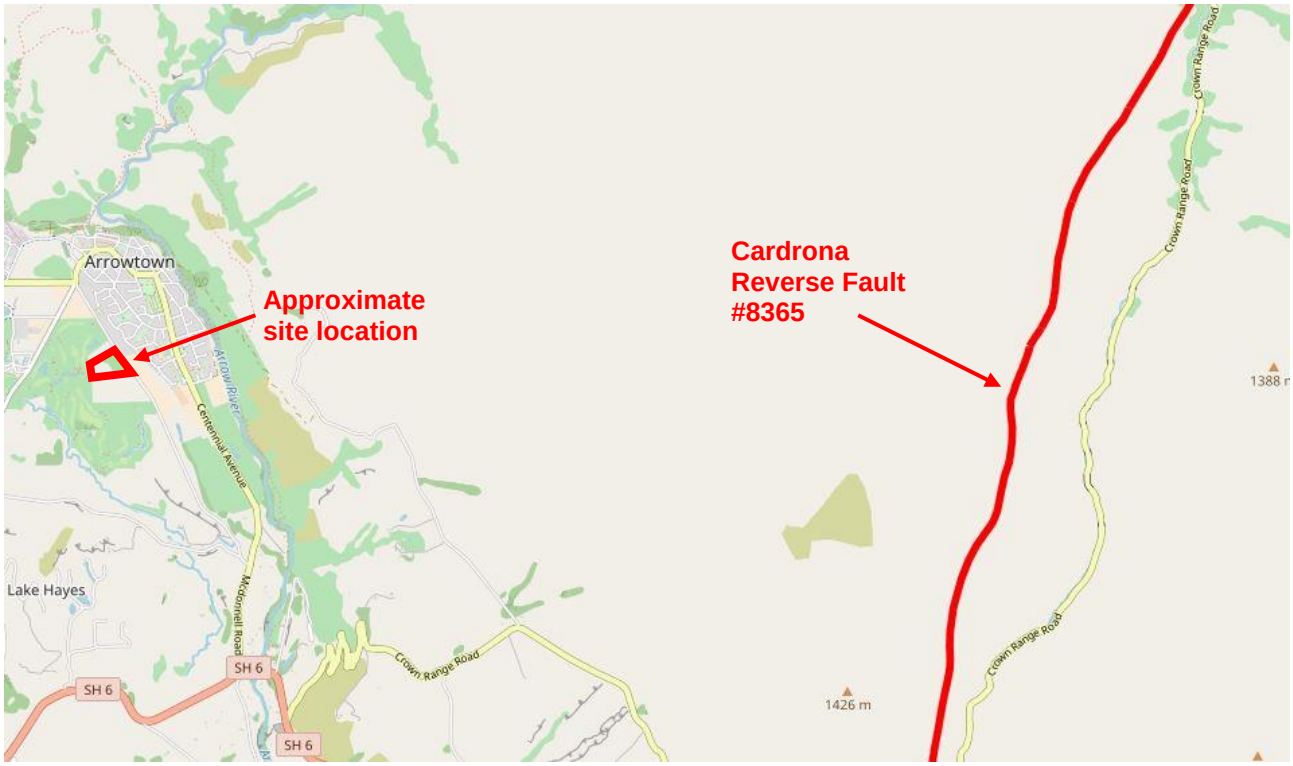


Figure 4: Extract from GNS Active Faults Database

3 Walkover Survey

A site walkover/ drive over was undertaken on 12th December 2017 by an Opus engineer and Richard Newman who guided the engineer around the property initially. A current site plan is attached as Appendix A, with photographs taken during the site inspection presented in Appendix D

The site is accessed via McDonnell road to the west of the site, as shown in the site layout plan presented in Appendix A.

The site is bound to the north, south and west by grassed farmland or natural scrubland with the occasional residential lifestyle property. To the east of the site lies McDonnell Road, and beyond that there is a residential development. Adjacent to the north-east corner of the site an electricity substation is located, there are a number of above ground power lines crossing the site and entering the substation.

The site itself generally comprises a large grassed paddock along the road side with a residential dwelling, greenhouse storage shed, gardens and animal pens located towards the centre of the site. Beyond these gardens and animal pens a further small paddock can be seen in the eastern section of the site. The house is accessed by a gravel driveway that runs along the southern site boundary. To the south of this driveway large conifers line the boundary fence. North of this driveway is lined by a number of semi mature trees, these trees become mature apple tress just east of the house. The remainder of the house and the landscaped garden section to the north are lined by conifer trees. In front of these trees to the north east are a number of bee hives.

To the west of the landscaped area, next to the house driveway, there are a number of paddocks; the south-eastern paddock is utilised as a vegetable plot and also contains a number of semi mature trees. Within this area there is a small area used for burning garden waste. To the west of this paddock there is a chicken coop and enclosed section of land containing several trees. To the north of both paddocks there is a further paddock, which is contains a large shed/garage including a log store, disused and cleaned spray equipment which has been discarded within the paddock, a number of young silver birch trees and a number of pet sheep. To the north of these paddocks, a large amount of wood/ brush has been stacked for burning at a later date. It is in this area that a potential waste pit was identified on historical aerial photographs, however on inspection it is apparent that the area comprises a stockpile of wood and brush for burning. A pump station is located within the large paddock in the eastern section of site, this pumping house draws its water from a natural well.

The topography of the site is highly varied with undulations across much of the site, however the prominent dip is to the south east, with the current house located within this dip.

No visual or olfactory evidence of contaminants were noted at any location during the drive over of the site.

Assessment of the activities undertaken on the site and conversation with the current owner (Richard Newman) indicates that the apple orchard was subject to spraying between 1994 and 2001. Further supporting evidence was located in the sheep paddock where spraying equipment has been left exposed to the elements. As such, this area of the site may be subject to HAIL activities, namely:

- **A10 – Persistent pesticide bulk storage or use including sports turfs, market gardens, orchards, glass houses or spray sheds.**

In addition, due to the proximity of the substation adjacent to the north-eastern corner of the site the following HAIL activity must be considered.

- **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.**

4 Development Proposals

It is understood that the site is proposed to undergo a thirteen lot subdivision, it is our understanding that at this time the current residential dwelling will remain. While the remaining lots undergoing a change of land use. Following the change of land use future potential development is anticipated. The current proposed development plans are presented in Appendix C.

5 Conceptual Site Model

This section of the report relates to the assessment of contamination arising from the previous and current land uses, both on and off the piece of land that may impact on the proposed land use change and development.

5.1 Potential Sources of Contamination

A review of all data sources and anecdotal evidence indicates that the site is currently used as production or pastoral land, with activities which may be deemed HAIL having occurred on areas of the site.

Potential sources of contamination typically associated with production or pastoral land along with potential sources observed as part of the historical review of the site may include:

- Chemical/Pesticide use, formulation, storage and disposal
- Polychlorinated Biphenyls (PCB's) - originating from the adjacent substation
- Heavy metals
- Polycyclic Hydrocarbons (PAH) – originating from burning waste

5.2 Potential Pathways

Plausible pathways such as inhalation, dermal contact, ingestion, leaching, and migration of contaminated groundwater, migration of ground gases and hazardous vapours as well as aggressive attack on construction materials have all be considered as part of the development of the conceptual site model for the piece of land on this site.

The most plausible migration pathways are dependent upon the type of contaminants and in this instance, they are considered to be:

- Inhalation of contaminated dust;
- Dermal Contact with contaminated soils/water;
- Ingestion of contaminated material or food; and
- Leaching of contaminants into surface water.

5.3 Potential Receptors

Taking in to account the proposed change of land use along with potential contaminants associated with the historical and current use as production/pastoral land, then the most sensitive receptors identified are as follows:

- Residents and visitors (end-users) to the site;
- Construction workers during earthworks and construction; and
- Environmental receptors including the spring on the site and the Arrow River approximately 9.7km east of the site

Using the data obtained from various sources and brought together within this report, a conceptual site model (CSM) has been derived for the site and is presented in Figure 5.

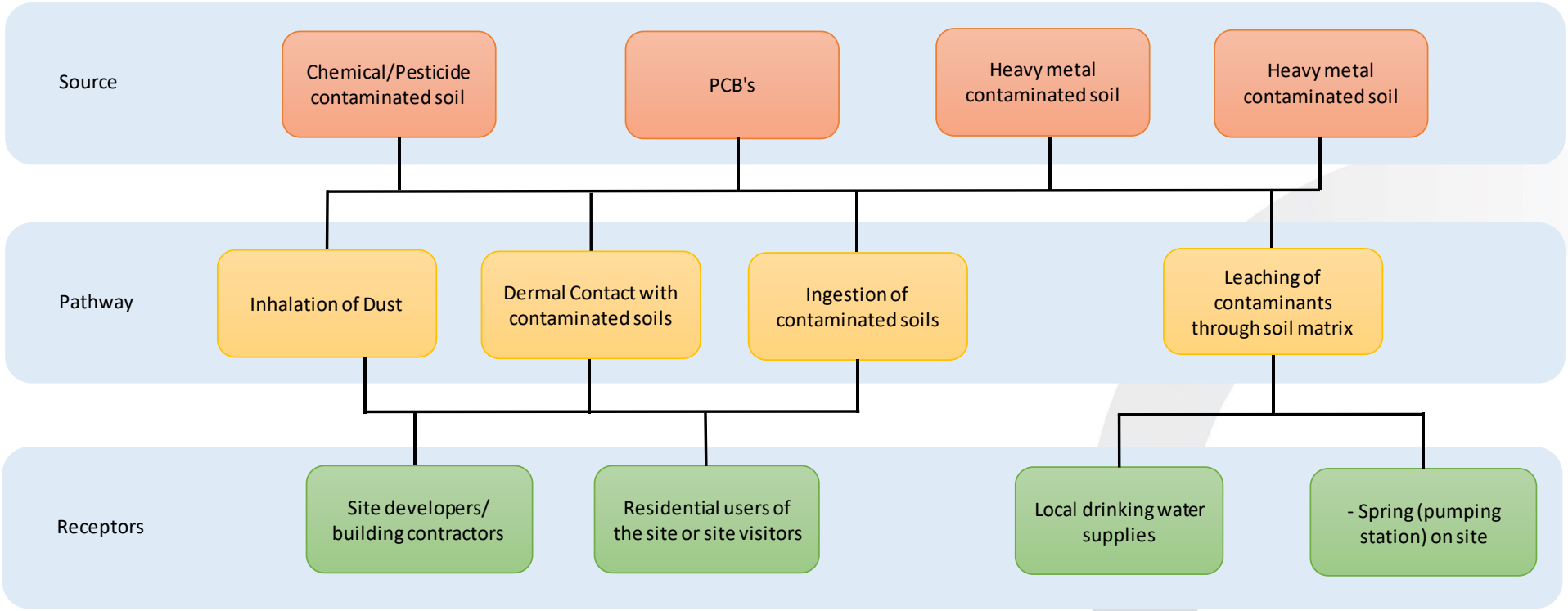


Figure 5: Conceptual Site Model

6 Preliminary Sampling and Analysis Programme

Sampling of the near surface soils was undertaken by an Opus engineer on 18th December 2018 as a screening exercise to assess the presence of any potential contamination across the orchard only.

The potential contamination risk arising from the area of burnt ground was not investigated as it is to remain within the garden area of the current residential lifestyle property with no change in land use. No samples were taken from the area of the site adjacent to the substation. The site is located both hydrogeologically and topographically above the substation and as such the risk of migration of potential contamination on to the site from the adjoining substation is considered low.

The location of samples taken was determined using a random sampling programme based on, onsite assessment and judgement of the engineer at the time of the visit. A plan showing the soil sampling locations is presented in Appendix E.

Sampling of the soils was undertaken using industry standard methods and protocols to avoid cross contamination of the samples, including but not restricted to the use of clean gloves for each sample taken, decontamination of the stainless-steel trowel using appropriate wash down and drying between samples and the use of appropriate sample containers supplied by Hill Laboratories, individually labelled and cross referenced using chain of custody documentation. Soils were stored in a chilled cool box prior to dispatch to the laboratories in the afternoon.

A total of three soil samples were collected from the site and scheduled for laboratory analysis by the engineer. Chemical analyses undertaken were as follows:

- Organo-chlorine pesticide screen; and
- Heavy metals with mercury.

The results of analytical testing are presented in Appendix F.

6.1 Strata Encountered

6.1.1 Topsoil

Topsoil was encountered within all of the exploratory holes on the site from ground level to depths of up to 0.25m below ground level (bgl). The topsoil was homogeneous across the areas of the site inspected, and generally comprised light brown slightly silty gravelly sand.

6.2 Field Quality Assurance and Quality Control (QA/QC)

Sampling of near surface soils was completed on 18th December 2018. Weather conditions were clear and dry during the sampling visit.

Samples were collected in glass jars and sent to Hill Laboratories via courier for heavy metals analysis and a pesticide screen. No blind replicas were completed for this sampling.

Decontamination of equipment was completed between the sample locations. Soil samples for laboratory analysis were collected using a hand trowel whilst wearing protective disposable gloves. Gloves were then changed between sample sites and the trowel was brushed and washed between each sample location

A chain of custody (CoC) form from Hill Laboratories was requested for receipt of the samples.

The location of samples taken is detailed in the sample location plan in Appendix E.

No duplicate samples were taken during this preliminary sampling programme.

6.3 Laboratory QA/AC

The Hill Laboratory Analysis report has been appended for perusal in Appendix F. This includes the analytical methods used by the laboratory and the laboratory accreditation for analytical methods used.

All Laboratory Analysis was completed through Hill Laboratories. Hill Laboratories are accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised

6.4 QA/QC Data Evaluation

Table 2: QA/QC Data Evaluation

EVALUATION OF ALL FIELD AND LABORATORY QA/QC INFORMATION	
Documentation and data completeness	Refer to sections 6.2 and 6.3.
Data representativeness	Refer to section 6 and 6.2.
Precision and accuracy of sampling and analysis for each analyse in each environmental matrix informing data users of the reliability, unreliability or qualitative value of the data.	Refer to sections 6.2 and 6.3.
Data comparability checks	
Collection and analysis of samples by different personnel	N/A
Collection and analysis by the same personnel using the same methods but at different times	N/A
Use of different sampling or analytical methodologies from those stipulated in the guideline documents	N/A
Spatial and temporal changes	N/A
Relative percent differences for inter and intra laboratory duplicates	N/A

7 Basis for Guideline Values

For contaminated site assessments, the hierarchy of reference documents containing guidelines for soils and waters, the MfE Contaminated Land Management Guidelines No 2 (November 2003) is referred to.

The potential development comprises a rural residential land use.

The primary human health receptors have been determined to be construction workers and end-users of the site. As such the most conservative end-use of rural residential (25% produce) is proposed for assessment purposes to take in to consideration potential regular contact with soils on the site by end-users, as highlighted in Table 3.

Table 3: Land Use Scenario

Scenario	Description
Rural / lifestyle block	Rural residential land use, including home-grown produce consumption (10 per cent). Applicable to the residential vicinity of farm houses for protection of farming families, but not the productive parts of agricultural land. (Not for regulatory use.)
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 that are 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. Check exposure for park maintenance staff using commercial / industrial unpaved.
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 sub-surface utilities (ie, a caretaker or site maintenance personnel). Also conservatively applicable to outdoor workers on a largely unpaved site.

Results from these screening analyses have initially been compared against soil guideline values (SGVs) from the National Environmental Standards (NES) Appendix B: Soil Contaminant Standards. Where no New Zealand Standards were available or more detailed guideline values were required contaminants, concentrations have been assessed using the appropriate guidelines within the MfE Environmental Guideline Value Database and are specified in the assessment results. SGVs for inorganic contaminants used in this assessment are outlined in Table 4.

Table 4: NES Soil Contaminants Standards for health ($SCS_{(health)}$) for inorganic compounds

	Arsenic	Boron	Cadmium (pH 5)[1]	Chromium		Copper	Inorganic lead	Inorganic mercury
				III	VI			
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Rural residential / lifestyle block 25% produce	17	>10,000	0.8	>10,000	290	>10,000	160	200
Residential 10% produce	20	>10,000	3	>10,000	460	>10,000	210	310
High-density residential	45	>10,000	230	>10,000	1,500	>10,000	500	1,000
Recreation	80	>10,000	400	>10,000	2,700	>10,000	880	1,800
Commercial / industrial outdoor worker (unpaved)	70	>10,000	1,300	>10,000	6,300	>10,000	3,300	4,200

Notes: All concentrations refer to dry weight (ie, mg/kg dry weight).

[1] Default value is for soil that is pH 5. Concentrations increase with increasing pH (see *Methodology*).

Although not a requirement of the NES, environmental receptors have also been considered and as such environmental soil contaminants standards for groundwater protection have also been considered as part of this assessment.

8 Summary of Analytical Results

The results of the chemical laboratory analysis were compared against the NES Soil Contaminant Standards for Health ($SCS_{(health)}$) and are summarised in Table 6. The proposed land use within the redevelopment area was assessed as being the most conservative end-use of rural residential (25% produce). This assessment was undertaken in order to assess the potential human health effects during site development works.

A full copy of the chemical laboratory results are presented in Appendix F.

8.1 Soils Assessment (Human health effects)

8.1.1 NES Heavy Metals

Laboratory results indicate that metal concentrations were within their relevant NES $SCS_{(health)}$ for a rural residential (25% produce) end use.

8.1.2 Pesticides

Laboratory results indicate that pesticide concentrations were within their relevant NES $SCS_{(health)}$ for a rural residential (25% produce) end use.

8.2 Groundwater Assessment

8.2.1 NES Heavy Metals

Laboratory results indicate that all of the results were below the relevant values for the protection of groundwater for potable supply.

8.1 Waste Disposal of Soils

At the time of writing this report it is envisaged that no soils will be disposed off-site for development of the sections.

For any soil which is to be disposed off-site, reference to the MfE Hazardous Waste Guidelines should be made. Taking into consideration the three samples that have been tested as part of this report, there may be a requirement to undertake additional analysis of the soils to determine concentrations of metals within the soils across the entire site if off-site disposal is undertaken in the future.

No background concentrations specific to Central Otago are currently available for cleanfill assessment purposes. However, reference can be made to the LRIS Portal which gives information on Predicted Background Soil Concentrations for New Zealand. These background concentrations are intended to provide an initial assessment of background soil concentrations based on the underlying geological unit.

Table 5:Chemical laboratory analysis results compared against the NES Soil Contaminant Standards for Health (SCS(health))

Site:	112 McDonnell Road, Arrowtown
Project No:	6-XZ374.00
Sample media:	Soil
Analysis:	Total Recoverable Concentrations
End-Use:	Rural Residential Lifstyle Block with 25% produce
Date:	Jan-18
Revision:	0

Sample Name	S1	S2	S3	Assessment Criteria (mg/kg)		
Sample Depth (m bgl)	0.2	0.25	0.2			
Natural / Fill?	Natural	Natural	Natural	**Protection of Human Health**		**Protection of Groundwater for Potable Use**
Soil Type	Topsoil	Topsoil	Topsoil	NZRB SCS (Health) Residential 25% Produce[7]	IRB NEPM SGV HIL A Residential with 25% Produce[8]	IRB - US EPA SSL Values Dilution Factor x20[10]
Metals (mg/kg)						
Arsenic	9	9	10	17	-	29
Cadmium[1]	< 0.10	< 0.10	< 0.10	0.8	-	8
Chromium[2]	6	7	9	290	-	38
Copper	10	10	11	<10,000	-	-
Lead	15.5	15.3	19.2	160	-	-
Mercury[3]	< 0.10	< 0.10	< 0.10	200	-	2
Nickel	7	8	8	-	400	130
Zinc	32	35	41	-	7,400	12,000
Pesticides (mg/kg)						
DDT[4]	0.06	0.07	0.13	45	-	-
Dieldrin[5]	< 0.011	< 0.011	< 0.011	1.1	-	-

Numerals in **Bold and Red** Indicate an Exceedance of One or More of the Acceptance Criteria
The Acceptance Criteria that has been Exceeded is also Highlighted
All concentrations are in mg/kg

Abbreviations:

SCS = Soil contaminant standard
SGV = Soil guideline value
NZRB = New Zealand Risk Based
IRB = International risk based
ND = Not derived
TEQ - Toxicity equivalent - indication of the toxicity of a mixture of compounds
NL - No limit. Derived value exceeds 10,000mg/kg.
SSL = Soil screening level
m bgl = meters below ground level
* SSL for DDT, DDE and DDD
** SSL for dieldrin + aldrin

Notes:

1. Cadmium - SCS based on pH 5. Cadmium absorption (i.e. plant uptake of cadmium) increases with decreasing pH (see MfE methodology document).
2. Chromium - SCS tabulated is for chromium VI. This is conservative as samples have been analysed for total chromium (i.e. III and VI). CCME SQG is for Total Chromium
3. Mercury - SCS tabulated is for inorganic mercury. Samples have been analysed for total mercury and therefore this SCS is conservative.
4. DDT - SCS is based on a sum of DDT, DDE and DDD
5. Dieldrin - SCS applicable to either dieldrin or aldrin seperately, or to the sum of aldrin and dieldrin if both are involved.
6. Sum of 12 dioxin-like PCBs (polychlorinated biphenyls) with variable toxicity, each multiplied by its toxicity equivalency factor (TEF), to give a toxic equivalancy (TEQ).
7. Users Guide National Environmental Standard (NES) For Assessing and Managing Contaminants in Soil to Protect Human Health. New Zealand. 2012
8. National Environmental Protection (Assessment of Site Contamination) Measure 1999 (Australia); Schedule B1 (as amended May 2013) - Guideline on Investigation Levels For Soil and Groundwater, Federal Register of Legislative Instruments F2013C00288, National Environmental Protection Council. (HIL - Health Investigation Level).
9. Environment Canterbury Background Concentrations of Selected Trace Elements in Canterbury Soils. R07/1/2 Dated February 2007. Table 2 Proposed level 2 background levels.
10. Supplemental Guidance for Developing Soil Screening Levels (human health) at Superfund Sites (US EPA, 2002) based on soil pH 6.8. Figures derived for protection of potable water supply, but are also used as a guideline figure for protection of ecological receptors in waterbodies in the absence of an alternative.

8.2 Discussion

8.2.1 Human Health Assessment

Chemical analysis results have revealed that concentrations of heavy metals and pesticides present within the soil sampled does not exceed the NES soil contaminant standard to protect human health for a rural residential (25% produce) end use.

8.2.2 Environmental Receptors Assessment

Testing results indicate that all the results were below the relevant values for the protection of groundwater for potable supply.

8.2.3 Waste Disposal Assessment

At the time of writing this report it is envisaged that no soils will be disposed off-site for development of the sections.

For any soil which is to be disposed off-site, reference to the MfE Hazardous Waste Guidelines should be made. As only three samples have been tested as part of this report which only covers a section of the site, there may be a requirement to undertake additional analysis of the soils to determine concentrations of metals within the soils across the sections of the site where disposal is proposed in the future. Results from the three samples tested do however indicate that soils may be considered as cleanfill.

9 Site Characterisation

The purpose of this Preliminary Site Investigation, in general accordance with CLMG No1 and the NES for Assessing and Managing Contaminants in the Soil to Protect Human Health (2011) is to provide an assessment of the historical land uses and intended land use to determine whether the activities have, more likely than not, resulted in contamination of the soil that may be hazardous to human health.

On this basis and based on a review of information currently available and through the compilation of a conceptual site model, our assessment of the site is as follows:

- The site is currently utilised as a residential dwelling, with associated ancillary buildings and gardens, a small apple orchard and pastoral land.
- No bulk storage of chemicals is known to have occurred on the site.
- There are several sheds/ ancillary buildings noted in the south of the site, these include some animal pens. Bee hives are noted in the centre of the site.
- Anecdotal evidence indicates that orchard spraying activities were undertaken on the site within the orchard area, between 1994 and 2001.
- Development proposals indicate that the site is to undergo a thirteen lot subdivision (with approved potential development platforms on each lot), with an associated a change of land use and future potential development;
- No obvious signs of vegetation dieback were noted across the site during the site walkover; and
- The underlying geology comprises Late Pleistocene Glacier Deposits beneath the south-eastern portion of the site; the remainder of the site is underlain by the Wanaka Lithologic Association TZIV Pelitic Schist (Rakaia Terrane).

Although there is a small orchard, which anecdotal evidence suggests has been sprayed, the results of the chemical testing did not reveal any potential contaminants of concern above respective SGV's. As such, the risk to human health associated with potential contamination in the near surface soils across the investigated part of the site is considered to be **low**.

The potential contamination risk arising from the area of burnt ground was not investigated as it would be remaining within the garden area of the current residential lifestyle property with no change of use proposed. No samples were taken from the area of the site adjacent to the substation. The site is located both hydrogeologically and topographically above the substation and as such the risk of migration of potential contamination on to the site from the adjoining substation is considered **low**. No potential sources of contamination were identified across the remaining sections of the site, however based on the homogeneity of soils across the site, findings of the site inspection and inference of the chemical analysis undertaken in the orchard, the risk to human health associated with potential contamination in the near surface soils across the remainder of the site is also considered to be **low**

Although not a requirement of the NES an assessment of risk to environmental receptors has been undertaken. There is a known spring located in the eastern part of the site which is believed to be utilised for irrigation purposes only. Topographically the spring lies lower than most of the site. However, based on the time since the last application of pesticides along with the presence of relatively free draining soils it is considered that any migration of potential contaminants to groundwater from the site is highly unlikely, with any contaminants which may have leached through near surface soils more likely than not readily diluted and dispersed over time. As such the risk to environmental receptors from potential contaminants on the site is considered to be **low**.

10 Conclusions and Recommendations

The Preliminary Site Investigation has revealed that the site is currently utilised as a residential dwelling, with associated ancillary buildings and gardens, a small apple orchard and pastoral land. There is a small orchard, which anecdotal evidence suggests has been sprayed with pesticides, the results of the chemical testing prove that the risk to human health associated with potential contamination in the near surface soils across this part of the site is considered to be **low**. It is also considered highly unlikely that any persistent pesticide has been applied or stored in bulk on the remainder of the site.

The conceptual site model and initial qualitative human health risk assessment presented herein is based upon information gained from historical information including anecdotal evidence, information gained from QLDC and other sources. The conceptual site model along with limited sampling and analysis within the orchard area indicates that historical and current site activities have a low potential risk of having contaminated the areas of the site to undergo subdivision and land use change.

As such it is considered **highly unlikely** that there is a risk to human health should the proposed subdivision, land use change and potential development proposals with associated ground disturbance be undertaken on the site.

As such the requirement to undertake further detailed site investigation works prior to any disturbance of the ground is not considered necessary on the site.

10.1 Recommendations

Based on the results of this investigation, Opus recommends that:

- Any ground disturbance undertaken on the site is considered to be a permitted activity providing that the works undertaken comply with clause 8(3) of the NES. Should volumes in excess of those detailed in clause 8(3) be disturbed on the site a resource consent application may be required as the site as a whole is considered to be HAIL;
- Should any ground conditions be encountered across the site which are not anticipated from the findings of this report a Suitably Qualified and Experienced Practitioner (SQEP) should be consulted in order to reassess the risks to human health;
- This PSI report is included with any Resource Consent application for the proposed development; and
- This Preliminary Site Investigation report is submitted to the regional authority in order to facilitate updating the HAIL database.

11 Applicability and Limitations

This report has been produced on behalf of Richard Newman and no responsibility is accepted to any third party for all or any part. This report should not be relied upon or transferred to any other parties without the express written authorisation of Opus. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors owe them no duty of care or skill. This report should only be reproduced in full.

We have reviewed information across the entire site where subdivision, change of land use and potential development may occur. As such any earthworks outside of the proposed development should be undertaken with due care and should ground conditions other than those anticipated be encountered work should cease and an SQEP consulted to further assess the risks to human health.

This report has been prepared for a specific purpose, as agreed between Opus and the Client. A tailored scope of works has been used to achieve the objectives, and the report should therefore not be used for different objectives.

This report has been prepared by Opus with all reasonable skill and care within the terms of the Contract with the Client, and taking account of the information made available by the Client, as well as the staff and resources devoted to it by agreement with the Client. The findings and opinions conveyed via this report are based on information obtained from a variety of sources, as detailed, which Opus believes are reliable. Nevertheless, Opus cannot and does not guarantee the authenticity or reliability of any information supplied by other parties.

The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry best practice. Due to the inherent variation in spatial and temporal patterns of contamination, the interpretation of site conditions at the specific locations investigated is not a complete description of all material at the site. Should further data be obtained that differs from that presented in this report, then conclusions and recommendations may no longer be valid.

The report is valid at the date of release. The condition of the site may change with time so that the results and interpretation are no longer valid. In addition, guidelines and legislation may change, making assessment of results and recommendations invalid.

Appendix A
Site Layout Plan

Image taken from Mapspast - (LINZ) Airphoto latest 2018

Key

- Approximate site location
- Apple orchard
- Brush/wood pile
- Chicken coop
- Sheep pen
- Existing residential dwelling and assoicated garden
- Pump house
- Vegetable garden
- Bee Hives
- Electricity substation

OPUS	**Project:** 112 McDonnell Road, Arrowtown **Project Number:** 6-XZ374.00 **Client:** Richard Newman	**Appendix A: Site Layout Plan**

Appendix B
Historical Information

QuickMap Title Details

Information last updated as at 27 Nov 2017

COMPUTER FREEHOLD REGISTER
DERIVED FROM LAND INFORMATION NEW ZEALAND

Identifier	**OT14A/295**	**Part-Cancelled**
Land Registration District	**Otago**	
Date Issued	21 November 1991	

Prior References
OT9A/546

Type	Fee Simple
Area	6.6194 hectares more or less
Legal Description	Section 1 Survey Office Plan 23541

Proprietors
McCulloch Trustees 2004 Limited and Ernest John Leslie Guthrie as to a 1/5 share
Banco Trustees Limited, Leanne Kaye Newman and Richard Morris Newman as to a 4/5 share

Subject to Section 11 Crown Minerals Act 1991

Subject to Part IV A Conservation Act 1987

Fencing Covenant in Transfer 792915.8 - 21.11.1991 at 9.35 am

7749359.1 Gazette Notice 2008 page 1534 declaring Section 10 SO Plan 375510 (0.0730ha) to be road vesting in Queenstown Lakes District Council - 13.3.2008 at 9:00 am

7875319.3 Mortgage to Bank of New Zealand - 3.11.2009 at 10:26 am

QuickMap Title Details
Historic Information

Information last updated as at 27 Nov 2017

COMPUTER FREEHOLD REGISTER
DERIVED FROM LAND
INFORMATION NEW ZEALAND

Identifier	**OT14A/295**	**Part-Cancelled**
Land Registration District	**Otago**	
Date Issued	21 November 1991	

Historic Memorials

Subject to Section 11 Crown Minerals Act 1991

Subject to Part IV A Conservation Act 1987

Fencing Covenant in Transfer 792915.8 - 21.11.1991 at 9.35 am

944672.1 Mortgage to Southland Building Society - 10.3.1998 at 2.00 pm

5091768.1 Discharge of Mortgage 944672.1 - 5.10.2001 at 9:22 am

5091768.2 Transfer to Walter John Rutherford and Richard Morris Newman (4/5 share) and Ernest John Leslie Guthrie, Bryan Bruce Collie and Eric John Thomson (1/5 share) - 5.10.2001 at 9:22 am

5091768.3 Mortgage to Bank of New Zealand - 5.10.2001 at 9:22 am

7875319.1 Discharge of Mortgage 5091768.3 - 3.11.2009 at 10:26 am

7749359.1 Gazette Notice 2008 page 1534 declaring Section 10 SO Plan 375510 (0.0730ha) to be road vesting in Queenstown Lakes District Council - 13.3.2008 at 9:00 am

8182085.1 Transfer of a 1/5 share/interest Ernest John Leslie Guthrie, Bryan Bruce Collie and Eric John Thomson to McCulloch Trustees 2004 Limited, Southern Trustees 2005 Limited and Ernest John Leslie Guthrie - 3.6.2009 at 11:41 am

7875319.2 Transfer to Richard Morris Newman and Banco Trustees Limited (4/5 share) and Ernest John Leslie Guthrie, McCulloch Trustees 2004 Limited and Southern Trustees 2005 Limited (1/5 share) - 3.11.2009 at 10:26 am

7875319.3 Mortgage to Bank of New Zealand - 3.11.2009 at 10:26 am

10153370.1 Transfer of a 1/5 share/interest Ernest John Leslie Guthrie, McCulloch Trustees 2004 Limited and Southern Trustees 2005 Limited to Ernest John Leslie Guthrie and McCulloch Trustees 2004 Limited - 13.8.2015 at 5:02 pm

10897529.1 Transfer to Richard Morris Newman, Leanne Kaye Newman and Banco Trustees Limited (4/5 share) and Ernest John Leslie Guthrie and McCulloch Trustees 2004 Limited (1/5 share) - 20.9.2017 at 2:47 pm

Historic Owners

BANCO TRUSTEES LIMITED	**MCCULLOCH TRUSTEES 2004 LIMITED**	**SOUTHERN TRUSTEES 2005 LIMITED**	
BRYAN BRUCE **COLLIE**	ERNEST JOHN LESLIE **GUTHRIE**	KAYE FRANCIS **MACALISTER**	RICHARD MORRIS **NEWMAN**
WALTER JOHN **RUTHERFORD**	ERIC JOHN **THOMSON**		

QuickMap Title Details

Information last updated as at 27 Nov 2017

COMPUTER FREEHOLD REGISTER
DERIVED FROM LAND INFORMATION NEW ZEALAND

Cancelled

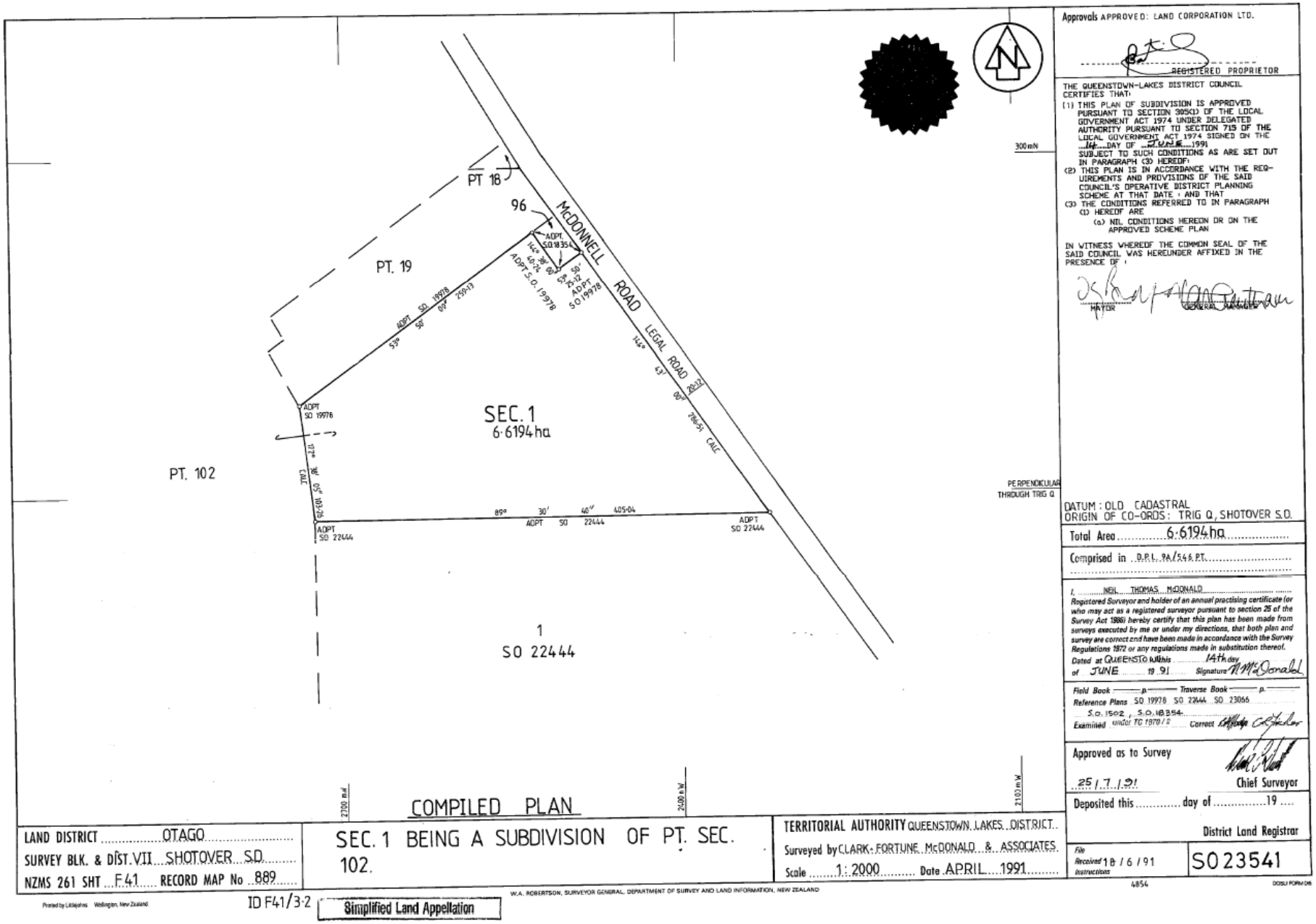
Identifier	**OT9A/546**
Land Registration District	**Otago**
Date Issued	01 January 1870

Prior References

Historic Owners

Issued Titles

OT14A/295 (Part-Cancelled) Section 1 Survey Office Plan 23541



Approvals APPROVED: LAND CORPORATION LTD.

REGISTERED PROPRIETOR

THE QUEENSTOWN-LAKES DISTRICT COUNCIL CERTIFIES THAT:

(1) THIS PLAN OF SUBDIVISION IS APPROVED PURSUANT TO SECTION 305(1) OF THE LOCAL GOVERNMENT ACT 1974 UNDER DELEGATED AUTHORITY PURSUANT TO SECTION 715 OF THE LOCAL GOVERNMENT ACT 1974 SIGNED ON THE 14th DAY OF JUNE 1991 SUBJECT TO SUCH CONDITIONS AS ARE SET OUT IN PARAGRAPH (3) HEREOF:

(2) THIS PLAN IS IN ACCORDANCE WITH THE REQUIREMENTS AND PROVISIONS OF THE SAID COUNCIL'S OPERATIVE DISTRICT PLANNING SCHEME AT THAT DATE : AND THAT

(3) THE CONDITIONS REFERRED TO IN PARAGRAPH (1) HEREOF ARE

(a) NIL CONDITIONS HEREON OR ON THE APPROVED SCHEME PLAN

IN WITNESS WHEREOF THE COMMON SEAL OF THE SAID COUNCIL WAS HEREUNDER AFFIXED IN THE PRESENCE OF :

MAYOR GENERAL MANAGER

DATUM : OLD CADASTRAL
ORIGIN OF CO-ORDS : TRIG Q, SHOTOVER S.D.

Total Area 6·6194ha

Comprised in D.P.L. 9A/546 PT.

I, NEIL THOMAS McDONALD

Registered Surveyor and holder of an annual practising certificate (or who may act as a registered surveyor pursuant to section 25 of the Survey Act 1986) hereby certify that this plan has been made from surveys executed by me or under my directions, that both plan and survey are correct and have been made in accordance with the Survey Regulations 1972 or any regulations made in substitution thereof.

Dated at QUEENSTOWN *this* 14th *day of* JUNE 19 91 *Signature* N McDonald

Field Book — p — Traverse Book — p —

Reference Plans SO 19978 SO 22444 SO 23066 S.O. 1502, S.O. 18354

Examined under TC 1970/8 Correct

Approved as to Survey

25/7/91 Chief Surveyor

Deposited this ..... day of ..... 19 ....

District Land Registrar

File Received 18/6/91 Instructions

SO 23541

Otago Regional Council

13 December 2017

Dear Beth,

Thank you for your enquiry regarding information that the Otago Regional Council may hold regarding potential soil contamination at the properties indicated below:

Address	Valuation Number / Legal Description
112-116 MacDonnell Road	Pt Sec 1 SP 23541

The Otago Regional Council maintains a database of properties where information is held regarding current or past land-uses that have the potential to contaminated land. Land-uses that have the potential to contaminate land are outlined in the Ministry for the Environment's Hazardous Activities and Industries List (HAIL).

Where investigation has been completed, results have been compared to relevant soil guideline values. The database is continually under development, and should not be regarded as a complete record of all properties in Otago. The absence of available information does not necessarily mean that the property is uncontaminated; rather no information exists on the database. You may also wish to examine the property file at the relevant City or District Council to check if there is any evidence that activities occurring on the HAIL have taken place.

I can confirm that:

The above land does not currently appear on the database; however, water permit 2000.107 was issued in 2001 to take water for the purpose of irrigating a 3ha apple orchard and nursery. Orchards and plant nurseries may be associated with persistent pesticide use.

If your enquiry relates to a rural property, please note that many current and past activities undertaken on farms may not be listed on the database, as they can be more difficult to identify. Activities such as use, storage, formulation, and disposal of pesticides, offal pits, landfills, animal dips, and fuel tanks have the potential to contaminated land.

Similarly, the long-term use of lead-based paints on buildings can, in some cases, cases cause soil contamination. The use of lead-based paint is generally not recorded on the database.

Please feel free to contact me if you have any other enquires, or you would like to discuss the matter further,

Regards,

Simon Beardmore
Senior Environmental Officer

The enclosed/attached information is derived from the Otago Regional contaminated land register and is being disclosed to you pursuant to the Local Government Official Information and Meetings Act 1987. This information reflects the Otago Regional Council's current understanding of this site, which is based solely on the information obtained by the Council and held on record. It is disclosed only as a copy of those records and is not intended to provide a full, complete or entirely accurate assessment of the site. Accordingly, the Otago Regional Council is not in a position to warrant that the information is complete or without error and accepts no liability for any

Otago Regional Council

COUNTERPART

Consent No: 2000.107

WATER PERMIT

Pursuant to Section 105 of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: [~~H A Macalister~~] *transferred 5/10/2001*
Walter John Rutherford and Richard Morris Newman being Trustees of the Newman Trust and Ernest John Leslie Guthrie, Bryan Bruce Collie and Eric John Thomson being Trustees of the Bendemeer Trust

Address: [~~McDonnell Road, R.D 1, Queenstown~~]
C/- Macalister Todd Phillips Bodkins Solicitors, 18 Limerick Street, Alexandra

to take 28,800 litres of water per day from a bore

for the purpose of irrigation.

for a term expiring 30 May 2026

Location of activity: McDonnell Road Arrowtown

Legal description of land adjacent to point of abstraction: Section 1 Block 7 Shotover Survey District

Map reference: NZMS 260 F41:813-759

Conditions:

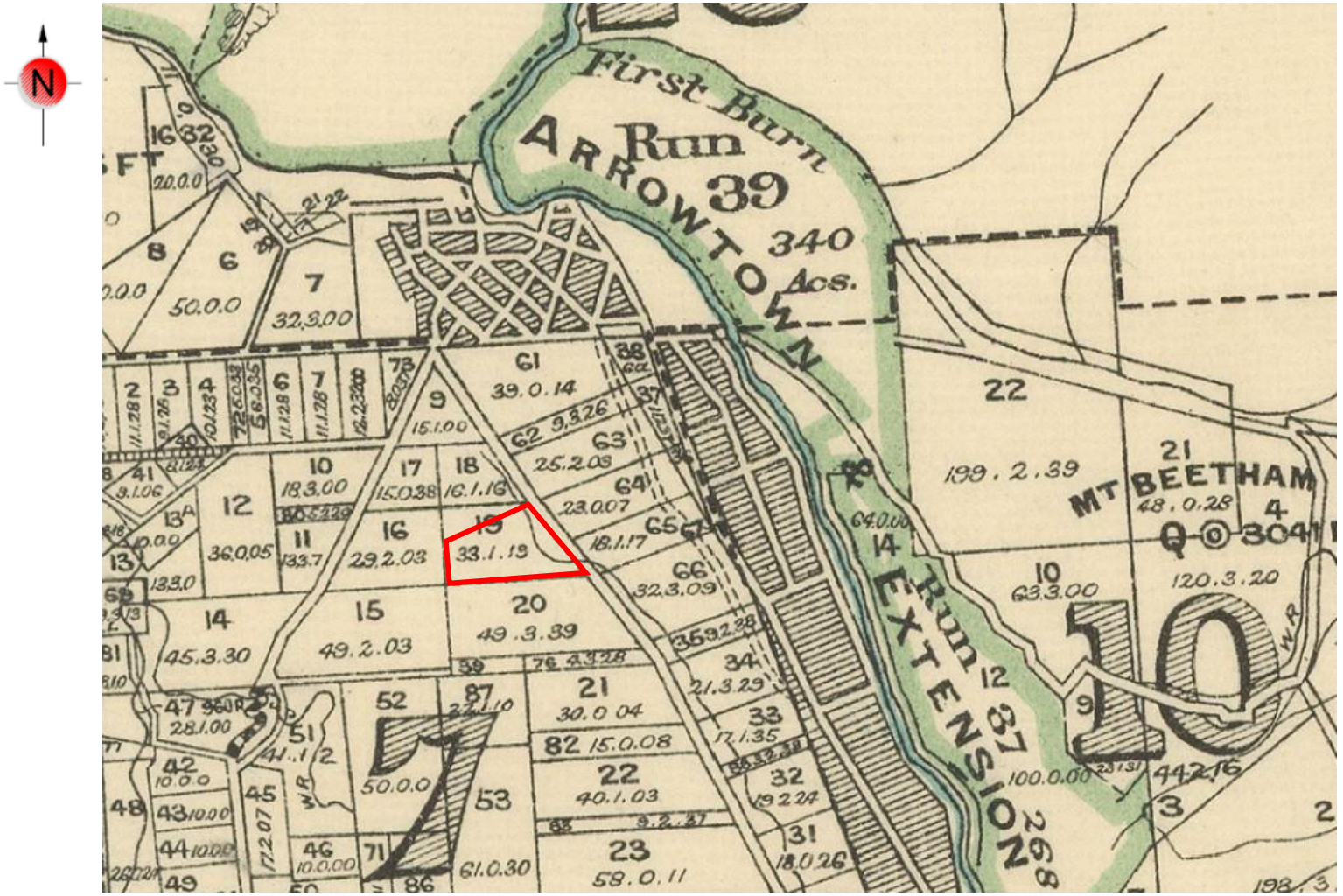
1) The abstraction shall not exceed
   (a) 28,800 litres of water per day.
   (b) 1.5 litres per second

Issued at Dunedin this 8th day of June 2001
Reissued at Dunedin this 6th day of March 2002 to reflect transfer of holder.

M E Weaver
Manager Consents
j. e. \\shadow\typist5\s11\@macalister p.doc

Mission Statement: "To promote the sustainable management of the region's resources"
70 Stafford Street, Private Bag, Dunedin. Telephone (03) 474-0827. Facsimile (03) 479-0015

WORKING FOR YOU & YOUR ENVIRONMENT



Opus International Consultants Ltd
P +64 3 440 2400
Alexandra Office
Tarbert Buildings, 69 Tarbert Street
PO Box 273, Alexandra 9340
New Zealand

Project:	112 McDonnell Road, Arrowtown
Project No.:	6-XZ374.00
Client:	Richard Newman

Appendix B

1929 Topographical Map
(Courtesy of Maps Past)

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PO Box 273, Alexandra 9340
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Project No.:	6-XZ374.00
Client:	Richard Newman

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1959 Aerial Photograph
(Courtesy of Retrolens)

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Project No.:	6-XZ374.00
Client:	Richard Newman

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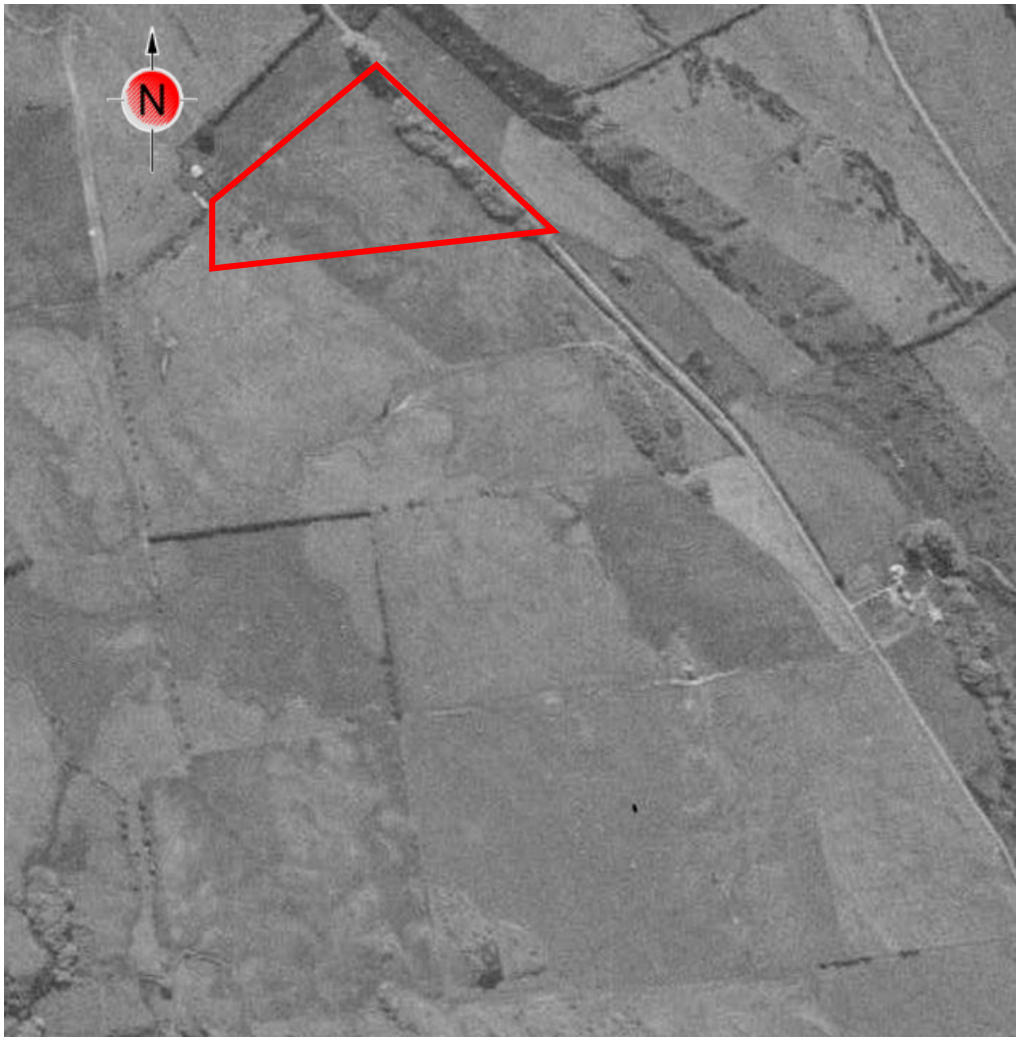
1960 Aerial Photograph
(Courtesy of Retrolens)



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Project:	112 McDonnell Road, Arrowtown
Project No.:	6-XZ374.00
Client:	Richard Newman

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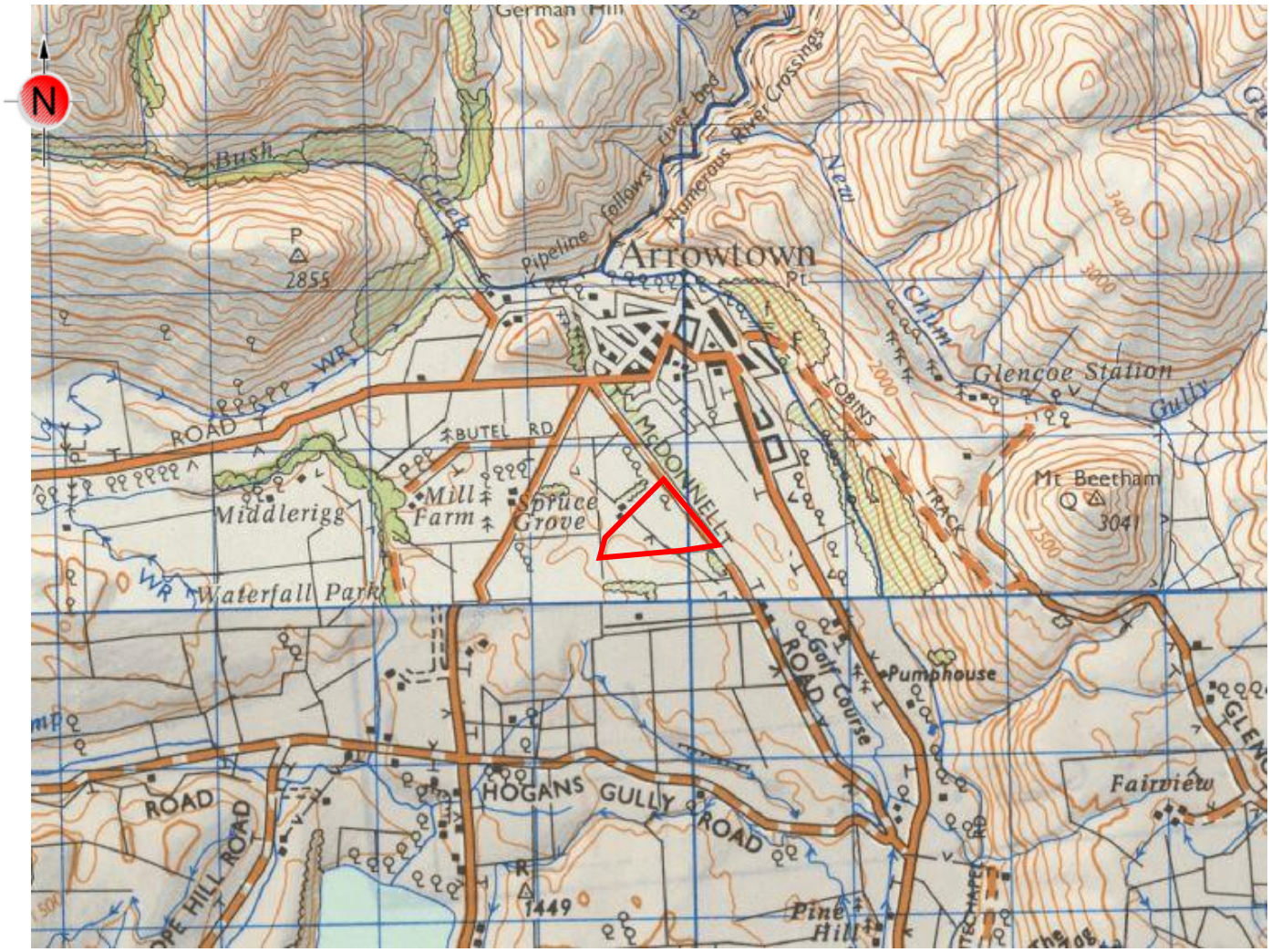
1966 Aerial Photograph
(Courtesy of Retrolens)



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New Zealand

Project:	112 McDonnell Road, Arrowtown
Project No.:	6-XZ374.00
Client:	Richard Newman

Appendix B

1979 Topographical Map
(Courtesy of Maps Past)

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New Zealand

Project:	112 McDonnell Road, Arrowtown
Project No.:	6-XZ374.00
Client:	Richard Newman

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1983 Aerial Photograph
(Courtesy of Retrolens)

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PO Box 273, Alexandra 9340
New Zealand

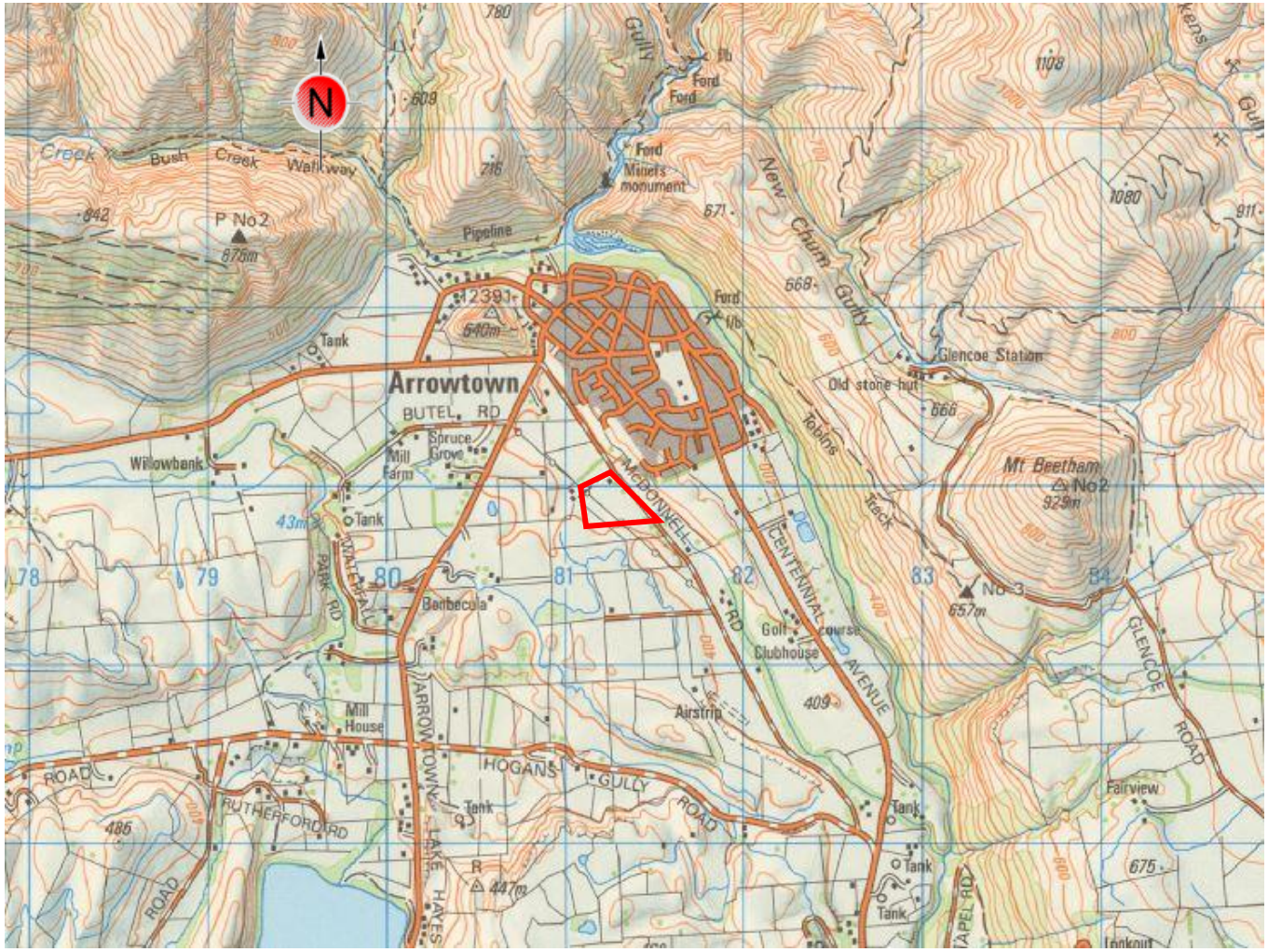
Project: 112 McDonnell Road, Arrowtown

Project No.: 6-XZ374.00

Client: Richard Newman

Appendix B

1984 Aerial Photograph
(Courtesy of Retrolens)



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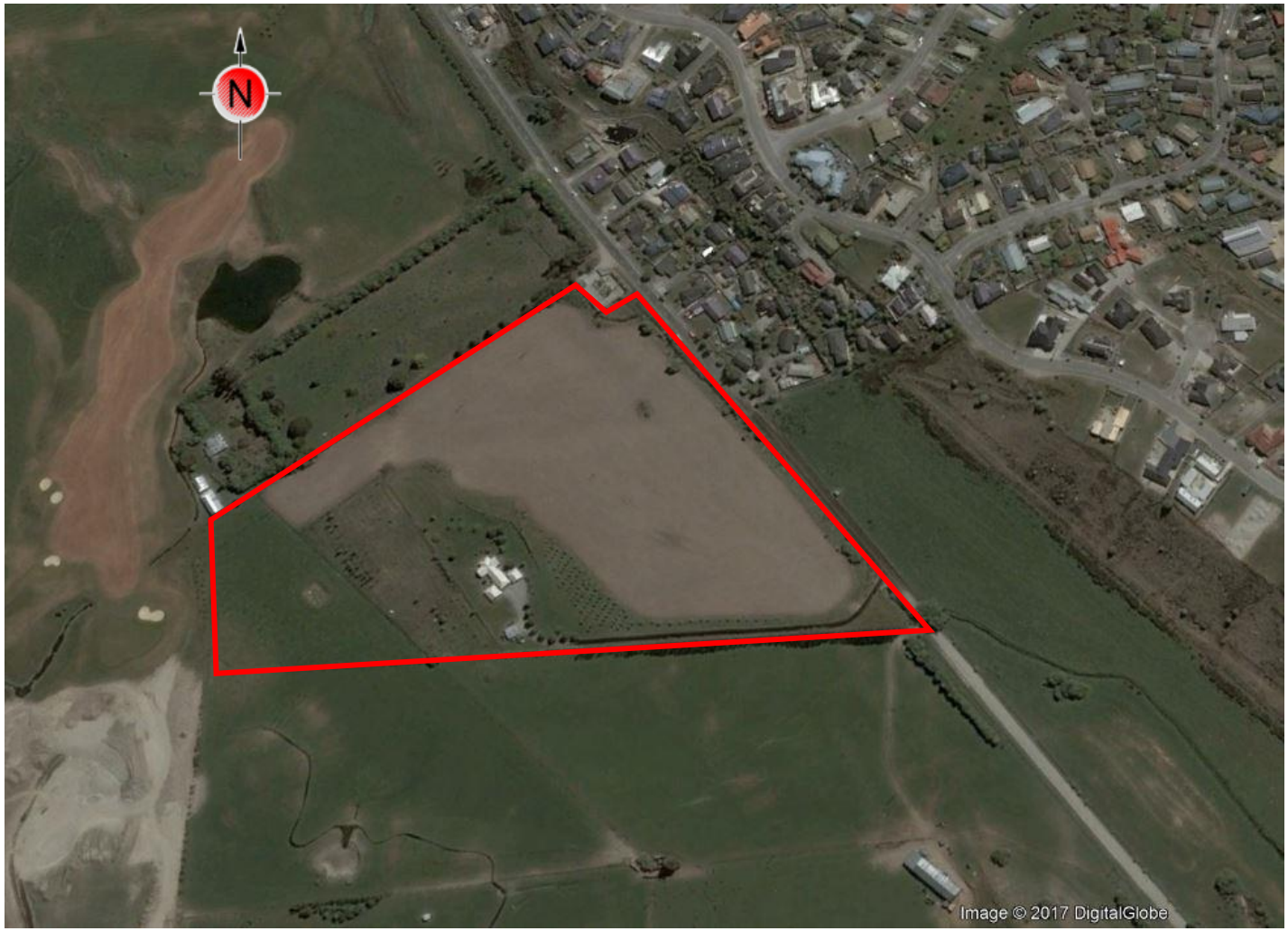
PO Box 273, Alexandra 9340
New Zealand

Project:	112 McDonnell Road, Arrowtown
Project No.:	6-XZ374.00
Client:	Richard Newman

Appendix B

1999 Topographical Map
(Courtesy of Maps Past)



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New Zealand

Project:	112 McDonnell Road, Arrowtown
Project No.:	6-XZ374.00
Client:	Richard Newman

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2004 Arial Photo
(Courtesy of Google Earth)

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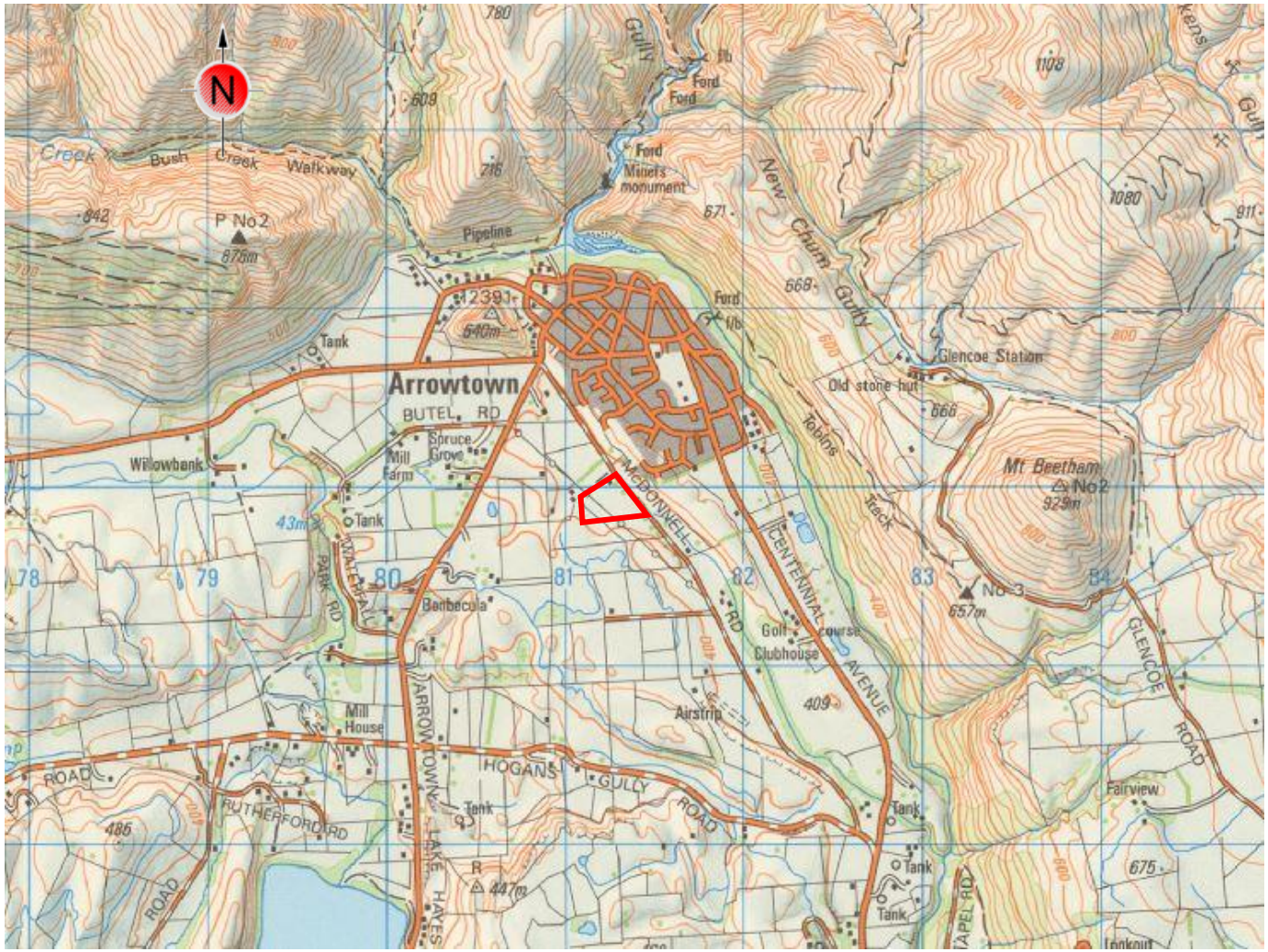
PO Box 273, Alexandra 9340
New Zealand

Project:	112 McDonnell Road, Arrowtown
Project No.:	6-XZ374.00
Client:	Richard Newman

Appendix B

2006 Arial Photo
(Courtesy of Google Earth)



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Alexandra Office
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PO Box 273, Alexandra 9340
New Zealand

Project:	112 McDonnell Road, Arrowtown
Project No.:	6-XZ374.00
Client:	Richard Newman

Appendix B

2009 Topographical Map
(Courtesy of Maps Past)

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Project No.:	6-XZ374.00
Client:	Richard Newman

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2010 Aerial Photo
(Courtesy of Google Earth)

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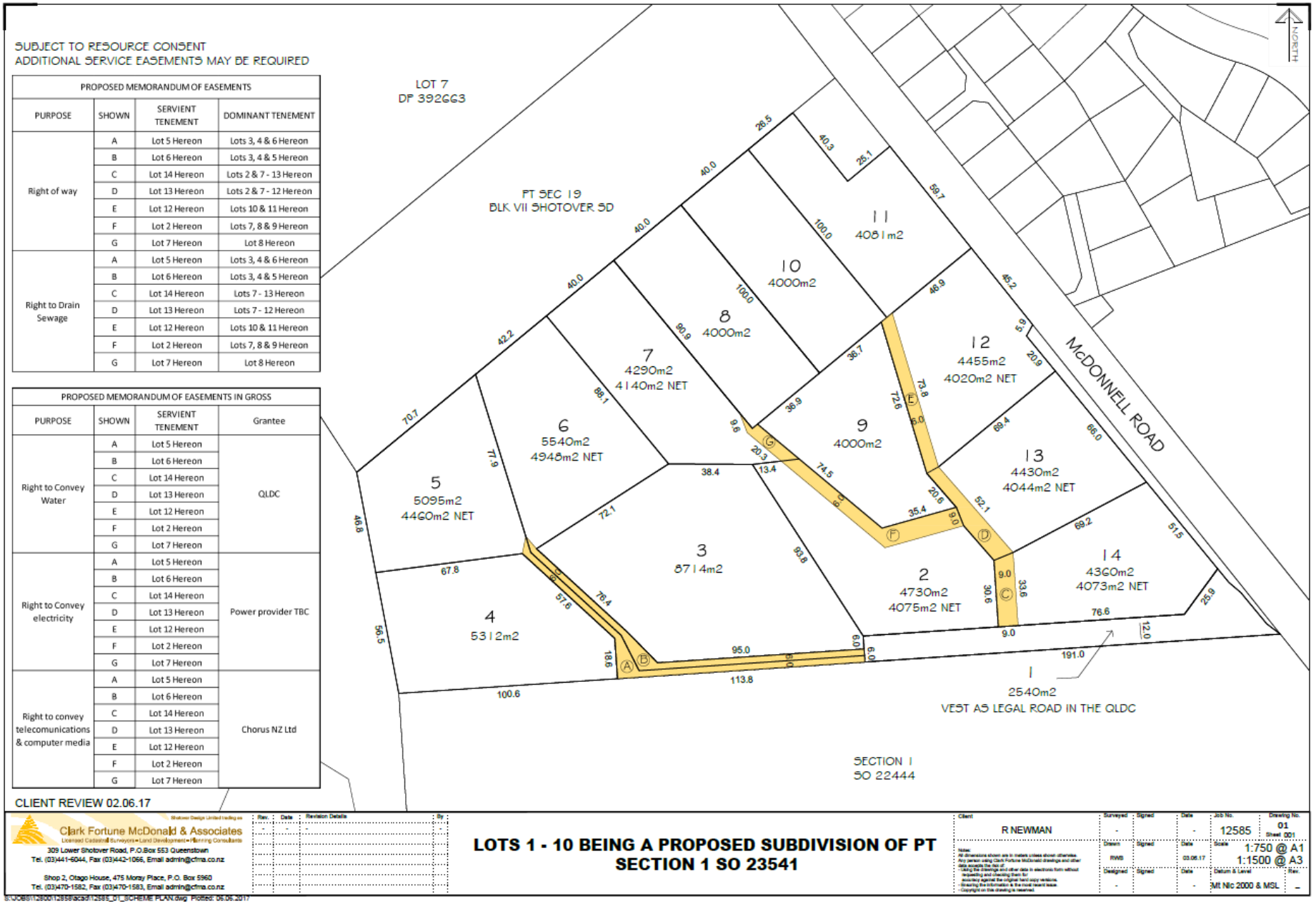
New Zealand

Project:	112 McDonnell Road, Arrowtown
Project No.:	6-XZ374.00
Client:	Richard Newman

Appendix B

2015 Aerial Photo
(Courtesy of Google Earth)

Appendix C
Proposed Development Plans

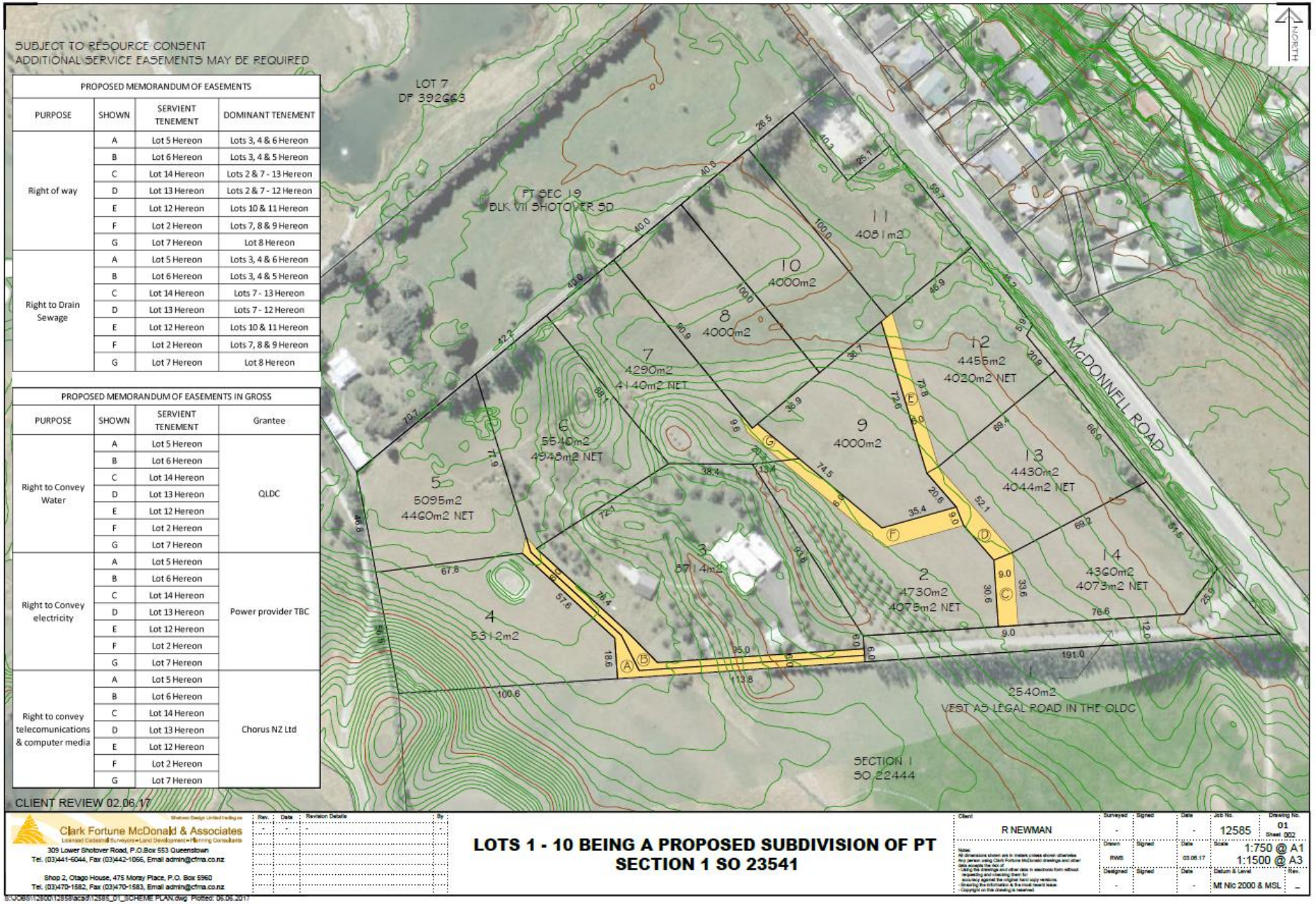


PROPOSED MEMORANDUM OF EASEMENTS

PURPOSE	SHOWN	SERVIENT TENEMENT	DOMINANT TENEMENT
Right of way	A	Lot 5 Hereon	Lots 3, 4 & 6 Hereon
	B	Lot 6 Hereon	Lots 3, 4 & 5 Hereon
	C	Lot 14 Hereon	Lots 2 & 7 - 13 Hereon
	D	Lot 13 Hereon	Lots 2 & 7 - 12 Hereon
	E	Lot 12 Hereon	Lots 10 & 11 Hereon
	F	Lot 2 Hereon	Lots 7, 8 & 9 Hereon
	G	Lot 7 Hereon	Lot 8 Hereon
Right to Drain Sewage	A	Lot 5 Hereon	Lots 3, 4 & 6 Hereon
	B	Lot 6 Hereon	Lots 3, 4 & 5 Hereon
	C	Lot 14 Hereon	Lots 7 - 13 Hereon
	D	Lot 13 Hereon	Lots 7 - 12 Hereon
	E	Lot 12 Hereon	Lots 10 & 11 Hereon
	F	Lot 2 Hereon	Lots 7, 8 & 9 Hereon
	G	Lot 7 Hereon	Lot 8 Hereon

PROPOSED MEMORANDUM OF EASEMENTS IN GROSS

PURPOSE	SHOWN	SERVIENT TENEMENT	Grantee
Right to Convey Water	A	Lot 5 Hereon	QLDC
	B	Lot 6 Hereon	
	C	Lot 14 Hereon	
	D	Lot 13 Hereon	
	E	Lot 12 Hereon	
	F	Lot 2 Hereon	
	G	Lot 7 Hereon	
Right to Convey electricity	A	Lot 5 Hereon	Power provider TBC
	B	Lot 6 Hereon	
	C	Lot 14 Hereon	
	D	Lot 13 Hereon	
	E	Lot 12 Hereon	
	F	Lot 2 Hereon	
	G	Lot 7 Hereon	
Right to convey telecomunications & computer media	A	Lot 5 Hereon	Chorus NZ Ltd
	B	Lot 6 Hereon	
	C	Lot 14 Hereon	
	D	Lot 13 Hereon	
	E	Lot 12 Hereon	
	F	Lot 2 Hereon	
	G	Lot 7 Hereon	



PROPOSED MEMORANDUM OF EASEMENTS

PURPOSE	SHOWN	SERVIENT TENEMENT	DOMINANT TENEMENT
Right of way	A	Lot 5 Hereon	Lots 3, 4 & 6 Hereon
	B	Lot 6 Hereon	Lots 3, 4 & 5 Hereon
	C	Lot 14 Hereon	Lots 2 & 7 - 13 Hereon
	D	Lot 13 Hereon	Lots 2 & 7 - 12 Hereon
	E	Lot 12 Hereon	Lots 10 & 11 Hereon
	F	Lot 2 Hereon	Lots 7, 8 & 9 Hereon
	G	Lot 7 Hereon	Lot 8 Hereon
Right to Drain Sewage	A	Lot 5 Hereon	Lots 3, 4 & 6 Hereon
	B	Lot 6 Hereon	Lots 3, 4 & 5 Hereon
	C	Lot 14 Hereon	Lots 7 - 13 Hereon
	D	Lot 13 Hereon	Lots 7 - 12 Hereon
	E	Lot 12 Hereon	Lots 10 & 11 Hereon
	F	Lot 2 Hereon	Lots 7, 8 & 9 Hereon
	G	Lot 7 Hereon	Lot 8 Hereon

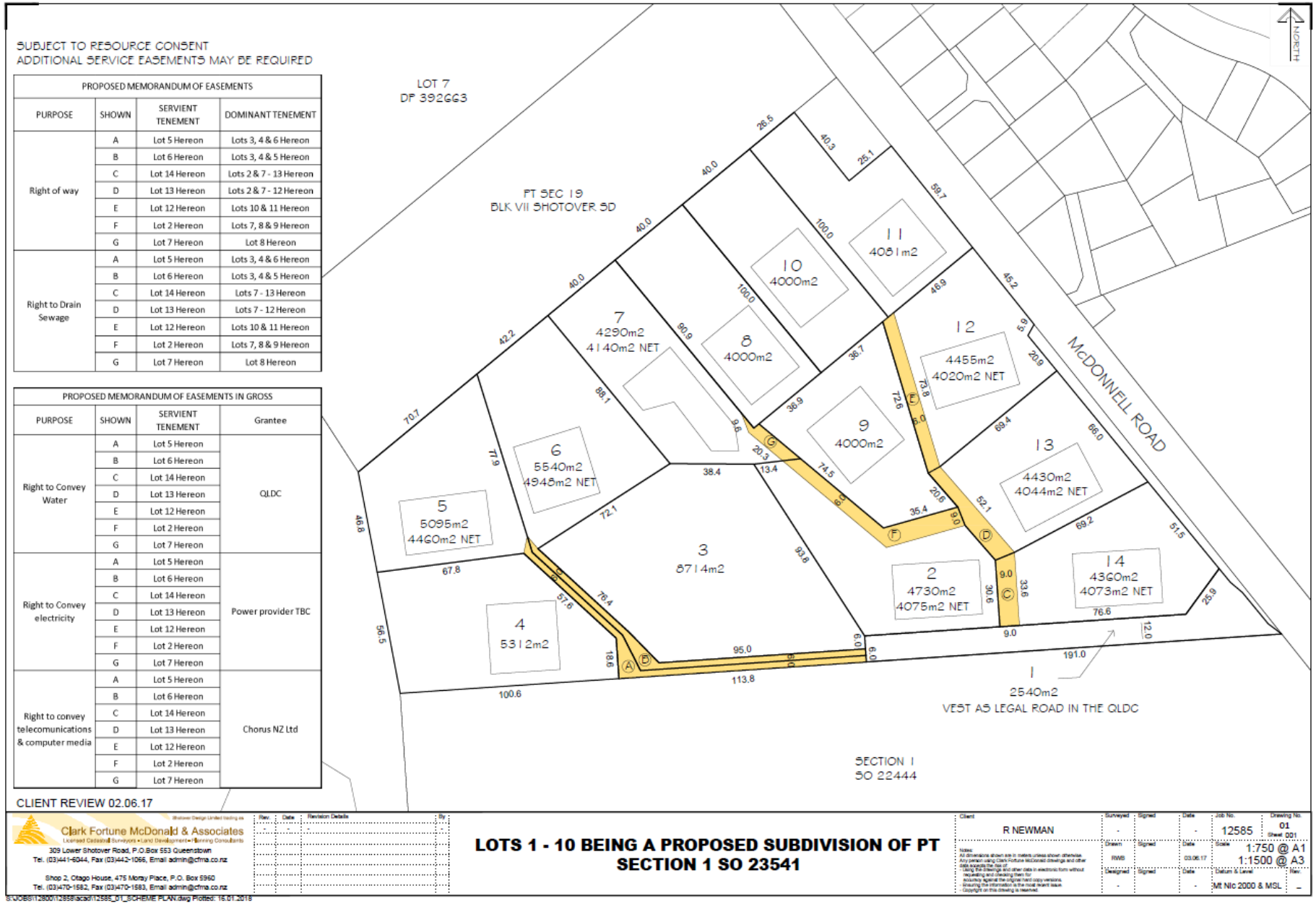
PROPOSED MEMORANDUM OF EASEMENTS IN GROSS

PURPOSE	SHOWN	SERVIENT TENEMENT	Grantee
Right to Convey Water	A	Lot 5 Hereon	QLDC
	B	Lot 6 Hereon	
	C	Lot 14 Hereon	
	D	Lot 13 Hereon	
	E	Lot 12 Hereon	
	F	Lot 2 Hereon	
	G	Lot 7 Hereon	
Right to Convey electricity	A	Lot 5 Hereon	Power provider TBC
	B	Lot 6 Hereon	
	C	Lot 14 Hereon	
	D	Lot 13 Hereon	
	E	Lot 12 Hereon	
	F	Lot 2 Hereon	
	G	Lot 7 Hereon	
Right to convey telecomunications & computer media	A	Lot 5 Hereon	Chorus NZ Ltd
	B	Lot 6 Hereon	
	C	Lot 14 Hereon	
	D	Lot 13 Hereon	
	E	Lot 12 Hereon	
	F	Lot 2 Hereon	
	G	Lot 7 Hereon	

Clark Fortune McDonald & Associates
Licensed Cadastral Surveyors • Land Development • Planning Consultants
309 Lower Shotover Road, P.O.Box 553 Queenstown
Tel. (03)441-6044, Fax (03)442-1066, Email admin@cfma.co.nz
Shop 2, Otago House, 475 Moray Place, P.O. Box 5960
Tel. (03)470-1582, Fax (03)470-1583, Email admin@cfma.co.nz

LOTS 1 - 10 BEING A PROPOSED SUBDIVISION OF PT SECTION 1 SO 23541

Client: R NEWMAN
Job No. 12585
Drawing No. 01 Sheet 002
Scale 1:750 @ A1, 1:1500 @ A3
Datum & Level: Mt Nic 2000 & MSL



PROPOSED MEMORANDUM OF EASEMENTS

PURPOSE	SHOWN	SERVIENT TENEMENT	DOMINANT TENEMENT
Right of way	A	Lot 5 Hereon	Lots 3, 4 & 6 Hereon
	B	Lot 6 Hereon	Lots 3, 4 & 5 Hereon
	C	Lot 14 Hereon	Lots 2 & 7 - 13 Hereon
	D	Lot 13 Hereon	Lots 2 & 7 - 12 Hereon
	E	Lot 12 Hereon	Lots 10 & 11 Hereon
	F	Lot 2 Hereon	Lots 7, 8 & 9 Hereon
	G	Lot 7 Hereon	Lot 8 Hereon
Right to Drain Sewage	A	Lot 5 Hereon	Lots 3, 4 & 6 Hereon
	B	Lot 6 Hereon	Lots 3, 4 & 5 Hereon
	C	Lot 14 Hereon	Lots 7 - 13 Hereon
	D	Lot 13 Hereon	Lots 7 - 12 Hereon
	E	Lot 12 Hereon	Lots 10 & 11 Hereon
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PROPOSED MEMORANDUM OF EASEMENTS IN GROSS

PURPOSE	SHOWN	SERVIENT TENEMENT	Grantee
Right to Convey Water	A	Lot 5 Hereon	QLDC
	B	Lot 6 Hereon	
	C	Lot 14 Hereon	
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	F	Lot 2 Hereon	
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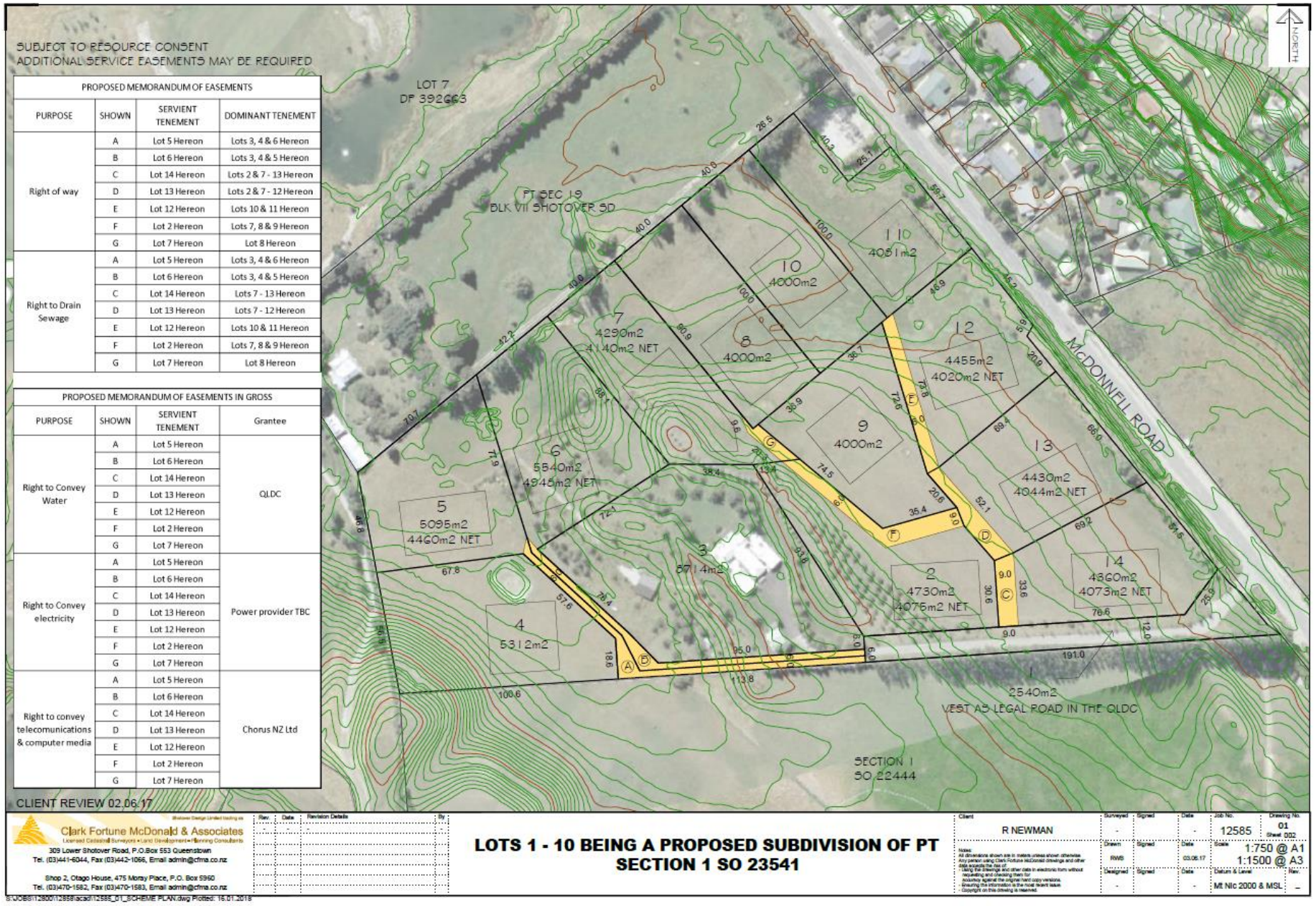
	B	Lot 6 Hereon	
	C	Lot 14 Hereon	
	D	Lot 13 Hereon	
	E	Lot 12 Hereon	
	F	Lot 2 Hereon	
	G	Lot 7 Hereon	



Appendix D
Site Photographs

Plate 1: View north-west looking across the far western part of the site.

Plate 2: View east along the northern site boundary.

Plate 3: View south along the eastern site boundary (McDonnell Road).

Plate 4: View east along southern site boundary.

Plate 5: electricity substation located adjacent to the north-eastern corner of the site.

Plate 6: View of the large eastern paddock.

Plate 7: View of the pumping house located in the eastern paddock.

Plate 8: View west overlooking a pile of brush, wood and garden waste.

Plate 9: Pile of waste in an area that has been previously used for burning.

Plate 10: The chicken coop and run.

Plate 11: A large shed within the sheep pen, the area was well used as a wood store.

Plate 12: The small apple orchard.

Plate 13: Unused spray equipment.

Plate 14: Beehives.

Plate 15: Greenhouse and garage

Appendix E – Sampling Location Plan

PSI Report: 112 McDonnel Road, Arrowtown

Image taken from Mapspast - (LINZ) Airphoto latest 2018

Key

Approximate site location

S1 Approximate sample locations

OPUS	**Project:** 112 McDonnell Road, Arrowtown **Project Number:** 6-XZ374.00 **Client:** Richard Newman	**Appendix E: Sampling Location Plan**

Appendix F – Hill Laboratories CoC and Results

Hill Laboratories
TRIED, TESTED AND TRUSTED
R J Hill Laboratories Limited
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Hamilton 3240 New Zealand
T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

ANALYSIS REPORT

Client:	Opus International Consultants Limited	Lab No:	1898709	SPv1
Contact:	Elizabeth Hannon	Date Received:	19-Dec-2017	
	C/- Opus International Consultants Limited	Date Reported:	04-Jan-2018	
	PO Box 273	Quote No:	82748	
	Alexandra 9340	Order No:		
		Client Reference:	6-XZ374.00	
		Submitted By:	Elizabeth Hannon	

Sample Type: Soil						
Sample Name:		S1 @ 0.2 18-Dec-2017	S2 @ 0.25 18-Dec-2017	S3 @ 0.2 18-Dec-2017		
Lab Number:		1898709.1	1898709.2	1898709.3		
Individual Tests						
Dry Matter	g/100g as rcvd	96	94	94	-	-
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	9	9	10	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	-
Total Recoverable Chromium	mg/kg dry wt	6	7	9	-	-
Total Recoverable Copper	mg/kg dry wt	10	10	11	-	-
Total Recoverable Lead	mg/kg dry wt	15.5	15.3	19.2	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	-
Total Recoverable Nickel	mg/kg dry wt	7	8	8	-	-
Total Recoverable Zinc	mg/kg dry wt	32	35	41	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
alpha-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
beta-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
delta-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
cis-Chlordane	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
trans-Chlordane	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
2,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
4,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
2,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
4,4'-DDE	mg/kg dry wt	0.043	0.051	0.100	-	-
2,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
4,4'-DDT	mg/kg dry wt	0.020	0.016	0.032	-	-
Total DDT Isomers	mg/kg dry wt	0.06	0.07	0.13	-	-
Dieldrin	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Endosulfan I	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Endosulfan II	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Endrin	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Endrin aldehyde	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Endrin ketone	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Heptachlor	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Methoxychlor	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-

IANZ ACCREDITED LABORATORY

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

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-3
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082). Tested on as recieved sample	0.010 - 0.06 mg/kg dry wt	2
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082).. Tested on as recieved sample	0.010 - 0.06 mg/kg dry wt	1, 3
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-3

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

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