Appendix 'H'

Soil Contamination Assessment

Project Number: 6-XZ371.00

269 Dunstan Road, Alexandra

Detailed Site Investigation Report
Molyneux Lifestyle Village Ltd

11 December 2020

wsp

150 YEARS IN AOTEAROA

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Revision Details

Revision	Details
1	Amended to reflect new development proposals and availability of background concentrations

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Executive Summary

Molyneux Lifestyle Village Ltd (herein referred to as 'the Client') commissioned Opus International Consultants Ltd (Opus) to undertake a Detailed Site Investigation (DSI) for a piece of land located at 269 Dunstan Road (herein referred to as 'the site'). The site is proposed to be subdivided with land use change and ground disturbance.

Prior to this commission CPG had undertaken a Preliminary Site Investigation (PSI) with preliminary sampling and analysis of the property in order to give an indication of the risks to human health and the environment. The findings of the PSI indicated that the site investigated, which constitutes part of the subject site, is currently suitable for rural residential living, inclusive of consumption of up to 25% of dietary produce from produce grown on site with respect to NES SGVs.

This DSI assessment has been undertaken to further investigate the remainder of the site and to supplement and confirm the existing CPG report findings; subsequently addressing the requirements of Central Otago District Council (CODC) for a Land Use Change in accordance with the provisions of the National Environmental Standards (NES) regarding subdivision of potentially contaminated land.

A Detailed Site Investigation programme was undertaken on 7th and 10th June 2017, by an Opus SQEP. Soils samples were taken from near surface soils to depths of up to 300mm. Sample locations were determined by the SQEP prior to commencement of site works and were located randomly within a grid basis to cover all areas of the site, filling in gaps of analytical data gained from the PSI. The results of both the PSI investigation and the subsequent DSI are included within this report.

Thirty five samples of soil were taken as part of this investigation, with samples from within the vineyard composited on a 2:1 basis for analysis, along with four samples from previous investigations.

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. Chemical analysis results have revealed no elevated concentrations of heavy metals, PAH's, MAH's and pesticides within the near surface soil sampled. In addition, with the exception of C10 – C14 within one sample, TPH's were not encountered in elevated concentrations across the remainder of the site. It should be noted that this result was not unexpected as S19 was collected at 0.20m bgl in an area situated directly below the above ground fuel tank located on the site. A landfill/waste disposal pit was noted on the eastern side of the site which will require remedial measures should development of this area be undertaken. The remaining site area is considered suitable for rural residential purposes. As such, it is considered highly unlikely that there is a risk to human health should the proposed residential activity be undertaken on the proposed residential subdivisions of the site.

Remedial options for the fuel tank area include doing nothing if the land use in the vicinity of the above ground fuel tank is to remain unchanged and localised site stripping with associated validation testing if there is a proposed land use change and ground disturbance within the vicinity of the fuel tank. The merits of each option are discussed in more detail within the conclusion of this report.

1 Introduction

Molyneux Lifestyle Village Ltd (herein referred to as 'the Client') commissioned Opus International Consultants Ltd (Opus) to undertake a Detailed Site Investigation (DSI) for a piece of land located at 269 Dunstan Road (herein referred to as 'the site').Since that commission the plans for the development site have changed and this report, completed by WSP New Zealand Ltd, includes the amendments for the proposed site layout. The Site is proposed to be subdivided with a land use change and ground disturbance providing the development with residential living in a rural setting.

Prior to this commission CPG had undertaken a Preliminary Site Investigation (PSI) (Job number: 705652 16 April 2012) with preliminary sampling and analysis of the property in order to give an indication of the risks to human health and the environment. The CPG report did not investigate the whole of the site; their report only investigated the southern quadrant an area used to dispose of winery wastewater (herein referred to as 'the CPG site). The findings of the PSI indicated that the portion of the site investigated is currently suitable for rural residential living, inclusive of consumption of up to 25% of dietary produce from produce grown on site with respect to NES SCVs.

This DSI assessment has been undertaken to further investigate the remainder of the site and to supplement and confirm the existing CPG report findings in order to address the requirements of Central Otago District Council (CODC) for a Land Use Change in accordance with the provisions of the National Environmental Standards (NES) regarding subdivision of potentially contaminated land.

1.1 Objectives

This report has been prepared in order to assess the potential for ground contamination across the site and to supplement and confirm the existing CPG report findings. The presence of vineyard activities on site indicates that the site is considered to be within the remit of the National Environmental Standards (2011), Appendix C – Hazardous Activities and Industries List (HAIL) namely:

A10: Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds.

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, particularly within the surrounds of the proposed development area;
- Assess whether further assessment or action is required with respect to the risks assessed;
- Determine the likely impact upon sensitive receptors including site users, occupiers and construction workers on site; and
- Provide recommendations where appropriate.

1.2 Scope of Work

In order to achieve the objectives set out above the following scope of works was undertaken:

- Review of all Preliminary Site Investigation data and findings;

- A site investigation comprising near surface soil sampling in order to provide additional information regarding the soil chemistry with respect to heavy metals, pesticides, and hydrocarbon concentrations at the site;
- Characterisation of the soils taking in to consideration the findings of nearby investigations to determine the risk to human health and the environment.
- Characterisation of the site in line with NES guidance.

2 Previous Investigation Summary

In May 2012 CPG carried out a PSI on 4.5 hectares of land at 269 Dunstan Road, Alexandra on behalf of SBS Bank in order to determine whether contaminants were present at levels high enough to warrant further action subject to being suitable for subdivision. The investigation carried out by CPG relates to the southern quadrant of the site being investigated in this DSI. A summary of the report corresponding to this investigation is given below.

2.1 Background Information

Located at 269 Dunstan Road, Alexandra the CPG site is listed on Central Otago District Council files under identifiers OT5B/1024 and OT5B/1025 and is zoned rural residential.

The land was first leased to William Hill Grant in 1960, and has been occupied and managed by the Grant family to the present day. A winery has been run on part of the land adjacent to the CPG site since 1973, the CPG site itself has not seen significant use during this time. For a period, the cultivation of asparagus, was trialled before being discontinued. Intermittently, sheep have been allowed to graze on the land. Since 2003 the site has been used to discharge winery wastewater (ORC consent 2003.384) and to dispose of grape peels and seeds.

Due to a past land use for waste disposal activities, the site may be interpreted to be a HAIL site (Hazardous Activities and Industries List site). As the waste that has been recently disposed to land at the site is a product of agricultural activity, potential contaminants are similar to that which might be anticipated from historical agricultural activities, i.e. pesticides, heavy metals and impurities that might be present in certain soils. Whilst there is some potential for the disposal of winery wastewater to land to cause contamination, the probability of this is low as the waste generated by the winery is primarily constituted of materials that are intended for human consumption. Additionally strong corrosive cleaning agents are reportedly not used.

Furthermore, the site has only been very marginally and sporadically cultivated, thus the present and recent potential for agrichemical accumulation and persistence is low. While grapes are grown on adjacent land, a few rows of which overlap onto the site boundary, it was noted that the grape growing operation is GrowSafe certified. GrowSafe is a scheme that trains people to apply agrichemicals in a safe, responsible and effective way with minimal adverse impact on human, environmental and animal health.

The ground surface at the CPG site and its immediate surroundings is flat. The area on which the CPG site is situated overlies a geological basement that is primarily composed of a schist/Tertiary mudstone that is overlain by sandy gravels and mixed glacial and alluvial deposits.

There is no surface water at the site; the site is close to the Clutha River, which lies just on the other side of the golf course that is immediately opposite the CPG site, across Dunstan Road to the west. Rainfall averages 350 mm/year, much of which reaches the Dunstan Flat sub-aquifer underling the site, depth to groundwater is highly variable, and most likely to be 1-3m.

2.2 CPG Results and Recommendations

Four samples were taken and then combined prior to testing as a composite sample for heavy metals and pesticide residues. Due to the use of composite sampling the soil guideline values (SGV) are divided by the number of samples composited resulting in adjusted soil guideline values (ASGV). The analysis of the composite sample resulted in all determinands being below the ASGV apart from an arsenic concentration of 7mg/kg which was higher than the ASGV of 4.3 mg/kg resulting in a technical exceedance for arsenic.

As such further investigation was warranted and the four individual samples were individually tested for arsenic, in order to determine any individual exceedances above the SGV. The results categorically confirmed that the arsenic concentrations in all of the samples tested were well

below the SGV of 17mg/kg as the highest result was 8mg/kg in Sub-sample 2, as such there were no exceedances of the SGV across the CPG site tested. CPG determined that the levels of arsenic detected are noted to probably arise due to a slightly elevated baseline value originating from the weathered schists found throughout the area.

In summary there was no evidence of HAIL activity or previous investigations and as no contaminants were found at levels above SGVs, and by this criterion the CPG site is not deemed to be contaminated. As such the PSI report concluded that the CPG site is currently suitable for rural residential living, inclusive of consumption of up to 25% of dietary produce from produce grown on site with respect to NES SGVs.

Based on the results obtained in this investigation CGP recommended that this report be provided to the Otago Regional Council with a request for a status update reflecting that the CPG site has been investigated with regards to being a potential HAIL site, with a negative result.

3 Site Identification and Description

3.1 Location and Description

The site is located at 269 Dunstan Road, Alexandra, as shown on the Site Location Plan in Figure 1.

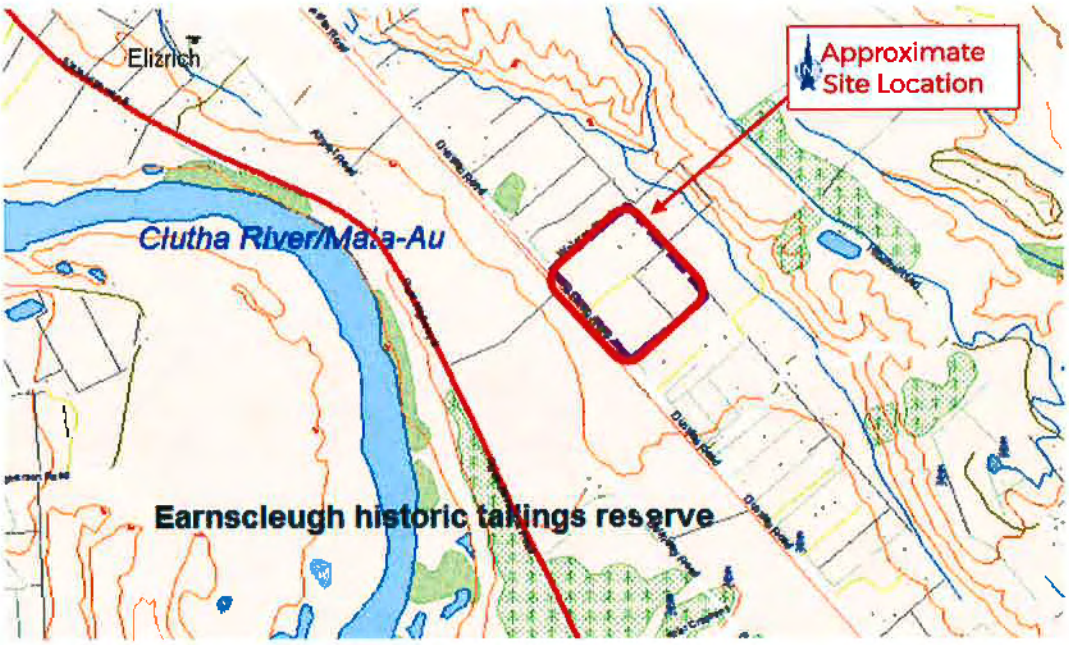


Figure 1: Site Location Plan

The site comprises four land parcels legally described as

- Pt Lot 13 Deposited plan 3194 (Certificate of Title OT5B/1137) ~4.05ha. Owned by William Hill Holdings Limited.
- Pt Lot 13 Deposited plan 3194 (Certificate of Title OT5B/1138) ~4.25ha. Owned by William Hill Holdings Limited.
- Pt Lot 12 Deposited plan 3194 (Certificate of Title OT5B/1024) ~4.17ha. Owned by David James Grant.
- Pt Lot 12 Deposited plan 3194 (Certificate of Title OT5B/1025) ~4.06ha. Owned by William Hill Holdings Limited.

The site has a total approximate area of 16.5ha.

Adjacent land uses to the site generally comprise rural residential land, lifestyle blocks with Dunstan Road immediately bounding the west of the site. At its closest point the site is located 550m east of the Clutha River.

Details of the land surrounding the site are shown on the Quickmap plan in Figure 2.

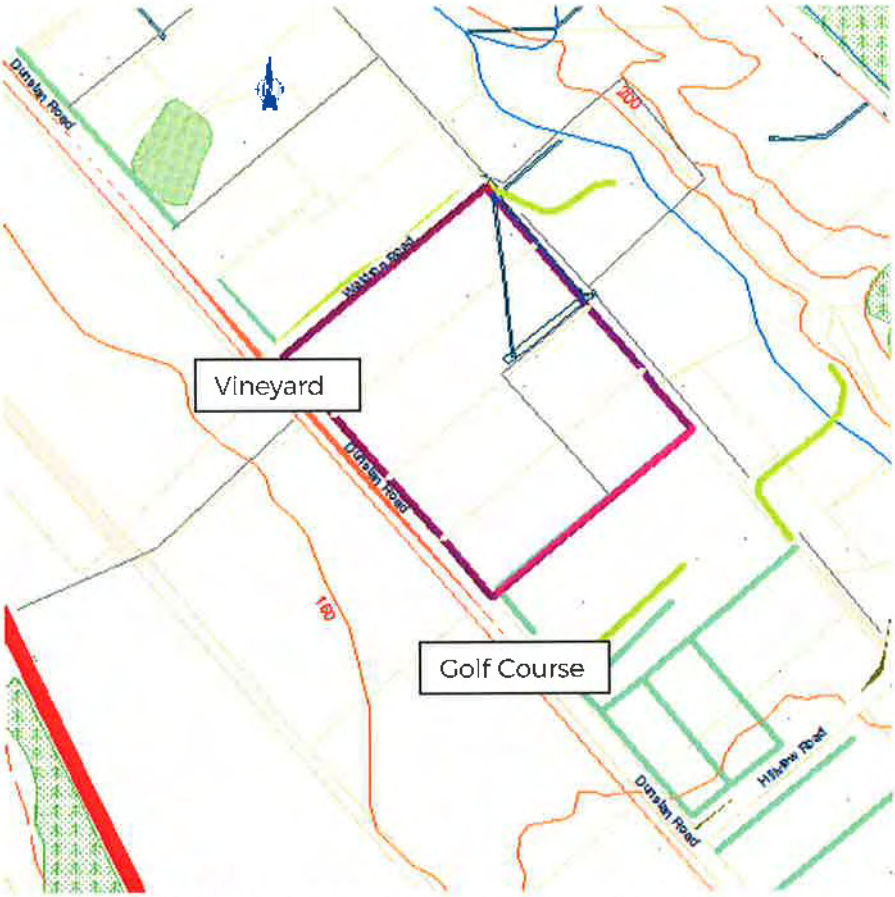


Figure 2: Quickmap plan of site and surrounds

3.2 Geology and Hydrogeology

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

This map indicates the site to be underlain by the Albert Town Advance superficial deposits comprising Late Pleistocene outwash deposits unweathered to weathered loose sandy to silty well rounded gravel, usually on large outwash plains. Basement geology consists of the Caples Group a well foliated schist with common quartz veins[1].

Naturally occurring arsenic bearing rocks associated with Otago Schist are well publicised[2] with weathering of natural rocks along with human mining activities in the area potentially allowing transportation of mineral rich debris across the area.

A review of the GNS Active Faults Database indicates that the nearest active fault, the Damsite Fault, lies some 7.5km north west of the site, as shown in Figure 4. This sinistral fault is described to have an unknown slip rate with a recurrence interval of between 5,000 and 10,000 years.

The property is located within the Dunstan Flats Aquifer catchment which was noted to have good water quality[3].

[1] http://www.orc.govt.nz/Publications-and-Reports/Research-and--Technical-Reports/Groundwater/Alexandra-Basin-Allocation-Study/
[2] Craw & Pacheco (2002). Mobilisation and bioavailability of arsenic around mesothermal gold deposits in a semiarid environment, Otago, New Zealand
[3] http://www.orc.govt.nz/Publications-and-Reports/Research-and--Technical-Reports/Groundwater/Alexandra-Basin-Allocation-Study/

All surface water flow in the area follows the general topography in a general south-westerly direction towards the Clutha River which is in hydraulic continuity with the aquifer.

Grow Otago[4] rainfall data indicated an annual median rainfall of between 351-400 mm in the vicinity of the site with a median annual potential evaporation of around 100 mm. However, the extremely well drained soils on the site indicate that the site typically has a water deficit prior to any irrigation measures.

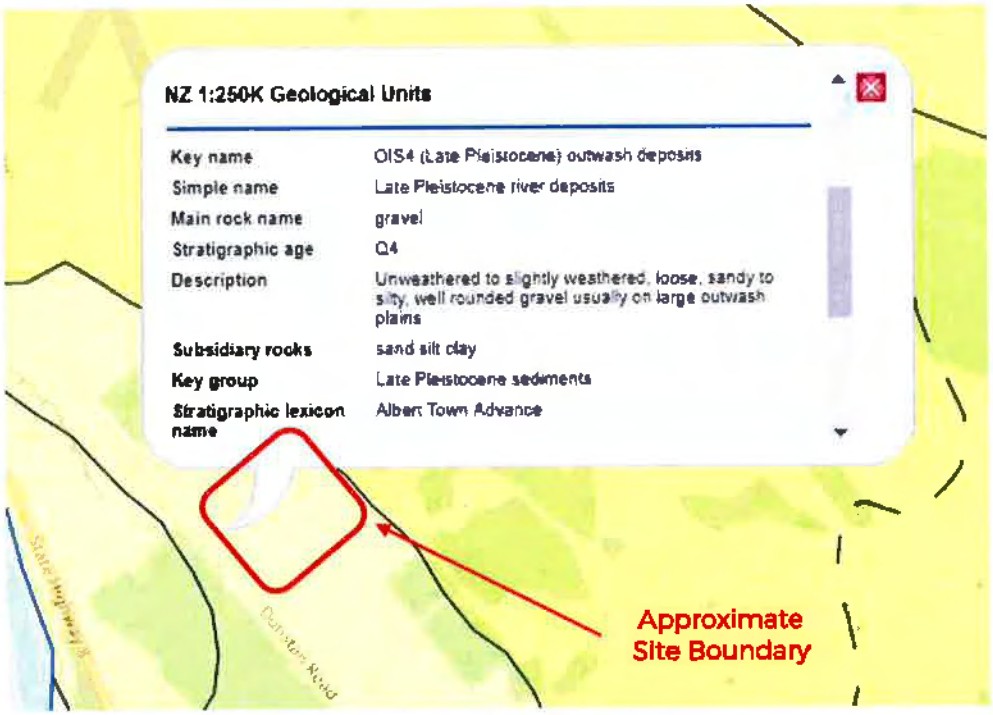


Figure 3: Geological Extract of the GNS Geology Web Map

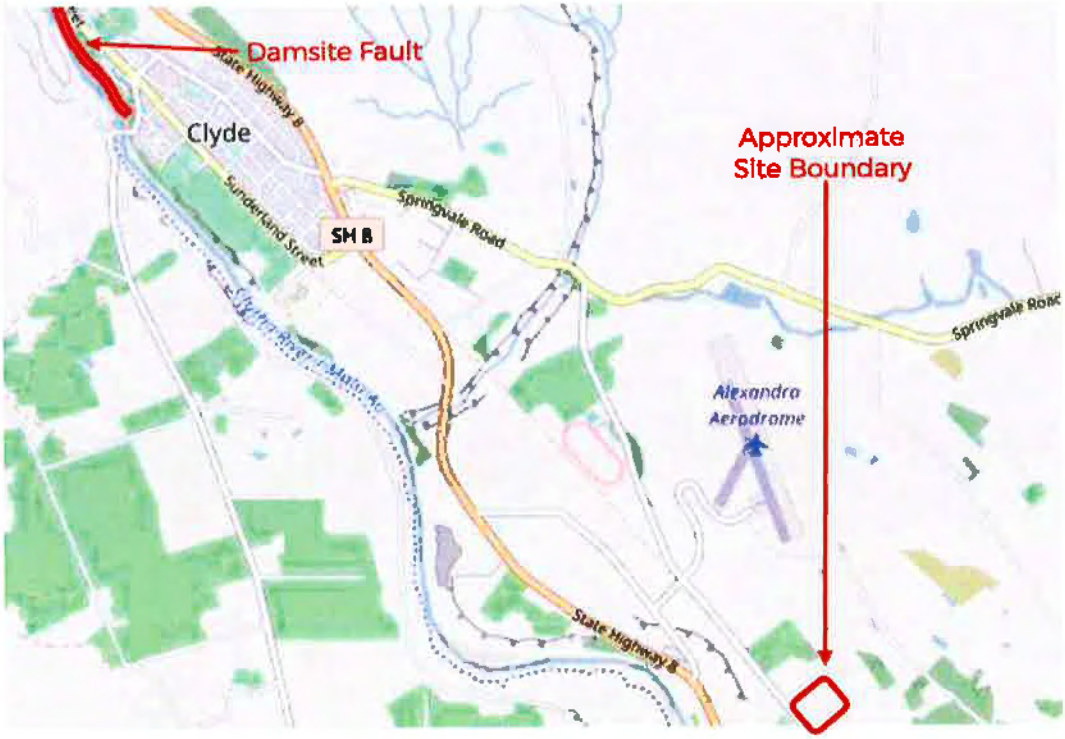


Figure 4: Extract from GNS Active Faults Database

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

3.3 Site History

A review of available aerial photographs has indicated that vines have been located on the site since at least 2005.

Details of the site history contained within the Preliminary Site Investigation report prepared by CGP for part of the site indicates that from the 1960 up until its sale earlier this year, the land was leased to the Grant family and used as a winery on the eastern part of the site while the remaining land, currently pasture, has intermittently cultivated or been grazed. Since 2003 this land has been used to discharge winery wastewater (ORC consent 2003.384) as well as disposal of grape peels and seeds.

The CPG report also indicates that the vineyard is currently certified as GrowSafe under the New Zealand Agrichemical Education Trust (NZAET). The vines are currently not tended or harvested for winemaking.

Historical information is presented in Appendix B.

3.4 Land Use Database

A review of CODC's District Plan Maps indicates that the piece of land lies within a Rural Resource Area.

From information available on CODCs eDocs website (accessed July 2017), it is evident that the site has previously been subject to seven resource consent applications, as detailed in Table 1.

Table 1: Consent applications for the site

DATE	DETAILS OF CONSENT APPLICATION
1993	Additions/implement shed – consent issued
1998	Additions to winery – consent issued
2000	Installation of woodsman ds80 – consent issued
2000	Erect toilet/changing room – consent issued
2002	Additions to winery – consent issued
2005	Install a new diesel fire appliance – consent issued
2005	Erect shed garage/workshop – consent issued

In addition a single resource consent was issued in 2014 giving subdivision consent.

3.5 Site Inspection

A site inspection was undertaken on the 6th July 2017 by an Opus (now WSP) SQEP. Details of the inspection are outlined below with a site plan presented within Appendix B and a selection of site photographs presented within Appendix C.

The Detailed Site Investigation site visit was completed on 7th and 10th June 2017 by an Opus SQEP. Samples of near surface soil were taken during this site visit for soils analysis.

During both site visits, the site was accessed off Dunstan Road via a gate and track in the centre of the site. The topography of the site was generally flat. However, a number of tracks were noted to crisscross the site presumably used to move equipment around the site.

The northern and eastern sections of the site were covered with vines and overgrown grasses. To the south and west there is rough pasture, while a number of buildings including a residential

building are located in the centre of the site, with a chemical storage shed situated on a concrete pad located along the eastern boundary in the southern portion of the site.

At the time of the site inspection and walkover no chemicals were noted in this area, it is understood that the vineyard has not been operational for some time. A number of empty plastic containers and storage tubs were noted alongside the shed and garage area on the southern part of the site, however no visible or olfactory signs of contamination was noted around the storage area. An above ground fuel tank was also noted in the centre of the site, a petrochemical odour is identifiable in this area. In the southern portion of the site a waste pit is easily identified, the primary use of this pit is to burn rubbish.

During both of the site inspections no obvious signs of contamination were noted, nor were any signs of vegetation dieback encountered.

Topsoil encountered on the site was noted to comprise a non- cohesive silty sand with abundant sub rounded to rounded gravel and cobbles.

4 Proposed Development

The Client proposes to develop a number of subdivisions and associated land use change across the 16.5 ha piece of land with a minimum lot size of 2007m^2 and a maximum lot size of 7001m^2. It is understood that the existing house and winery will remain on the site.

It is understood that resource consent is being sought for these subdivisions. A copy of the proposed development plan is attached within Appendix D.

5 Conceptual Site Model

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

5.1 Source-Pathway-Receptor Assessment

5.1.1 Potential Sources of Contamination

Potential of sources of contamination on the site are likely a result of current and historical viticulture activities on the site along with the above ground fuel tank. No spray records were available for the site, however it can be assumed that a standard range of agrochemicals was used across the site prior to its last crop in 2004. As such potential sources of contamination are likely to include:

- Organochlorine, organo-nitrate pesticides;
- Heavy metals including arsenic: and
- Hydrocarbons.

5.1.2 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 this site.

The most plausible pathways for contaminant migration associated with this site are therefore considered to be:

- Inhalation of contaminated dust;
- Dermal Contact with contaminated soils/water;
- Ingestion of contaminated material or food; and
- Leaching of contaminants through the soil matrix.

5.1.3 Potential Receptors

Considering the environmental setting of the site and the potential sources of contamination, the most sensitive receptors on the site have been identified as being end-users of the site such as future occupiers and residents (via direct contact with contaminated soils and direct ingestion pathways) and construction workers (via direct contact, ingestion and inhalation of dusts created during ground works).

Environmental receptors include groundwater and surface water. These have been taken into account when undertaking the preliminary risk assessment for the site, although are not the focus within the requirements for assessment of the National Environmental Standards (NES) in terms of risk to human health from soil borne contamination.

Using the data obtained from this report a preliminary Conceptual Site Model has been derived for the site and is presented in Figure 5.

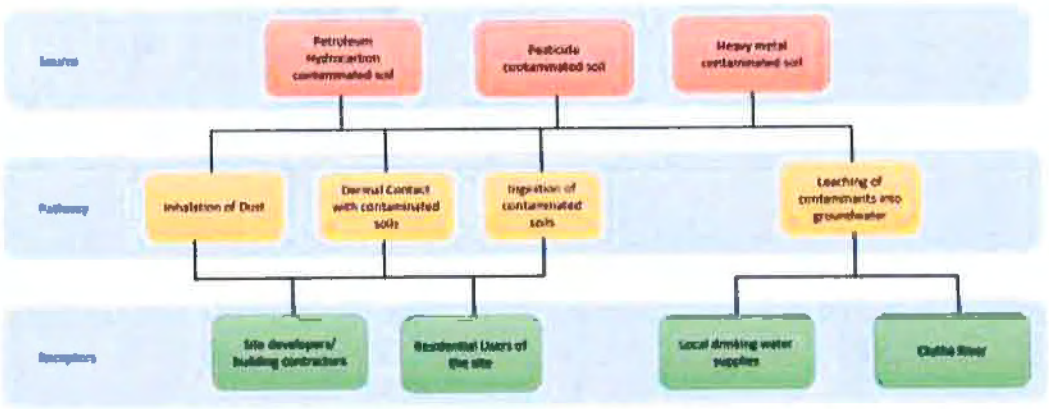


Figure 5: Conceptual Site Model

5.2 Preliminary Risk Assessment

For sensitive receptors to be at risk from identified sources of contamination a plausible linkage or pathway must exist. The site is known to have been sprayed with various agrochemicals in a controlled and managed manner.

Chemicals which are likely to have been applied to the vineyard would more likely than not have been subject to dilution and infiltration in to the ground since the last application due to rainfall. However in areas where chemicals were mixed or stored higher concentrations may have been leached in to the near surface soil environment.

Both anthropogenic and geogenic sources of contaminants need to be taken in to account as part of this preliminary risk assessment.

Due to the presence of large machinery, vehicles, and an above ground fuel tank as well as the periodical burning of rubbish on site, there is a potential risk of hydrocarbon contamination in these areas and is associated with spills and leaks. However it is anticipated that any potential hydrocarbon contamination will be confined close to the source of contamination. Nevertheless there is the potential for more widespread contamination associated with the burning of waste due to distribution by the wind.

In order to further quantify the potential risks posed from historic pesticide use and localised hydrocarbon spillages, a detailed site investigation was undertaken across the site in order to provide an overview of the potential for pesticide and heavy metal contamination associated with the primary contamination sources identified. In addition a number of samples will target areas associated with potential hydrocarbon contamination.

6 Detailed Site Investigation

6.1 Investigation Design Strategy

A Detailed Site Investigation programme was undertaken on 7th and 10th July 2017, supervised by an Opus (now WSP) Engineer. Soils samples were taken from near surface soils to depths of up to 300mm. Sample locations were determined by the SQEP prior to commencement of site works and were located randomly within a grid basis to cover all areas of the site, filling in gaps of analytical data gained from the PSI.

The location of samples taken was determined on site by the Engineer using a judgemental sampling programme taking into account the initial findings of the PSI searches and an assessment of the site at the time of the visit. A plan showing the soil sampling locations is presented in Figure 6.

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 the next day.

A total of thirty five soil samples were collected from the site and scheduled for laboratory analysis by the SQEP. Samples taken from within the vineyard were composited with 2 samples combined in to one sample. This was undertaken due to the homogeneity of the soils across the vineyard area of the site. Chemical analyses initially undertaken were as follows:

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

The results of analytical testing are presented in Appendix D.

6.2 Field Quality Assurance and Quality Control

Sampling of near surface soils was completed on 7th and 10th July 2017. Weather conditions were sunny and dry with frozen ground.

Samples were collected in laboratory supplied clean plastic pots and sent to Hill Laboratories via courier for pesticide screening and heavy metals analysis.

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.

Chain of Custody (CoC) forms from Hill Laboratories were requested for receipt of the samples and are presented with the results in Appendix F.

The location of samples taken are detailed in the sample location plan in Appendix E. Samples were not taken from the proposed sections 1, 2 and 3 due to access constraints at the time of the investigation, however due to the homogeneity of soils across the site soil characteristics can be inferred on the basis of results from across the remainder of the vineyard..

6.3 Laboratory QA/QC

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 6.1 and 6.2.
Data representativeness	Refer to section 6 and 6.1.
Precision and accuracy of sampling and analysis for each analyte in each environmental matrix informing data users of the reliability, unreliability or qualitative value of the data.	Refer to sections 6.1 and 6.2
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	Samples were collected on 7th and 10th July 2017. Weather conditions and ground conditions did not change during the sampling period.
Use of different sampling or analytical methodologies from those stipulated in the guideline documents	N/A
Spatial and temporal changes	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 proposed development comprises a rural residential/lifestyle block 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 (EGV) Database and are specified in the assessment results (see arsenic SGV reassessment below). 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 within the EGV database have also been considered as part of this assessment.

7.1 Background Concentrations

For the purposes of comparison with background concentrations to determine the applicability of the NES as per NES Regulation 5(9). No background concentrations specific to Central Otago are currently available. 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 for applicability of the NES and to determine cleanfill disposal criteria.

For the purpose of comparison with background concentrations as per NES regulation 5(9), background concentrations of organochlorine pesticides, including DDT and its isomers above the laboratory's limit of detection were determined as being above background concentrations

7.2 Disposal Criteria

In addition to assessing the human health risks and environmental risks associated with the development and end use of the site, an assessment of off-site disposal options for any excess spoil generated during site development works has been conducted. Depending upon the contamination condition of the spoil off-site options range from disposal to 'cleanfill' sites (lowest cost) through managed sites to licensed hazardous waste landfills (highest cost).

A disposal to a 'cleanfill' site represents the most cost effective off-site disposal option, the results have been compared to the MfE definition of "cleanfill". The publication "A guide to the Management of Clean Fills" (MfE 2002) defines clean fill as:

> *"Material that when buried will have no adverse effect on people or the environment. Clean-fill material includes virgin natural materials such as clay, soil and rock, and other inert materials such as concrete or brick that are free of:*
>
> - *Combustible, putrescible, degradable or leachable components;*
> - *Hazardous substances;*
> - *Products or materials derived from hazardous waste treatment, hazardous waste stabilisation or hazardous waste disposal practices;*
> - *Materials that may present a risk to human health or animal health such as medial and veterinary waste. Asbestos or radioactive substances; and*
> - *Liquid waste."*

The requirement for the material to be 'free' of 'hazardous substances' effectively requires the concentrations of non-naturally occurring compounds to be the level of analytical detection. In terms of naturally occurring compounds it is generally recognised that clean-fill acceptance criteria are defined by the background concentrations of these compounds in the relevant local or regional environment.

For the purpose of comparison with background concentrations as per NES regulation 5(9), background concentrations of organochlorine pesticides, including DDT and its isomers above the laboratory's limit of detection were determined as being above background concentrations.

To provide an indication of disposal options, comparison of the results against the Landfill Acceptance Criteria has also been made to assist with determining where any excess material may be disposed

Table 4: Extract of Appendix A of the Hazardous Waste Guidelines – Landfill Waste Acceptance Criteria for Class A and B Landfills (Refer to full document for footnotes)

	CLASS A LANDFILLS		CLASS B LANDFILLS	
	Screening Criteria (mg/kg)	Concentration in Leachate (mg/L)	Screening Criteria (mg/kg)	Concentration in Leachate (mg/L)
Arsenic	100	5	10	0.5
Boron	400	20	40	2
Cadmium	20	1	2	0.1
Chromium (IV)	100	5	10	0.5
Copper	100	5	10	0.5
Lead	100	5	10	0.5
Mercury	4	0.2	0.4	0.02

7.3 Results of Chemical Laboratory Analysis

The results of the chemical laboratory analysis were initially compared against the NES Soil Contaminant Standards for Health (SCS $_{(health)}$). The proposed development was assessed for a rural residential land use scenario with 25% produce consumption. This is considered conservative based on the proposed site of sections on site. Other metals analysed were compared to appropriate soil guideline values which are referenced within the summary table.

The chemical laboratory results are presented in Appendix F and summarised in Table 5 below.

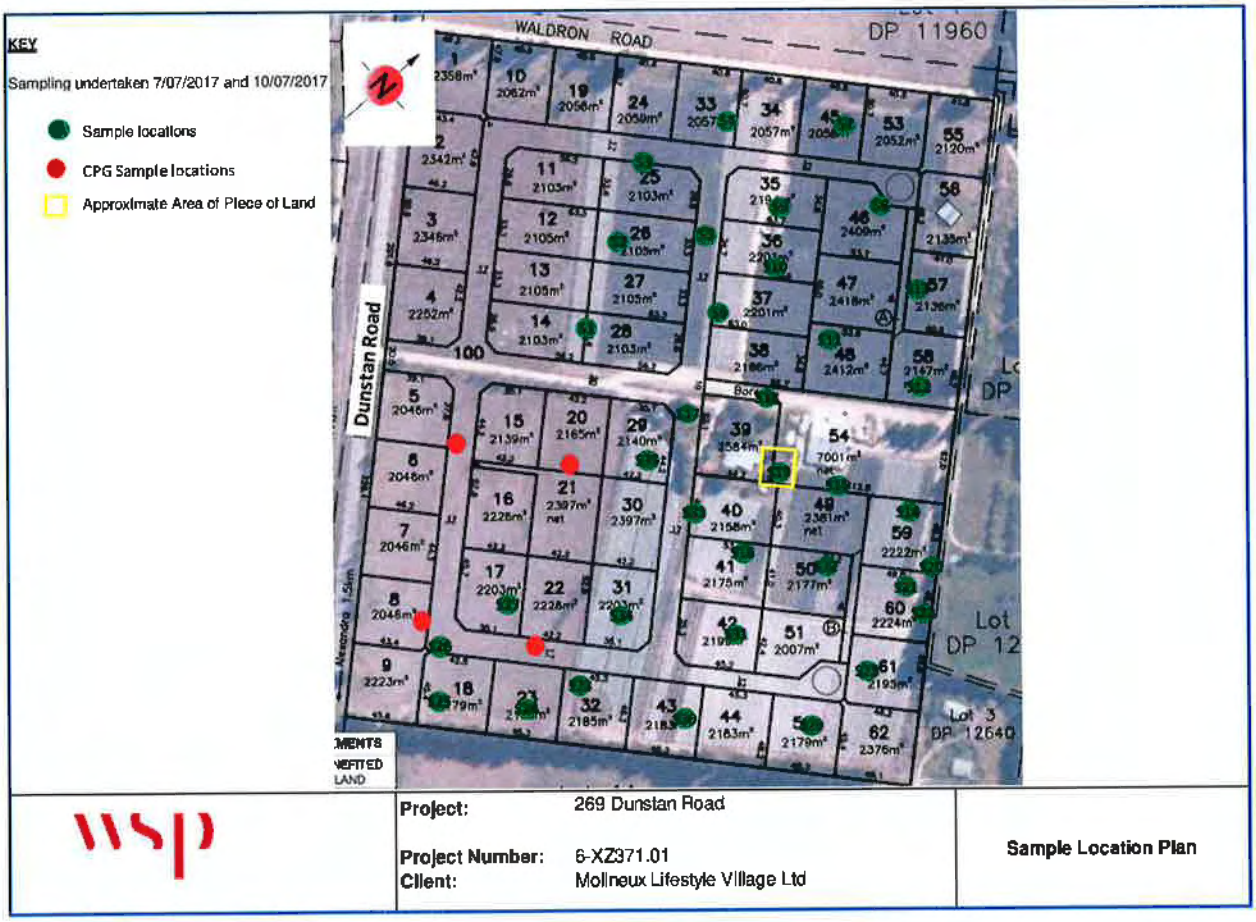
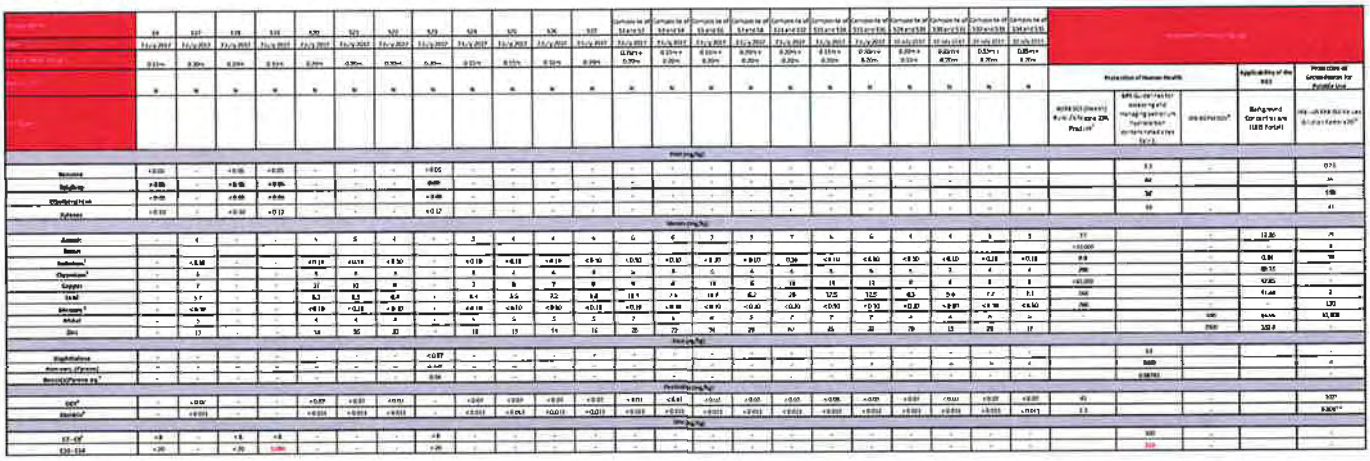


Figure 6: Sample Location Plan

Table 5: Summary of Metals and Pesticide Results



7.4 Human Health Criteria

NES Heavy Metals

Laboratory results indicated that none of the analysed soil samples for heavy metals exceeded their relevant soil guideline value for NES SCS (health) for a rural residential land-use with 25% produce consumption.

PAH's

PAH's were screened in a single soil sample collected from next to the pile of rubbish that had been recently burned during the PSI. The results returned were below their relevant SGV for the type of soil (silty sand) that was identified on site.

Pesticides

A full range of organochlorine pesticides were screened in nineteen soil samples taken from the vineyard area of the site. All results, were returned below their method detection limit and as such were below their relevant SGV for a rural residential end use.

TPH's

TPH's were screened in four soil samples collected from areas which were thought to present a higher risk of contamination during the PSI. The results returned were below their relevant SGV for the type of soil (silty sand) that was identified on site, apart from the C10-C14 fraction which had a concentration of 1080 mg/kg in S19. This elevated concentration is over double the SGV of 510 mg/kg denoted by the Ministry of the Environment for the type of soil (silty sand) that was identified on site.

MAH's (BTEX)

MAH's were screened in four soil samples collected from areas which were thought to present a higher risk of contamination during the PSI. The results returned were below their relevant SGV for the type of soil (silty sand) that was identified on site.

7.5 Background Concentrations

Assessment of heavy metal analysis results indicate that none were present above their local background concentrations.

A point source of petroleum hydrocarbons in the diesel range was noted on site.

7.6 Waste Disposal of Soils

Assessment of results against background indicates that soils removed from site (with the exception of the area around the point source of TPH) may be considered as cleanfill.

Soils from the area of TPH contamination would need to be disposed as managed waste at a facility authorised to accept these materials

For any soil which is to be disposed off-site as managed fill, reference to the MfE Hazardous Waste Guidelines should be made.

7.7 Revised Risk Assessment

Chemical analysis results have revealed no elevated concentrations of heavy metals, PAH's, MAH's and pesticides within the near surface soil sampled. In addition, with the exception of C10 – C14, TPH's were not encountered in elevated concentrations across any of the site investigated.

A single C10 – C14 concentration in excess of the SGV was recorded at a specific location on the site (S19). However it should be noted that this result was not unexpected as soil was collected at 0.20m bgl in an area situated directly below the above ground fuel tank located on the site. As such the TPH exceedance located below the above ground fuel tank does pose a direct exposure risk however this risk is limited to the immediate vicinity of the fuel tank.

8 Conclusions and Recommendations

The conceptual site model and human health risk assessment presented herein is based upon information gained from a site inspection, anecdotal evidence, information gained from CODC and other sources together with an assessment of soil conditions using data from detailed soil sampling and chemical analyses, as per the requirements of CLMG and the NES.

Results of the completed chemical analyses indicate that with the exception of diesel range Petroleum Hydrocarbons C10 – C14 from a point source, TPH, PAH, MAH (BTEX), heavy metals and pesticide concentrations are present at levels below accepted and published soil guideline values for a rural residential end use across the site. It is therefore considered highly unlikely that there is a risk to human health associated with anthropogenic sources of contaminants on the site.

Taking into consideration the location of elevated hydrocarbons and visual assessment, it can be determined that only the immediate vicinity of the above ground fuel tank is contaminated by C10-C14 Hydrocarbons. The remaining site area is therefore considered suitable for rural residential purposes.

As such, it is considered **highly unlikely** that there is a risk to human health should the proposed residential activity be undertaken on the remainder of the site. Although no elevated contaminants of concern were encountered within the waste pit, the area in its current condition is not considered suitable for rural residential development. Removal of waste and burnt materials should be undertaken to an appropriate facility prior to any filling of this area of the site.

The above ground fuel tank and surrounding near surface are considered to be a 'piece of land' with respect to the NES and cannot be deemed suitable for the proposed end-use due to an elevated C10-C14 concentration. If that area of the site is to be developed then some form of remedial measures would need to be undertaken on this area in order to create suitable ground conditions.

8.1 Consenting Requirements

Based on the reported soil results, with the exception of the piece of land surrounding the fuel tank, contaminants of concern do not exceed human health criteria or published local background concentrations.

As such, outside of the delineated piece of land as shown on Figure 6, the NES does not apply to the remaining site area.

8.2 Remedial Options

A number of options are available in order to mitigate the presence of elevated Petroleum Hydrocarbons C10 – C14 in the centre of the site, within the vicinity of S19.

- **Do nothing**: this would mean that the area of the site in the immediate vicinity of the above ground fuel tank would not be suitable for a rural residential development. This option would not be suitable should ground disturbance be proposed in the area, however should no change of land use or ground disturbance be proposed the risks posed from localised hydrocarbon contamination can be managed;
- **Localised site strip**: If the fuel tank were to be removed or ground disturbance occur in the vicinity of the fuel tank, the soil directly below would need to be removed thereby removing the risk of future hydrocarbon contamination on the site. In order to ensure the removal of all contaminated soil verification testing would be required in accordance with the requirements of the NES.

8.3 Recommendations

Based on the results of this Detailed Site Investigation, Opus recommends that:

- With the exception of the area in the direct vicinity of the above ground storage tank (Piece of Land), the site is suitable for a rural residential development as soil contamination does not exceed the relevant stated applicable standards;
- Remedial options given above are considered appropriate should development of the area in the immediate vicinity of the above ground storage tank be undertaken;
- Should development be proposed within the vicinity of the waste pit on site, remedial measures will be required in order to remove residual waste along with burnt materials from the area. Infilling of the pit in its present form is not considered appropriate remediation should residential development of the area be proposed.
- 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 Detailed Site Investigation report is submitted to the consenting authority.
- This Detailed Site Investigation report is submitted to the reginal authority in to facilitate updating the HAIL database; and
- Any disturbance of soils on the subdivided sections proposed for rural residential development are considered to be controlled activities as this Detailed Site Investigation does not exceed the relevant applicable standard.

9 Applicability and Limitations

This report has been prepared for the benefit of the client, Molyneux Lifestyle Village Ltd with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our review or agreement.

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. 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. Whilst this report may express an opinion on the possible configuration of strata or contaminants between or beyond exploratory hole positions or in the possible presence of features based on either visual, verbal or published evidence, this is for guidance only and no liability can be accepted for its accuracy. Should further data be obtained that differs from that presented in this report, then conclusions and recommendations may no longer be valid.

This 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
Historical Information

QuickMap Title Details

Information last updated as at 03 Jul 2017

COMPUTER FREEHOLD REGISTER
DERIVED FROM LAND INFORMATION NEW ZEALAND

Identifier OT5B/1137
Land Registration District Otago
Date Issued 15 June 1973

Prior References
OT4D/343

Type Fee Simple
Area 4.0469 hectares more or less
Legal Description Part Lot 13 Deposited Plan 3194

Proprietors
Molyneux Lifestyle Village Limited

482177 Transfer creating the following easements - 29.6.1977 at 10:03 am

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Store water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Storage easement A Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Line Pipeline easement Diagram A Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Lot 1 Deposited Plan 12640 - CT OT6A/1154	Line Pipeline easement Diagram B Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Lot 2 Deposited Plan 12640 - CT OT6A/1155	Line Pipeline easement Diagram B Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	

Subject to a right to convey water over part marked A DP 417284 created by Easement Instrument 8206380.1 - 29.6.2009 at 12:13 pm

The information provided on this report forms a guideline only. As a result, Custom Software Limited cannot and does not provide any warranties or assurances of any kind in relation to the accuracy of the information provided through this report, the Site and Service. Custom Software Limited will not be liable for any claims in relation to the content of this report, the site and this service.

QuickMap Title Details

Information last updated as at 03 Jul 2017

COMPUTER FREEHOLD REGISTER
DERIVED FROM LAND INFORMATION NEW ZEALAND

Identifier OT5B/1138
Land Registration District Otago
Date Issued 15 June 1973

Prior References
OT4D/343

Type Fee Simple
Area 4.2543 hectares more or less
Legal Description Part Lot 13 Deposited Plan 3194

Proprietors
Molyneux Lifestyle Village Limited

482177 Transfer creating the following easements - 29.6.1977 at 10.03 am

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Store water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Storage easement diagram A Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Line Pipeline easement diagram A Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Lot 1 Deposited Plan 12640 - CT OT6A/1154	Line Pipeline easement diagram B Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Lot 2 Deposited Plan 12640 - CT OT6A/1155	Line Pipeline easement diagram B Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	

Subject to a right to convey water over part marked B DP 417284 and right to take and convey water over part marked C DP 417284 created by Easement Instrument 8206380.1 - 29.6.2009 at 12:13 pm

Subject to a right to convey electricity (in gross) over part marked D on DP 506529 in favour of Aurora Energy Limited created by Easement Instrument 10659232.4 - 24.4.2017 at 4:06 pm

The information provided on this report forms a guideline only. As a result, Custom Software Limited cannot and does not provide any warranties or assurances of any kind in relation to the accuracy of the information provided through this report, the Site and Service. Custom Software Limited will not be liable for any claims in relation to the content of this report, the site and this service.

QuickMap Title Details

Information last updated as at 03 Jul 2017

COMPUTER FREEHOLD REGISTER
DERIVED FROM LAND INFORMATION NEW ZEALAND

Identifier OT5B/1138
Land Registration District Otago
Date Issued 15 June 1973

Prior References
OT4D/843

Type Fee Simple
Area 4.2543 hectares more or less
Legal Description Part Lot 13 Deposited Plan 3194

Proprietors
Molyneux Lifestyle Village Limited

482177 Transfer creating the following easements - 29.6.1977 at 10.03 am

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Store water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Storage easement diagram A Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Line Pipeline easement diagram A Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Lot 1 Deposited Plan 12640 - CT OT6A/1154	Line Pipeline easement diagram B Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Lot 2 Deposited Plan 12640 - CT OT6A/1155	Line Pipeline easement diagram B Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	

Subject to a right to convey water over part marked B DP 417284 and right to take and convey water over part marked C DP 417284 created by Easement Instrument 8206380.1 - 29.6.2009 at 12:13 pm

Subject to a right to convey electricity (in gross) over part marked D on DP 506529 in favour of Aurora Energy Limited created by Easement Instrument 10659232.4 - 24.4.2017 at 4:06 pm

QuickMap Title Details

Information last updated as at 03 Jul 2017

COMPUTER FREEHOLD REGISTER
DERIVED FROM LAND INFORMATION NEW ZEALAND

Identifier	**OT5B/1025**
Land Registration District	**Otago**
Date Issued	**21 June 1973**

Prior References

OT4D/344

Type	**Fee Simple**
Area	**4.0620 hectares more or less**
Legal Description	**Part Lot 12 Deposited Plan 3194**

Proprietors

Molyneux Lifestyle Village Limited

482177 Transfer creating the following easements - 29.6.1977 at 10.03 am

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Store water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Storage Easement A Transfer 482177	Part Lot 12 Deposited Plan 3194 - herein	
Convey water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Pipeline Easement A Transfer 482177	Part Lot 12 Deposited Plan 3194 - herein	
Convey water	Lot 1 Deposited Plan 12640 - CT OT6A/1154	Pipeline Easement B Transfer 482177 B	Part Lot 12 Deposited Plan 3194 - herein	
Convey water	Lot 2 Deposited Plan 12640 - CT OT6A/1155	Pipeline Easement B Transfer 482177 B	Part Lot 12 Deposited Plan 3194 - herein	

QuickMap Title Details
Historic Information

Information last updated as at 03 Jul 2017

COMPUTER FREEHOLD REGISTER
DERIVED FROM LAND
INFORMATION NEW ZEALAND

Identifier OT5B/1137
Land Registration District Otago
Date Issued 15 June 1973

Historic Memorials

482177 Transfer creating the following easements - 29.6.1977 at 10.08 am

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Store water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Storage easement A Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Line Pipeline easement Diagram A Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Lot 1 Deposited Plan 12640 - CT OT6A/1154	Line Pipeline easement Diagram B Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Lot 2 Deposited Plan 12640 - CT OT6A/1155	Line Pipeline easement Diagram B Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	

894523.5 Mortgage to Bank of New Zealand - 1.11.1995 at 9.33 am

5534867.1 Discharge of Mortgage 894523.5 - 27.3.2003 at 9:00 am

5534867.2 Mortgage to Southland Building Society - 27.3.2003 at 9:00 am

7747719.1 Discharge of Mortgage 5534867.2 - 1.4.2008 at 9:38 am

7747719.2 Transfer to William Hill Holdings Limited - 1.4.2008 at 9:38 am

7747719.3 Mortgage to Southland Building Society - 1.4.2008 at 9:38 am

Subject to a right to convey water over part marked A DP 417284 created by Easement Instrument 8206380.1 - 29.6.2009 at 12:13 pm

10353666.1 CAVEAT BY DIVINE INTERNATIONAL LIMITED - 4.3.2016 at 3:15 pm

10666627.2 Withdrawal of Caveat 10353666.1 - 21.12.2016 at 1:18 pm

10780875.1 Transfer in exercise of power of sale in Mortgage 7747719.3 to Molyneux Lifestyle Village Limited - 31.5.2017 at 2:42 pm

Historic Owners

WILLIAM HILL HOLDINGS LIMITED

WILLIAM HILL LIMITED

QuickMap Title Details
Historic Information

Information last updated as at 03 Jul 2017

COMPUTER FREEHOLD REGISTER
DERIVED FROM LAND
INFORMATION NEW ZEALAND

Identifier OT5B/1138
Land Registration District Otago
Date Issued 15 June 1973

Historic Memorials

482177 Transfer creating the following easements - 29.6.1977 at 10.03 am

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Store water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Storage easement diagram A Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Line Pipeline easement diagram A Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Lot 1 Deposited Plan 12640 - CT OT6A/1154	Line Pipeline easement diagram B Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	
Convey water	Lot 2 Deposited Plan 12640 - CT OT6A/1155	Line Pipeline easement diagram B Transfer 482177	Part Lot 13 Deposited Plan 3194 - herein	

894523.5 Mortgage to Bank of New Zealand - 1.11.1995 at 9:33 am

5534867.1 Discharge of Mortgage 894523.5 - 27.3.2003 at 9:00 am

5534867.2 Mortgage to Southland Building Society - 27.3.2003 at 9:00 am

7747719.1 Discharge of Mortgage 5534867.2 - 1.4.2008 at 9:38 am

7747719.2 Transfer to William Hill Holdings Limited - 1.4.2008 at 9:38 am

7747719.3 Mortgage to Southland Building Society - 1.4.2008 at 9:38 am

Subject to a right to convey water over part marked B DP 417284 and right to take and convey water over part marked C DP 417284 created by Easement Instrument 8206380.1 - 29.6.2009 at 12:13 pm

9540867.1 CAVEAT BY AURORA ENERGY LIMITED - 11.10.2013 at 8:38 am

10659232.1 Withdrawal of Caveat 9540867.1 - 24.4.2017 at 4:06 pm

10353666.1 CAVEAT BY DIVINE INTERNATIONAL LIMITED - 4.3.2016 at 3:15 pm

10666627.2 Withdrawal of Caveat 10353666.1 - 21.12.2016 at 1:18 pm

Subject to a right to convey electricity (in gross) over part marked D on DP 506529 in favour of Aurora Energy Limited created by Easement Instrument 10659232.4 - 24.4.2017 at 4:06 pm

10780875.1 Transfer in exercise of power of sale in Mortgage 7747719.3 to Molyneux Lifestyle Village Limited - 31.5.2017 at 2:42 pm

Historic Owners

WILLIAM HILL HOLDINGS LIMITED **WILLIAM HILL LIMITED**

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Information last updated as at 03 Jul 2017

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INFORMATION NEW ZEALAND

Identifier OT5B/1024
Land Registration District Otago
Date Issued 21 June 1973

Historic Memorials

482177 Transfer creating the following easements - 29.6.1977 at 10.03 am

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Store water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Storage Easement diagram A Transfer 482177	Part Lot 12 Deposited Plan 3194 - herein	
Convey water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/156	Line pipeline easement diagram A Transfer 482177	Part Lot 12 Deposited Plan 3194 - herein	
Convey water	Lot 1 Deposited Plan 12640 - CT OT6A/1154	Line pipeline easement diagram B Transfer 482177	Part Lot 12 Deposited Plan 3194 - herein	
Convey water	Lot 2 Deposited Plan 12640 - CT OT6A/1155	Line pipeline easement diagram B Transfer 482177	Part Lot 12 Deposited Plan 3194 - herein	

5534863.1 Transfer to David James Grant - 27.3.2003 at 9:00 am

5534863.2 Mortgage to Southland Building Society - 27.3.2003 at 9:00 am

6623242.1 NOTICE OF CLAIM OF INTEREST PURSUANT TO SECTION 42(2) PROPERTY (RELATIONSHIPS) ACT 1976 BY JOANNA MARGARET ROBINSON - 26.10.2005 at 9:00 am

8335428.1 Withdrawal of Notice of Claim 6623242.1 - 17.11.2009 at 9:11 am

10353639.1 CAVEAT BY DIVINE INTERNATIONAL LIMITED (AFFECTS PART) - 4.3.2016 at 3:14 pm

10666627.1 Withdrawal of Caveat 10353639.1 - 21.12.2016 at 1:18 pm

10353740.1 CAVEAT BY DIVINE INTERNATIONAL LIMITED - 4.3.2016 at 3:16 pm

10666627.3 Withdrawal of Caveat 10353740.1 - 21.12.2016 at 1:18 pm

10780875.2 Transfer in exercise of power of sale in Mortgage 5534863.2 to Molyneux Lifestyle Village Limited - 31.5.2017 at 2:42 pm

Historic Owners

DAVID JAMES GRANT

SELWYN ERNEST TOMKINS

QuickMap Title Details
Historic Information

Information last updated as at 03 Jul 2017

COMPUTER FREEHOLD REGISTER
DERIVED FROM LAND
INFORMATION NEW ZEALAND

Identifier **OT5B/1025**
Land Registration District **Otago**
Date Issued 21 June 1973

Historic Memorials

482177 Transfer creating the following easements - 29.6.1977 at 10.03 am

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Store water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Storage Easement A Transfer 482177	Part Lot 12 Deposited Plan 3194 - herein	
Convey water	Section 51 Block VII Leaning Rock Survey District - CT OT6A/1156	Pipeline Easement A Transfer 482177	Part Lot 12 Deposited Plan 3194 - herein	
Convey water	Lot 1 Deposited Plan 12640 - CT OT6A/1154	Pipeline Easement B Transfer 482177 B	Part Lot 12 Deposited Plan 3194 - herein	
Convey water	Lot 2 Deposited Plan 12640 - CT OT6A/1155	Pipeline Easement B Transfer 482177 B	Part Lot 12 Deposited Plan 3194 - herein	

894523.5 Mortgage to Bank of New Zealand - 1.11.1995 at 9.33 am

5534867.1 Discharge of Mortgage 894523.5 - 27.3.2003 at 9:00 am

5534867.2 Mortgage to Southland Building Society - 27.3.2003 at 9:00 am

7747719.1 Discharge of Mortgage 5534867.2 - 1.4.2008 at 9:38 am

7747719.2 Transfer to William Hill Holdings Limited - 1.4.2008 at 9:38 am

7747719.3 Mortgage to Southland Building Society - 1.4.2008 at 9:38 am

10353666.1 CAVEAT BY DIVINE INTERNATIONAL LIMITED - 4.3.2016 at 3:15 pm

10666627.2 Withdrawal of Caveat 10353666.1 - 21.12.2016 at 1:18 pm

10780875.1 Transfer in exercise of power of sale in Mortgage 7747719.3 to Molyneux Lifestyle Village Limited - 31.5.2017 at 2:42 pm

Historic Owners

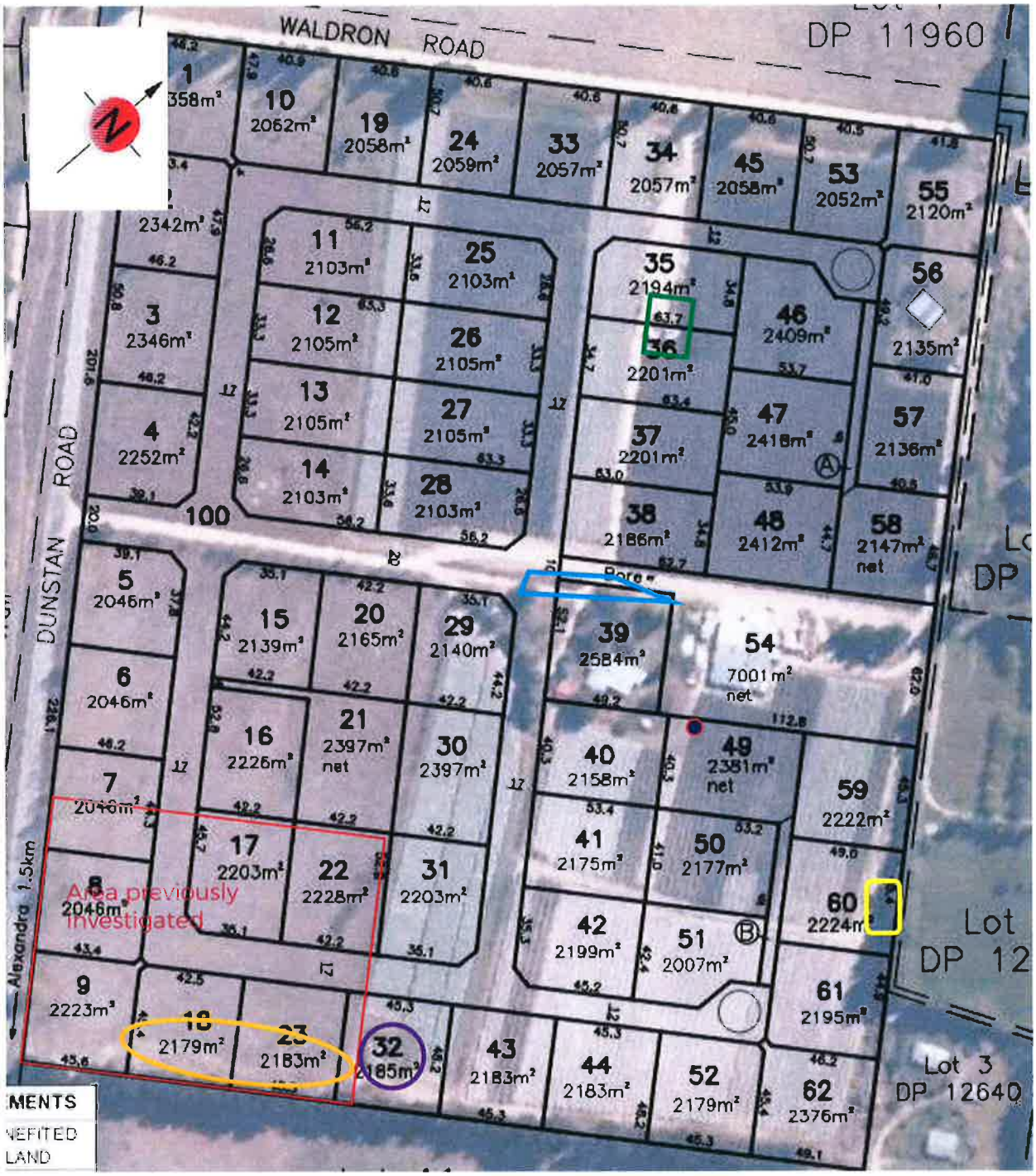
WILLIAM HILL HOLDINGS LIMITED

WILLIAM HILL LIMITED

1966 Aerial Photo

2012 Aerial Photo

Appendix B
Site Layout Plan



Key

- Above ground fuel tank
- Area of recently burned
- Area of fly tipping
- Stone cutting equipment and cut
- Pesticide mixing and storage
- Vehicle parking area.

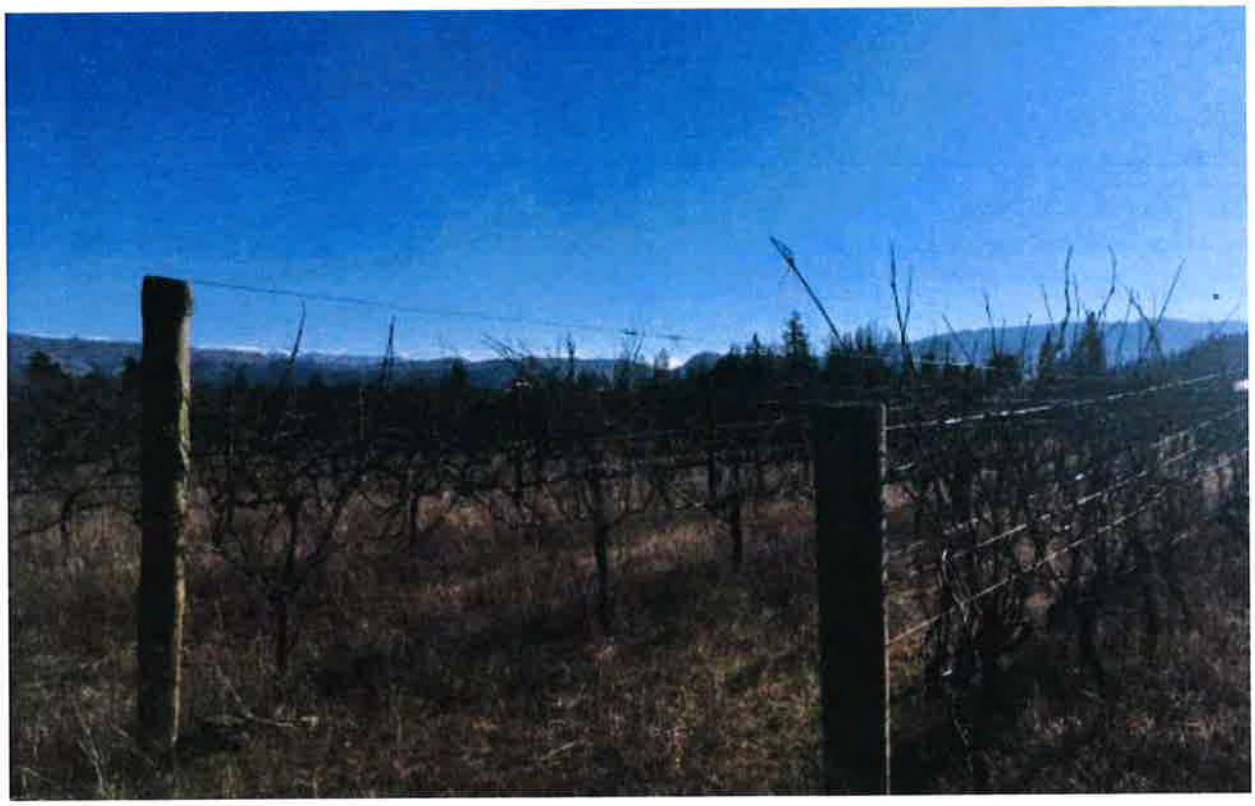
Appendix C
Site Photographs

View south west along the main access road towards the access gate from the centre of the site.

View south east along eastern boundary of site.

Southern site boundary view towards south west.

Fly tipping on southern side of site.



View north west from northern edge of site.

View east from the centre of the site.

Above ground fuel storage tank.

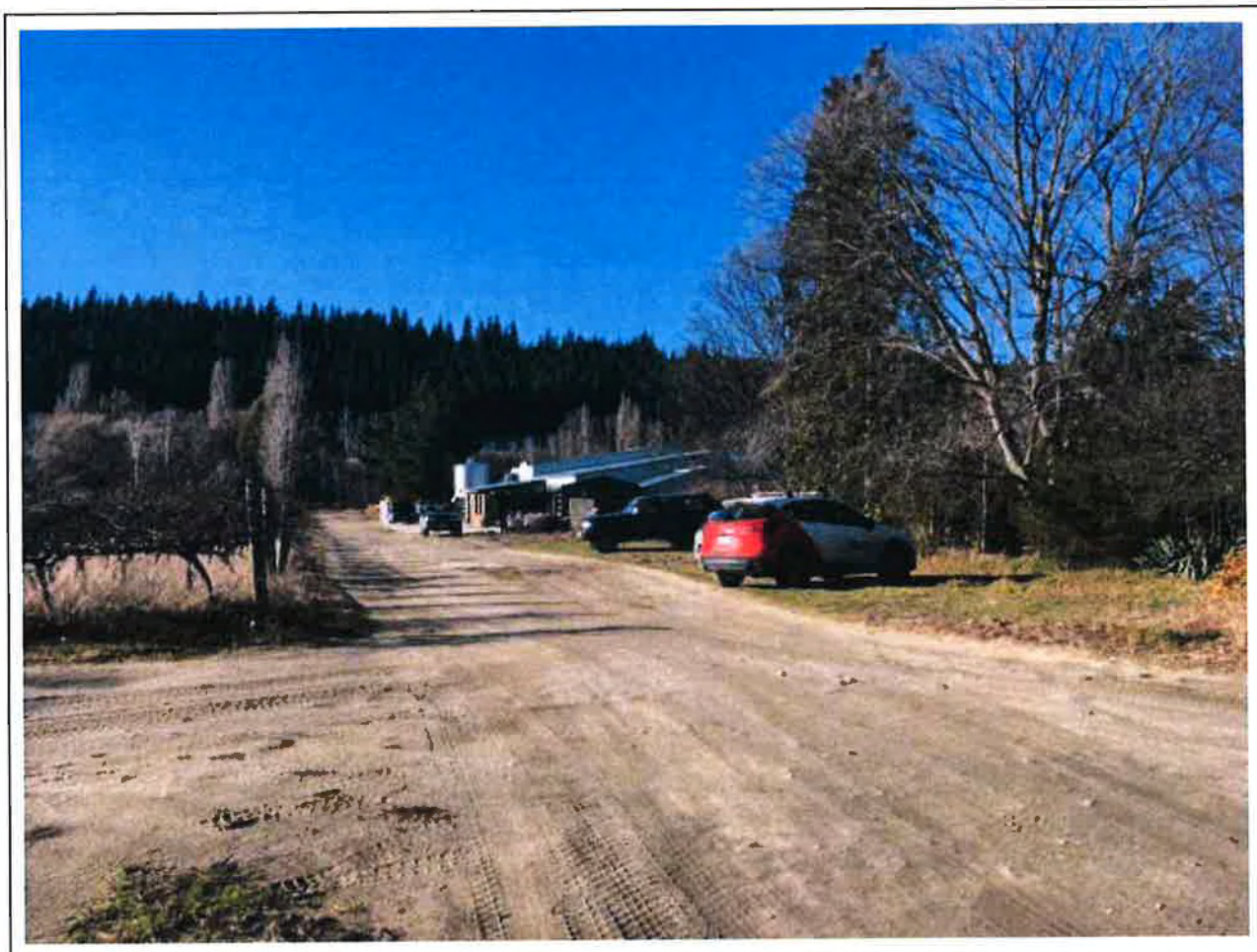
Pesticide storage and mixing shed located on eastern boundary.

Plastic storage drums located on the eastern site boundary just south of the pesticide mixing shed.

Pit containing miscellaneous rubbish close to the southern site boundary taken on the 9th July 2017.

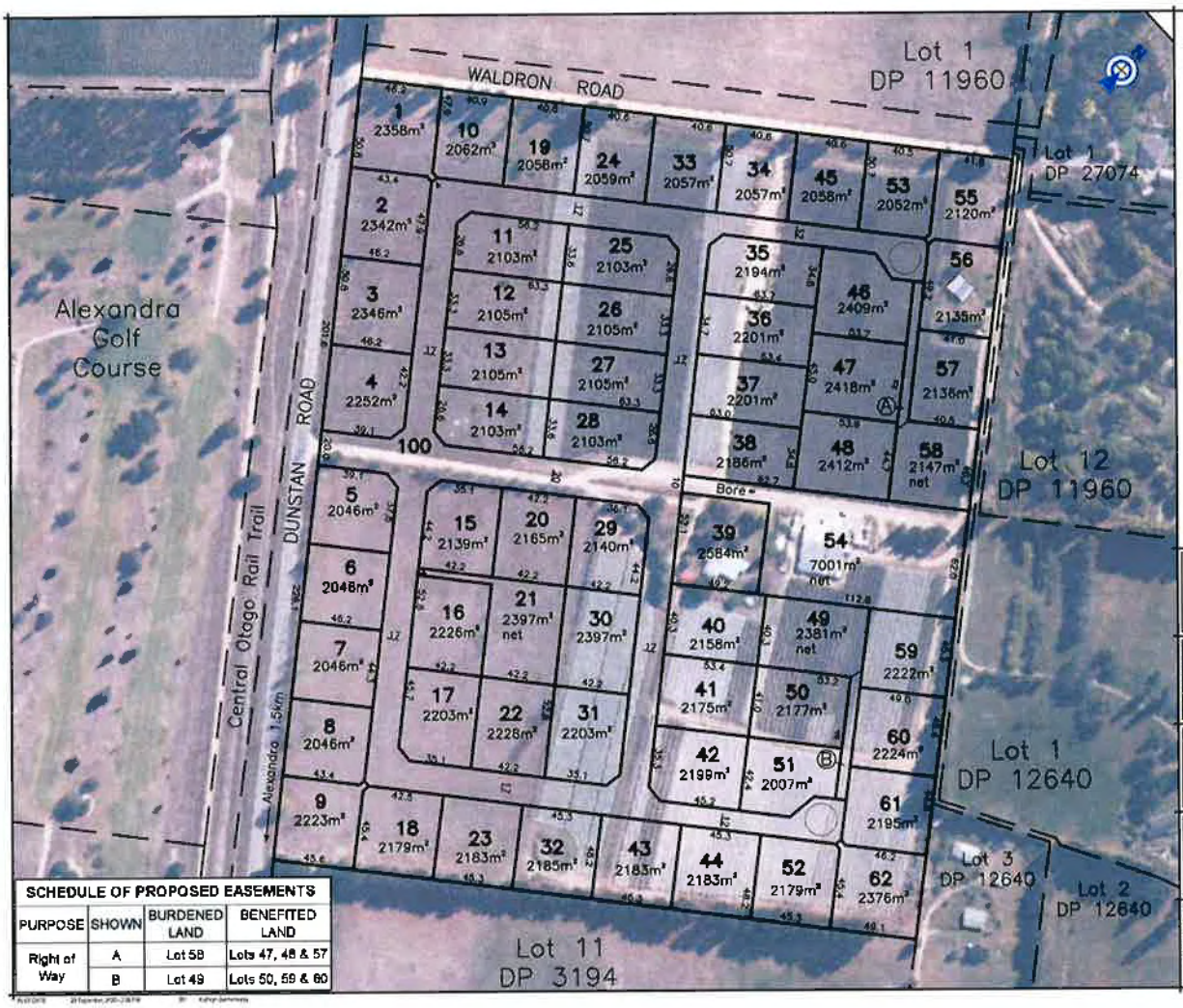
Pit containing recently burnt still slightly smoking rubbish close to the southern site boundary.

Mobile diesel tank for filling house heating system, next to the existing house.



Vehicles parking on the grass next to the winery.

Appendix D
Proposed Development Plan



Notes

- All lots subject to possible easements for power, telecom, water supply & wastewater.
- Areas & dimensions subject to resource consent and legal survey.
- Lot 100 to vest as legal public road in CODC.

SCHEDULE OF PROPOSED EASEMENTS

PURPOSE	SHOWN	BURDENED LAND	BENEFITED LAND
Right of Way	A	Lot 58	Lots 47, 48 & 57
	B	Lot 49	Lots 50, 59 & 60

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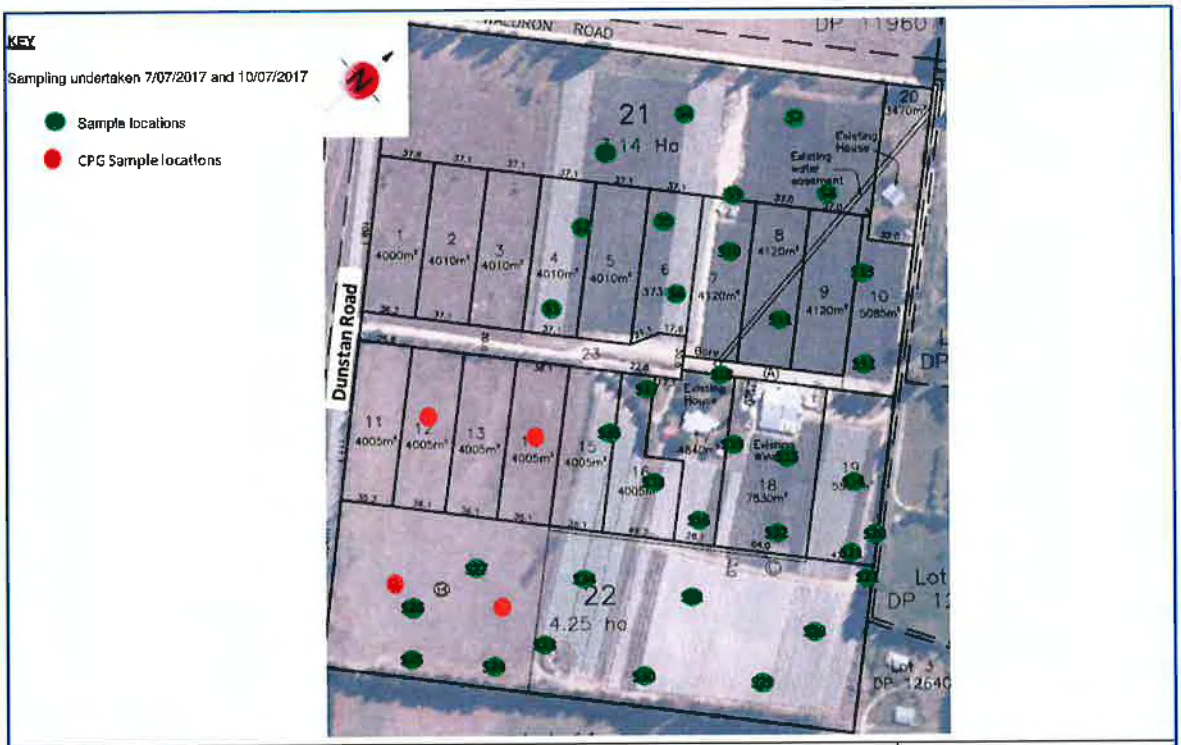
Cromwell 9342.
T 03 445 1826
E cromwell@ppgroup.co.nz

Dunstan Road Subdivision

Lots 1 - 62 & 100 Being a Subdivision of Pt's Lot's 12 & 13 DP 3194

Surveyed		Original Size	Scale
Designed	PD	A3	1:2000
Drawn	KRG		
Checked	PD		DO NOT SCALE
Approved	PD		
Job Ref	Sheet No	Revision No	Date Plotted
A4814_SCM	2	B	21/09/2020

Appendix E
Soil Sampling Location Plan



wsp	**Project:** 269 Dunstan Road **Project Number:** 6-XZ371.01 **Client:** Molineux Lifestyle Village Ltd	**Sample Location Plan**

Appendix F

Hill Laboratories CoC and Results

Hill Laboratories
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ANALYSIS REQUEST

R J Hill Laboratories Limited
1 Clyde Street Hamilton 3216
Private Bag 3205
Hamilton 3240 New Zealand

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W www.hill-laboratories.com

Job No: **180 6809** Date Recv: 11-Jul-17 08:42
Received by: Melody Walker

Quote No 82748
Primary Contact EDH
Submitted By EDH
Client Name Opus International
Address 69 Tarbert Street
Alexandra Postcode 9310
Phone 03 440 6218 Mobile
Email elizabeth.hannon@opus.
Charge To OPUS International Consultants Limited 224
Client Reference Dunstan Rd.
Order No

Results To Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.
☒ Email Primary Contact ☐ Email Submitter ☐ Email Client
☐ Email Other
☐ Other

ADDITIONAL INFORMATION

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time:
☐ Tick if you require COC to be emailed back Name: Signature:

Received at Hill Laboratories Date & Time: Name: Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 5.4

☐ Sample & Analysis details checked
Signature:

Priority ☐ Low ☐ Normal ☑ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)
NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

Quoted Sample Types
Soil (Soil), Ground Water (GW), TCLP Extract (TCLP), Building Material (BM)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	S 1 @ 0.	7/7/17	S	Composite
2	S 2 @ 0.		S	Heavy metals with mercury (HMHgSoil) organochlorine Pesticides Screening (OCPsc)
3	S 3 @ 0.		S	Composite
4	S 4 @ 0		S	HMHgs Soil OCPsc
5	S 5 @ 0.		S	Composite
6	S 6 @ 0.		S	HMHgs Soil OCPsc
7	S 7 @ 0.		S	Composite
8	S 8 @ 0.		S	HMHgs Soil OCPsc
9	S 9 @ 0.		S	~~TPH~~ TPH + BTEX Profile (TPH01BXp)
10	S 10 @ 0.		S	

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required
11	S 11 @ 0.	7/7/17	S	Composite
12	S 12 @ 0.		S	HMHgs Soil OCPsc
13	S 13 @ 0.		S	Composite
14	S 14 @ 0.		S	HMHgs Soil OCPsc
15	S 15 @ 0.		S	~~HMHgs~~ Composite
16	S 16 @ 0.		S	HMHgs Soil OcPsc
17	S 17 @ 0.		S	HMHgs Soil OcPsc
18	S 18 @ 0.		S	TPH + BTEX Profile
19	S 19 @ 0.		S	TPH + BTEX Profile
20	S 20 @ 0.		S	HMHgs Soil OCPsc
21	S 21 @ 0.		S	HMHgs Soil OCPsc
22	S 22 @ 0.		S	HMHgs Soil OCPsc
23	S 23 @ 0.		S	~~PAH~~ TPH + PAH + BTEX Profile
24	S 24 @ 0.		S	HMHgs Soil OCPsc
25	S 25 @ 0.		S	HMHgs Soil OCPsc
26	S 26 @ 0.		S	HMHgs Soil OCPsc
27	S 27 @ 0.	↓	S	HMHgs Soil OCPsc
28	S 28 @ 0.	10/7/17	S	Composite
29	S 29 @ 0.		S	HMHgs Soil OcPsc
30	S 30 @ 0		S	Composite
31	S 31 @ 0.		S	HMHgs Soil OCPsc
32	S 32 @ 0		S	Composite
33	S 33 @ 0.		S	HMHgs Soil OCPsc
34	S 34 @ 0.		S	Composite
35	S 35 @ 0.	↓	S	HMHgs Soil OCPsc
36				
37				
38				
39				
40				

KB Item 23775 Version 2

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Job Information Summary

Client:	Opus International Consultants Limited	**Lab No:**	1806809
Contact:	Elizabeth Hannon	**Date Registered:**	12-Jul-2017 9:29 am
	C/- Opus International Consultants Limited	**Priority:**	High
	PO Box 273	**Quote No:**	82748
	Alexandra 9340	**Order No:**	
		Client Reference:	Dunstan Rd
		Add. Client Ref:	
		Submitted By:	Elizabeth Hannon
		Charge To:	OPUS International Consultants Limited
		Target Date:	18-Jul-2017 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	S1@0.2 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
2	S2@0.2 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
3	S3@0.15 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
4	S4@0.2 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
5	S5@0.15 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
6	S6@0.2 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
7	S7@0.2 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
8	S8@0.2 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
9	S9@0.15 07-Jul-2017	Soil	GSoil300	TPH + BTEX profile, Soil
10	S10@0.15 07-Jul-2017	Soil	GSoil300	Hold Cold
11	S11@0.2 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
12	S12@0.2 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
13	S13@0.15 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
14	S14@0.2 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
15	S15@0.2 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
16	S16@0.2 07-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
17	S17@0.2 07-Jul-2017	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
18	S18@0.2 07-Jul-2017	Soil	GSoil300	TPH + BTEX profile, Soil
19	S19@0.15 07-Jul-2017	Soil	GSoil300	TPH + BTEX profile, Soil
20	S20@0.2 07-Jul-2017	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
21	S21@0.2 07-Jul-2017	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
22	S22@0.2 07-Jul-2017	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
23	S23@0.2 07-Jul-2017	Soil	GSoil300	TPH + PAH + BTEX profile
24	S24@0.15 07-Jul-2017	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
25	S25@0.15 07-Jul-2017	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
26	S26@0.15 07-Jul-2017	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
27	S27@0.2 07-Jul-2017	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
28	S28@0.2 10-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
29	S29@0.15 10-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
30	S30@0.25 10-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
31	S31@0.2 10-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
32	S32@0.15 10-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
33	S33@0.2 10-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
34	S34@0.15 10-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
35	S35@0.2 10-Jul-2017	Soil	GSoil300	Composite Environmental Solid Samples
36	Composite of S1@0.2 & S2@0.2	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
37	Composite of S3@0.15 & S4@0.2	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
38	Composite of S5@0.15 & S6@0.2	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
39	Composite of S7@0.2 & S8@0.2	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
40	Composite of S11@0.2 & S12@0.2	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
41	Composite of S13@0.15 & S14@0.2	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
42	Composite of S15@0.2 & S16@0.2	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
43	Composite of S28@0.2 & S29@0.15	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
44	Composite of S30@0.25 & S31@0.2	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
45	Composite of S32@0.15 & S33@0.2	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil
46	Composite of S34@0.15 & S35@0.2	Soil	GSoil300	Heavy Metals with Mercury, Screen Level; Organochlorine Pesticides Screening in Soil

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	17, 20-22, 24-27, 36-46
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample [KBIs:5782,26887,3629]	0.05 - 0.10 mg/kg dry wt	9, 18-19, 23
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	17, 20-22, 24-27, 36-46
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	0.010 - 0.05 mg/kg dry wt	23
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample [KBIs:5786,2805,10734]	8 - 60 mg/kg dry wt	9, 18-19, 23
TPH + PAH + BTEX profile	Sonication extraction, SPE cleanup, GC & GC-MS analysis	0.010 - 60 mg/kg dry wt	23
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry), gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550	0.10 g/100g as rcvd	9, 17-27, 36-46
Composite Environmental Solid Samples	Individual sample fractions mixed together to form a composite fraction.	-	1-8, 11-16, 28-35
1-Methylnaphthalene	Sonication extraction, SPE cleanup, GC-MS SIM analysis. Modified US EPA 8270.	0.010 mg/kg dry wt	23
2-Methylnaphthalene	Sonication extraction, SPE cleanup, GC-MS SIM analysis. Modified US EPA 8270.	0.010 mg/kg dry wt	23
Perylene	Sonication extraction, SPE cleanup, GC-MS SIM analysis. Modified US EPA 8270.	0.010 mg/kg dry wt	23

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ANALYSIS REPORT

Client:	Opus International Consultants Limited	**Lab No:**	1806809 SPv1
Contact:	Elizabeth Hannon	**Date Received:**	11-Jul-2017
	C/- Opus International Consultants Limited	**Date Reported:**	19-Jul-2017
	PO Box 273	**Quote No:**	82748
	Alexandra 9340	**Order No:**	
		Client Reference:	Dunstan Rd
		Submitted By:	Elizabeth Hannon

Sample Type: Soil

Sample Name:		S9@0.15 07-Jul-2017	S17@0.2 07-Jul-2017	S18@0.2 07-Jul-2017	S19@0.15 07-Jul-2017	S20@0.2 07-Jul-2017
Lab Number:		1806809.9	1806809.17	1806809.18	1806809.19	1806809.20
Individual Tests						
Dry Matter	g/100g as rcvd	91	92	86	97	92
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	4	-	-	5
Total Recoverable Cadmium	mg/kg dry wt	-	< 0.10	-	-	< 0.10
Total Recoverable Chromium	mg/kg dry wt	-	4	-	-	3
Total Recoverable Copper	mg/kg dry wt	-	7	-	-	11
Total Recoverable Lead	mg/kg dry wt	-	6.7	-	-	8.3
Total Recoverable Mercury	mg/kg dry wt	-	< 0.10	-	-	< 0.10
Total Recoverable Nickel	mg/kg dry wt	-	5	-	-	4
Total Recoverable Zinc	mg/kg dry wt	-	17	-	-	18
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	-	< 0.05	< 0.05	-
Toluene	mg/kg dry wt	< 0.05	-	< 0.05	< 0.05	-
Ethylbenzene	mg/kg dry wt	< 0.05	-	< 0.05	< 0.05	-
m&p-Xylene	mg/kg dry wt	< 0.10	-	< 0.10	< 0.10	-
o-Xylene	mg/kg dry wt	< 0.05	-	< 0.05	< 0.05	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	< 0.011	-	-	< 0.011
alpha-BHC	mg/kg dry wt	-	< 0.011	-	-	< 0.011
beta-BHC	mg/kg dry wt	-	< 0.011	-	-	< 0.011
delta-BHC	mg/kg dry wt	-	< 0.011	-	-	< 0.011
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.011	-	-	< 0.011
cis-Chlordane	mg/kg dry wt	-	< 0.011	-	-	< 0.011
trans-Chlordane	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	< 0.04	-	-	< 0.04
2,4'-DDD	mg/kg dry wt	-	< 0.011	-	-	< 0.011
4,4'-DDD	mg/kg dry wt	-	< 0.011	-	-	< 0.011
2,4'-DDE	mg/kg dry wt	-	< 0.011	-	-	< 0.011
4,4'-DDE	mg/kg dry wt	-	< 0.011	-	-	< 0.011
2,4'-DDT	mg/kg dry wt	-	< 0.011	-	-	< 0.011
4,4'-DDT	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Total DDT Isomers	mg/kg dry wt	-	< 0.07	-	-	< 0.07
Dieldrin	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Endosulfan I	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Endosulfan II	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Endosulfan sulphate	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Endrin	mg/kg dry wt	-	< 0.011	-	-	< 0.011

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.

Sample Type: Soil						
Sample Name:		S9@0.15 07-Jul-2017	S17@0.2 07-Jul-2017	S18@0.2 07-Jul-2017	S19@0.15 07-Jul-2017	S20@0.2 07-Jul-2017
Lab Number:		1806809.9	1806809.17	1806809.18	1806809.19	1806809.20
Organochlorine Pesticides Screening in Soil						
Endrin aldehyde	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Endrin ketone	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Heptachlor	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Heptachlor epoxide	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Hexachlorobenzene	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Methoxychlor	mg/kg dry wt	-	< 0.011	-	-	< 0.011
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	-	< 8	< 8	-
C10 - C14	mg/kg dry wt	< 20	-	< 20	1,080	-
C15 - C36	mg/kg dry wt	< 40	-	< 40	15,700	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	-	< 70	16,800	-

Sample Name:		S21@0.2 07-Jul-2017	S22@0.2 07-Jul-2017	S23@0.2 07-Jul-2017	S24@0.15 07-Jul-2017	S25@0.15 07-Jul-2017
Lab Number:		1806809.21	1806809.22	1806809.23	1806809.24	1806809.25
Individual Tests						
Dry Matter	g/100g as rcvd	91	92	74	95	96
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	4	-	5	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	-	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	4	3	-	3	4
Total Recoverable Copper	mg/kg dry wt	13	8	-	7	8
Total Recoverable Lead	mg/kg dry wt	8.9	6.4	-	6.3	5.5
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	-	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	4	4	-	5	5
Total Recoverable Zinc	mg/kg dry wt	16	33	-	18	15
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	-	-	< 0.06	-	-
Toluene	mg/kg dry wt	-	-	0.07	-	-
Ethylbenzene	mg/kg dry wt	-	-	< 0.06	-	-
m&p-Xylene	mg/kg dry wt	-	-	< 0.12	-	-
o-Xylene	mg/kg dry wt	-	-	< 0.06	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
alpha-BHC	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
beta-BHC	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
delta-BHC	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
gamma-BHC (Lindane)	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
cis-Chlordane	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
trans-Chlordane	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	-	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
4,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
2,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
4,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
2,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
4,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Total DDT Isomers	mg/kg dry wt	< 0.07	< 0.07	-	< 0.07	< 0.07
Dieldrin	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Endosulfan I	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Endosulfan II	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Endosulfan sulphate	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Endrin	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Endrin aldehyde	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Endrin ketone	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011

Sample Type: Soil						
Sample Name:		S21@0.2 07-Jul-2017	S22@0.2 07-Jul-2017	S23@0.2 07-Jul-2017	S24@0.15 07-Jul-2017	S25@0.15 07-Jul-2017
Lab Number:		1806809.21	1806809.22	1806809.23	1806809.24	1806809.25
Organochlorine Pesticides Screening in Soil						
Heptachlor	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Heptachlor epoxide	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Hexachlorobenzene	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Methoxychlor	mg/kg dry wt	< 0.011	< 0.011	-	< 0.011	< 0.011
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	-	-	0.026	-	-
2-Methylnaphthalene	mg/kg dry wt	-	-	0.017	-	-
Perylene	mg/kg dry wt	-	-	< 0.014	-	-
Acenaphthylene	mg/kg dry wt	-	-	< 0.014	-	-
Acenaphthene	mg/kg dry wt	-	-	< 0.014	-	-
Anthracene	mg/kg dry wt	-	-	0.039	-	-
Benzo[a]anthracene	mg/kg dry wt	-	-	0.071	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	0.040	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	< 0.014	-	-
Benzo[e]pyrene	mg/kg dry wt	-	-	0.030	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	< 0.014	-	-
Benzo[k]fluoranthene	mg/kg dry wt	-	-	< 0.014	-	-
Chrysene	mg/kg dry wt	-	-	0.069	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	< 0.014	-	-
Fluoranthene	mg/kg dry wt	-	-	0.162	-	-
Fluorene	mg/kg dry wt	-	-	0.014	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	< 0.014	-	-
Naphthalene	mg/kg dry wt	-	-	< 0.07	-	-
Phenanthrene	mg/kg dry wt	-	-	0.152	-	-
Pyrene	mg/kg dry wt	-	-	0.147	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	-	-	< 8	-	-
C10 - C14	mg/kg dry wt	-	-	< 20	-	-
C15 - C36	mg/kg dry wt	-	-	830	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	-	-	830	-	-

Sample Name:		S26@0.15 07-Jul-2017	S27@0.2 07-Jul-2017	Composite of S1@0.2 & S2@0.2	Composite of S3@0.15 & S4@0.2	Composite of S5@0.15 & S6@0.2
Lab Number:		1806809.26	1806809.27	1806809.36	1806809.37	1806809.38
Individual Tests						
Dry Matter	g/100g as rcvd	91	92	91	92	90
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	4	6	6	7
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	4	4	5	4	6
Total Recoverable Copper	mg/kg dry wt	7	8	9	8	11
Total Recoverable Lead	mg/kg dry wt	7.2	6.8	10.9	7.8	11.7
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	5	5	7	6	8
Total Recoverable Zinc	mg/kg dry wt	19	19	26	22	34
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
alpha-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
beta-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
delta-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
gamma-BHC (Lindane)	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
cis-Chlordane	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
trans-Chlordane	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011

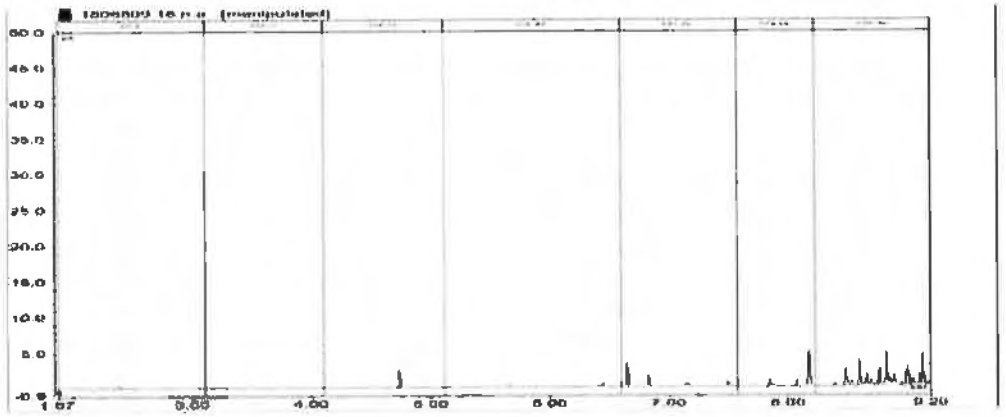
Sample Type: Soil						
Sample Name:		S26@0.15 07-Jul-2017	S27@0.2 07-Jul-2017	Composite of S1@0.2 & S2@0.2	Composite of S3@0.15 & S4@0.2	Composite of S5@0.15 & S6@0.2
Lab Number:		1806809.26	1806809.27	1806809.36	1806809.37	1806809.38
Organochlorine Pesticides Screening in Soil						
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
4,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
2,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
4,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
2,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
4,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Total DDT Isomers	mg/kg dry wt	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Dieldrin	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Endosulfan I	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Endosulfan II	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Endosulfan sulphate	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Endrin	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Endrin aldehyde	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Endrin ketone	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Heptachlor	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Heptachlor epoxide	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Hexachlorobenzene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Methoxychlor	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011

Sample Name:		Composite of S7@0.2 & S8@0.2	Composite of S11@0.2 & S12@0.2	Composite of S13@0.15 & S14@0.2	Composite of S15@0.2 & S16@0.2	Composite of S28@0.2 & S29@0.15
Lab Number:		1806809.39	1806809.40	1806809.41	1806809.42	1806809.43
Individual Tests						
Dry Matter	g/100g as rcvd	92	89	84	87	95
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	7	6	6	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.16	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	4	6	6	6	3
Total Recoverable Copper	mg/kg dry wt	8	16	14	12	8
Total Recoverable Lead	mg/kg dry wt	6.2	26	12.5	12.5	6.3
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	5	7	7	7	4
Total Recoverable Zinc	mg/kg dry wt	20	67	35	32	20
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
alpha-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
beta-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
delta-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
gamma-BHC (Lindane)	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
cis-Chlordane	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
trans-Chlordane	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
4,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
2,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
4,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
2,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
4,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
Total DDT Isomers	mg/kg dry wt	< 0.07	< 0.07	< 0.08	< 0.07	< 0.07
Dieldrin	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
Endosulfan I	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
Endosulfan II	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011

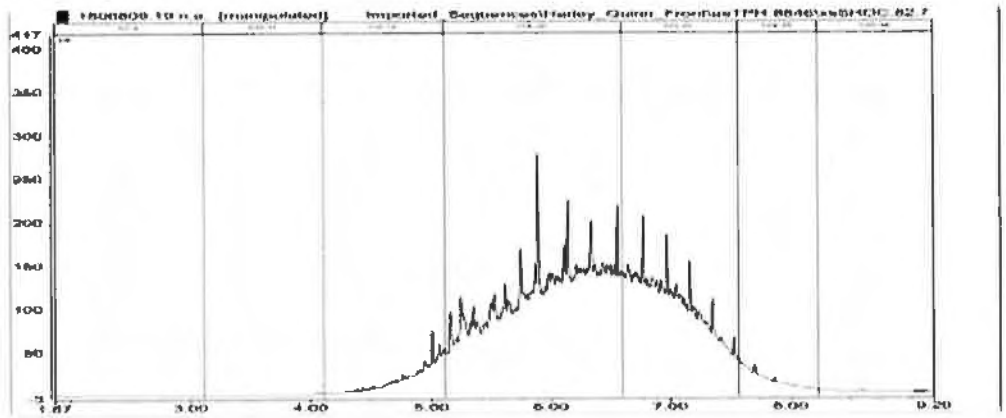
Sample Type: Soil						
Sample Name:		Composite of S7@0.2 & S8@0.2	Composite of S11@0.2 & S12@0.2	Composite of S13@0.15 & S14@0.2	Composite of S15@0.2 & S16@0.2	Composite of S28@0.2 & S29@0.15
Lab Number:		1806809.39	1806809.40	1806809.41	1806809.42	1806809.43
Organochlorine Pesticides Screening in Soil						
Endosulfan sulphate	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
Endrin	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
Endrin aldehyde	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
Endrin ketone	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
Heptachlor	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
Heptachlor epoxide	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
Hexachlorobenzene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011
Methoxychlor	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.012	< 0.011

Sample Name:		Composite of S30@0.25 & S31@0.2	Composite of S32@0.15 & S33@0.2	Composite of S34@0.15 & S35@0.2		
Lab Number:		1806809.44	1806809.45	1806809.46		
Individual Tests						
Dry Matter	g/100g as rcvd	93	93	91	-	-
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	6	5	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	-
Total Recoverable Chromium	mg/kg dry wt	3	4	4	-	-
Total Recoverable Copper	mg/kg dry wt	9	8	8	-	-
Total Recoverable Lead	mg/kg dry wt	5.6	7.2	7.1	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	-
Total Recoverable Nickel	mg/kg dry wt	4	6	5	-	-
Total Recoverable Zinc	mg/kg dry wt	19	20	17	-	-
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	< 0.011	< 0.011	< 0.011	-	-
2,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
4,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	< 0.011	-	-
Total DDT Isomers	mg/kg dry wt	< 0.07	< 0.07	< 0.07	-	-
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	-	-

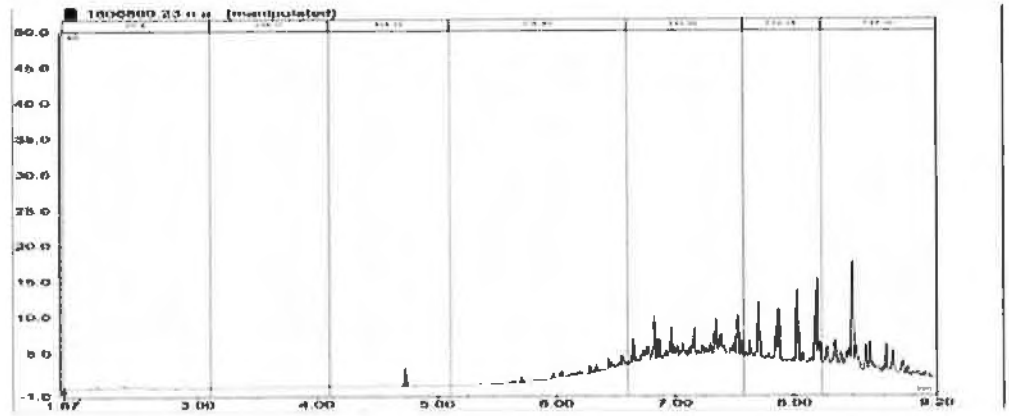
1506809.18
S18@0.2 07-Jul-2017
Client Chromatogram for TPH by FID



1506809.19
S19@0.15 07-Jul-2017
Client Chromatogram for TPH by FID



1506809.23
S23@0.2 07-Jul-2017
Client Chromatogram for TPH by FID



Analyst's Comments

It was observed that the container for sample 1806809/18 was not completely filled. Volatile loss may have occurred due to the headspace created in the container.

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	17, 20-22, 24-27, 36-46
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample [KBIs:5782,26687,3629]	0.05 - 0.10 mg/kg dry wt	9, 18-19, 23
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	17, 20-22, 24-27, 36-46
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	0.010 - 0.05 mg/kg dry wt	23
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/M/E Petroleum Industry Guidelines. Tested on as received sample [KBIs:5786,2805,10734]	8 - 60 mg/kg dry wt	9, 18-19, 23
TPH + PAH + BTEX profile	Sonication extraction, SPE cleanup, GC & GC-MS analysis	0.010 - 60 mg/kg dry wt	23
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry), gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	9, 17-27, 36-46
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-8, 11-16, 28-35
1-Methylnaphthalene	Sonication extraction, SPE cleanup, GC-MS SIM analysis. Modified US EPA 8270.	0.010 mg/kg dry wt	23
2-Methylnaphthalene	Sonication extraction, SPE cleanup, GC-MS SIM analysis. Modified US EPA 8270.	0.010 mg/kg dry wt	23
Perylene	Sonication extraction, SPE cleanup, GC-MS SIM analysis. Modified US EPA 8270.	0.010 mg/kg dry wt	23

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.

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Ara Heron BSc (Tech)
Client Services Manager - Environmental

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