



26 November 2021

David Moore
Director
Golf Strategy Group Limited
60 Clearwater Avenue
CHRISTCHURCH 8051

Dear David,

MURIWAI DOWNS GOLF PROJECT: DETAILED SITE INVESTIGATION

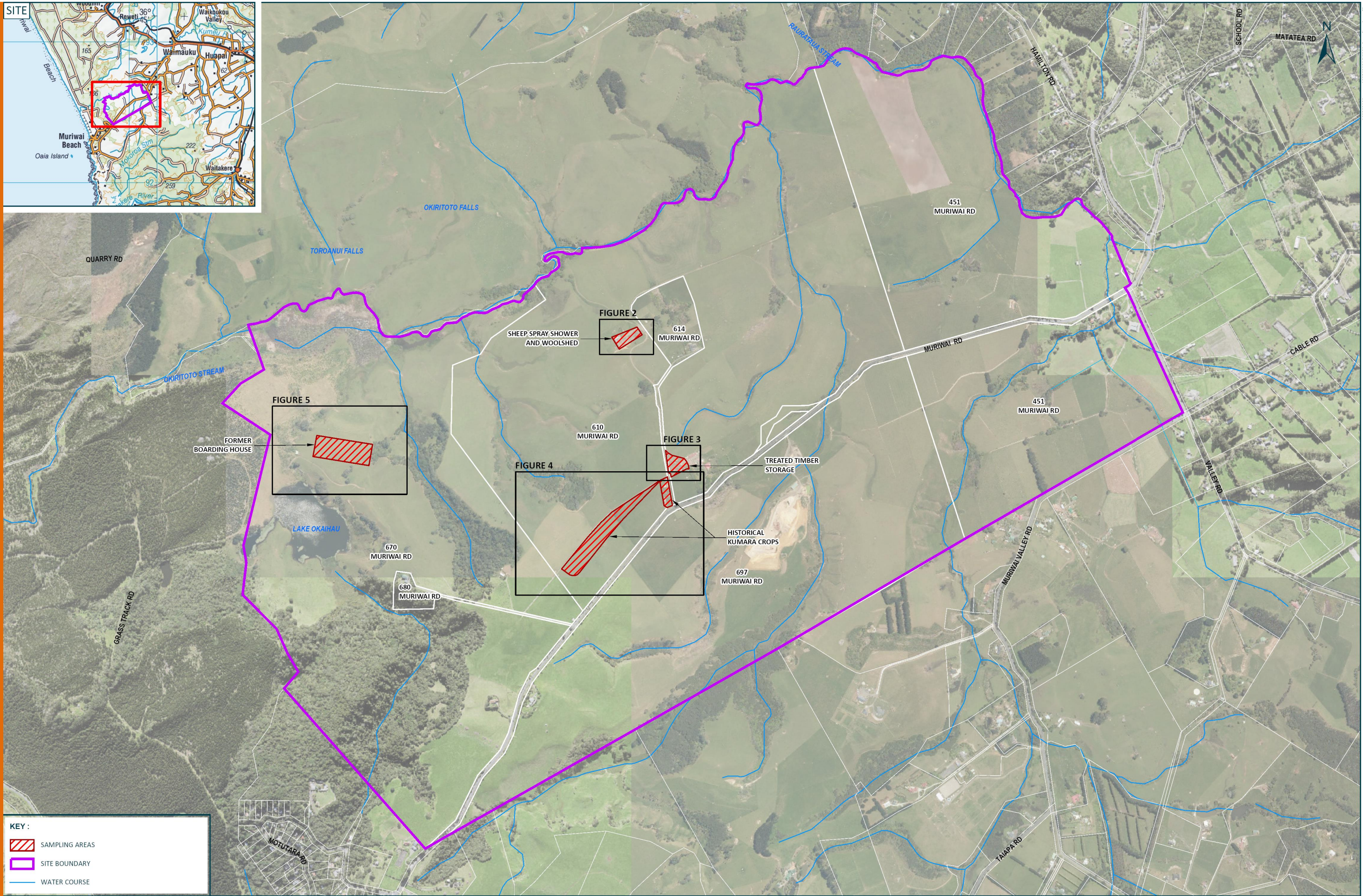
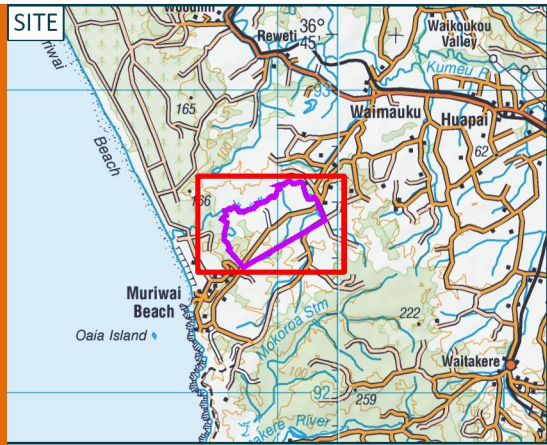
1.0 Introduction and Background

Pattle Delamore Partners Limited (PDP) has been engaged by Golf Strategy Group Limited (GSG) to undertake a Detailed Site Investigation (DSI) of the properties located at 451, 610, 614, 670, 680 and 697 Muriwai Road, Waimauku, otherwise known as Muriwai Downs ('the site'; Figure 1).

This DSI builds upon the Updated Preliminary Site Investigation (PSI) report completed by PDP in 2021, which identified a number of potential areas/activities at discrete locations across the site categorised under the Hazardous Activity and Industry List (HAIL)¹ (PDP, 2021a). These included:

- ∴ A Historical Kumara Crops area - Potential impacts from various contaminants (including persistent organic pesticides) from historical horticultural activities (kumara crops) in the centre of the site (current paddocks between the workshop area and the "Kumara Shed");
- ∴ A Sheep Spray Shower & Woolshed area - Potential impacts from various contaminants (including persistent organic pollutants) from the sheep spray shower (with areas of hard seal), holding/draining pens and exit races located near the woolshed, and the potential historical storage of these chemicals in the woolshed itself;
- ∴ Potential impacts from various contaminants from storage of timber (including a long-term Treated Timber Storage area in the paddocks to the west of the workshop as well as the timber stored within a building in the workshop area and under the woolshed);
- ∴ Localised lead (and potentially arsenic) impacts from painted surfaces on current/historical houses/structures (including a Former Boarding House area) constructed prior to the mid-1970s;

¹ The Hazardous Activities and Industries List (HAIL) is a compilation of activities and industries that are considered likely to cause land contamination resulting from hazardous substance use, storage or disposal. The HAIL is intended to identify most situations in New Zealand where hazardous substances could cause, and in many cases have caused, land contamination.



KEY :

- SAMPLING AREAS
- SITE BOUNDARY
- WATER COURSE

0 200 400
METRES

SCALE : 1:12,500 (A3)

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FIGURE
FIG 1: SITE LOCATION AND SAMPLING AREA PLAN

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MURIWAI DOWNS GOLF PROJECT - DETAILED SITE INVESTIGATION

- ∴ Asbestos/asbestos containing material (ACM) impacts to soils from current/historical building materials that are observed to be in a deteriorated condition or could have been potentially removed (including from the Former Boarding House area) using inappropriate practises (and not to current standards);
- ∴ Potential hydrocarbon impacts from bulk storage of diesel and petrol in un-bunded aboveground storage tanks (ASTs) in the workshop area (including a recent [as of December 2020] spill from the diesel AST) and from fuel drums stored adjacent to the ASTs;
- ∴ Potential hydrocarbon impacts from the storage of old fuel drums in the workshop;
- ∴ Potential heavy metal and hydrocarbon impacts from the storage of fuel/chemicals and burning of refuse in (and with respect to the refuse; adjacent to) the main workshop building; and
- ∴ Potential impacts from various contaminants from storage of chemicals in the hazardous chemicals storage shed located in the workshop area.

The PSI report concluded that the *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* ('the NESCS') apply to discrete, localised pieces of land where these potential contamination sources have been identified, and would be triggered by the proposed activities anticipated to be undertaken in the future, which are expected to include change of land use (from rural to a combination of residential, rural residential, commercial and recreational) and soil disturbance. A DSI was recommended to be undertaken on the identified potential contamination sources to determine the nature and extent of impacts to ground as a result of these current/historical activities.

This DSI has been carried out to determine the nature and extent of impacts of the contaminants of potential concern (COPC) to ground (that is to be disturbed by the proposed development as outlined in Section 3.0) as a result of the current or historical activities that have or have potentially been undertaken prior to completing any bulk soil disturbance activities on the site.

This DSI has also been undertaken to support the consenting of the proposed Muriwai Downs Golf Project ('the project'). PDP understand GSG has been appointed by The Bears Home Project Management Limited ('the Applicant') to manage the project.

This DSI has been directed and reviewed by Suitably Qualified and Experienced Practitioners (SQEPs) with respect to contaminated land and has been undertaken in accordance with the Ministry for the Environment's (MfE's) *Contaminated Land Management Guidelines (CLMG) No.1 – Reporting on Contaminated Sites in New Zealand* (MfE, 2021a), and the principles contained in *CLMG No.5 – Site Investigation and Analysis of Soils* (MfE, 2021b). A certifying statement to this effect is provided in Appendix A.

This report provides the findings of the investigation.

2.0 Objectives and Scope of Work

2.1 Objectives

The key objectives of this DSI are to:

- ∴ Assess the likelihood of human health and environmental risk associated with the proposed soil disturbance and change of land use through soil sampling and comparison of analytical results against relevant guidelines/criteria; and

- ✧ Assess the requirements for potential contaminated land consents in relation to the NESCS and the Auckland Unitary Plan: Operative in Part (AUP:OP) (Auckland Council (AC), 2021) contaminated land rules.

2.2 Scope of Work

In order to meet the project objectives, the following scope of work, as detailed in PDP's Sampling and Analysis Plan (SAP; 2021b), was undertaken:

- ✧ Soil sampling across four discrete areas within the site with identified potential or known contamination/HAIL sources² (as shown in Figure 1) that are proposed to be disturbed/developed (as described in Section 3.0).
- ✧ Laboratory analysis of collected soil samples for key COPC based on recorded site use, including:
 - Heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc).
 - Organochlorine pesticide (OCPs).
 - Polycyclic aromatic hydrocarbon (PAHs).
 - Pentachlorophenol (PCP).
 - Tributyltin (TBT).
 - Presence/absence asbestos in soil.
- ✧ Assessment of the analytical sample results against the relevant soil contaminant standards (SCSs) and environmental guideline values (EGVs) from applicable guideline documents.
- ✧ Provision of this report, including updating the conceptual site model (CSM) for the contaminant sources identified and providing an assessment of the applicable NESCS and contaminated land rules of the AUP:OP.

3.0 Proposed Development

PDP understands the project intends to establish a golf resort facility with short-stay accommodation, and associated clubhouse and built facilities (as shown in the Master Site Layout Plan provided in Appendix B). The project is described as the construction, operation and maintenance of:

- ✧ A 19-hole golf course with warm-up fairway and short-game practice area;
- ✧ A clubhouse;
- ✧ A sports academy (including an academy building, driving range, practice green, 9-hole short course, and indoor and outdoor tennis facilities);
- ✧ A golf and property maintenance complex;
- ✧ A luxury lodge;
- ✧ Groundwater and surface water abstraction facilities;
- ✧ Off-stream water storage reservoir;
- ✧ Significant ecological restoration and enhancement works; and
- ✧ Various supporting infrastructure associated with the above.

² Including the areas where the historical kumara crops, treated timber storage, sheep spray shower and woolshed, and former boarding house were/are located.

PDP understands that the golf course and associated facilities will operate in tandem with the site’s current use as a farm.

4.0 Site Description

4.1 Site Identification

The site is located in Muriwai, with rural/residential properties, farmland and Muriwai Valley Road forming the site boundary to the south; Okiritoto Stream and farmland to the north; rural/residential properties including horticultural activities along Muriwai and Hamilton Roads to the east; and bush/forestry land to the west (Figure 1). Muriwai Road runs through the middle of the site.

The collection of properties that make up the site comprise multiple addresses and legal descriptions as listed in Table 1.

Table 1: Muriwai Downs Property Information		
Site Address	Description	Titles
451 Muriwai Road ¹	Lot 3 DP 196479, Lot 4 DP 187060, Sec 3 SO 41485	NA117B/171, NA125C/443
610 Muriwai Road	Lot 2 DP 196478	NA125C/442
614 Muriwai Road	Lot 1 DP 196478	NA125C/441
670 Muriwai Road	Lot 1 DP 187057	NA117B/168
	Lot 1 DP 191137 and Section 1 SO Plan 69201	NA134D/135
680 Muriwai Road	Lot 1 DP 163736	NA98D
697 Muriwai Road ²	Lot 5 DP 187061	NA117B/172
<p>Notes:</p> <ol style="list-style-type: none"> This property includes land to the north and south of Muriwai Road. Development is only earmarked for the part of this address that lies to the north of Muriwai Road and immediately adjacent to the south of Muriwai Road. Only the northeastern corner of this property is earmarked for development, making up part of the proposed off-stream water storage reservoir. 		

The site area is approximately 500 hectares (5,000,000 m²) in size. The site is currently largely pastoral land with accompanying dwellings and structures including five residential houses with associated garages and sheds, a workshop area containing multiple structures, a woolshed and a small number of barns and ancillary farm sheds. There is a small quarry in the middle of the 697 Muriwai Road property, which is excluded from the project and therefore has not been assessed as part of this DSI.

The surrounding land use is largely rural residential. Bush/forestry land exists to the west of the site. A full description of the site and surrounds is provided in the site’s Updated PSI report (PDP, 2021a).

4.2 Geology and Hydrogeology

The Geological Map of Auckland (Edbrooke, 2001) indicates that the site area is underlain by multiple geological units. The majority of the site is underlain by sandstone of the Awhitu Group, which is characterised by moderately to poorly consolidated cross-bedded, plane-parallel and ripple-laminated sandstone with paleosols, lignite and carbonaceous mudstone and sandstone. The eastern section of the site is underlain by alluvial and colluvial deposits of sand, silt, mud and clay with local gravel and peat beds while the western/northwestern section of the site is underlain by mobile dunes of loose sand in active, unvegetated or sparsely vegetated dune fields and deflation zones. In the central-east of the site is an area underlain by the Waatarua Formation, which is characterised by basalt flows, pillow lavas,

hyaloclastites and associated intrusives with minor basic andesite. Lastly, an area within the Okiritoto Stream in the northern section of the site is underlain by the Nihotupu Formation, which is characterised by submarine volcanoclastic grit, sandstone and siltstone. All potential HAIL areas identified across the site are underlain by sediments of the Awhitu Group.

The site has a topographic high in the southwestern corner of the site (~130 m RL) and slopes away to a topographic low of ~10 m RL at the Okiritoto Stream in the northwestern corner of the site. The remainder of the site is largely undulating with a slope towards either the Raurataua Stream in the east, Okiritoto Stream in the north or Lake Okaihau in the west. The surrounding land to the north and east is steep and hilly, and generally elevated compared to the adjacent land on the site. Lake Okaihau is in the western section of the site at around 32 m RL.

Borehole records from AC for the site and surrounding area indicates a measured groundwater level of 100 m below ground level at 75 Motutara Road (located to the southwest of the site). Groundwater in the east of the site is expected to generally flow in an east-northeast direction towards Raurataua Stream while over the rest of the site groundwater is expected to flow generally in a north/northwest direction towards Okiritoto Stream and Lake Okaihau.

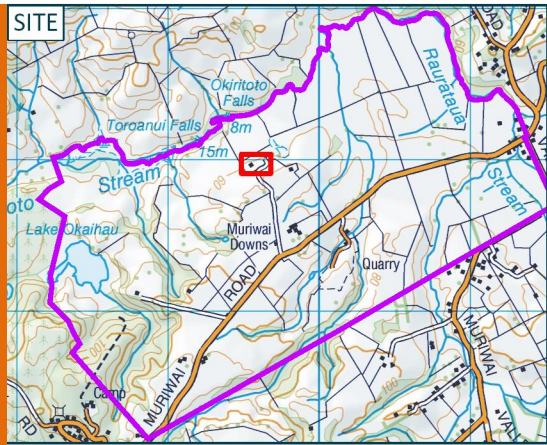
Local geology, as identified during this investigation, generally consists of a layer of silty/sandy topsoil to between approximately 0.1 and 0.4 m below ground level (bgl). Below this is a layer of clayey silt/silty clay to between 1 and 1.3 m bgl. Beneath this layer is generally sand/silty sand, consistent with the published geology (i.e. the Awhitu Group). Groundwater was not encountered in any of the hand augered locations down to the target depths but suspected perched groundwater was encountered at two locations within the Sheep Spray Shower & Woolshed area at 0.8 m bgl. Selected bore logs representative of the sampling areas are provided in Appendix C.

5.0 Site Investigation

The number of sample locations, depth ranges for sampling, and the COPC that the samples were analysed for were informed by the Updated PSI report for the site (PDP, 2021a), with reference to the proposed development as outlined in Section 3.0. The SAP (PDP, 2021b) was prepared, which detailed the site investigation activities and rationale. The SAP is included for reference purposes within this report in Appendix D. Following the scope of work in the SAP, soil samples were collected from 73 locations across the following sampling areas³ on 6, 10 and 11 August 2021:

- ∴ Sheep Spray Shower & Woolshed area (as shown in Figure 2).
- ∴ Treated Timber Storage area (as shown in Figure 3).
- ∴ Historical Kumara Crops area (as shown in Figure 4).
- ∴ Former Boarding House area (as shown in Figure 5).

³ Based on the total area of the site to be disturbed/developed (as part of the golf course) that intersects with the discrete areas across the site with potential or known contamination/HAIL sources. The other discrete areas across the site with identified potential or known contamination/HAIL sources (including the timber stored within a building in the workshop area and under the woolshed; other current/historical houses/structures constructed prior to the mid-1970s; bulk storage of diesel and petrol in un-bunded ASTs, the storage of old fuel drums and fuel/chemicals, and burning of refuse in the workshop area; and the storage of chemicals in the hazardous chemicals storage shed located in the workshop area) were not assessed as part of this DSI as no soil disturbance and/or land use change has been proposed at those locations.



KEY :

- SAMPLE LOCATIONS
- SAMPLING AREA
- SITE BOUNDARY



0 10 20
METRES

SCALE : 1:500 (A3)

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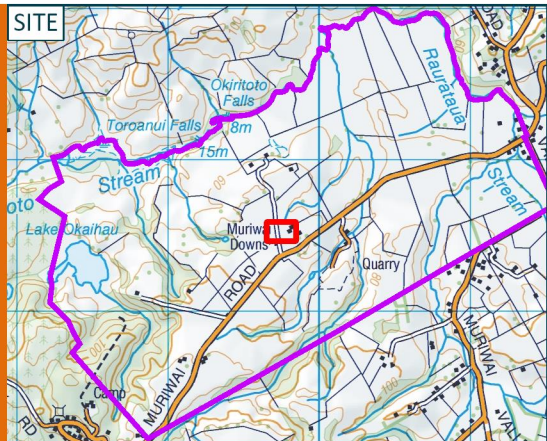
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FIGURE
FIG 2: SHEEP SPRAY SHOWER AND WOOLSHED SAMPLING LOCATION PLAN

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KEY :

- SAMPLE LOCATIONS
- SAMPLING AREA
- SITE BOUNDARY



SCALE : 1:500 (A3)

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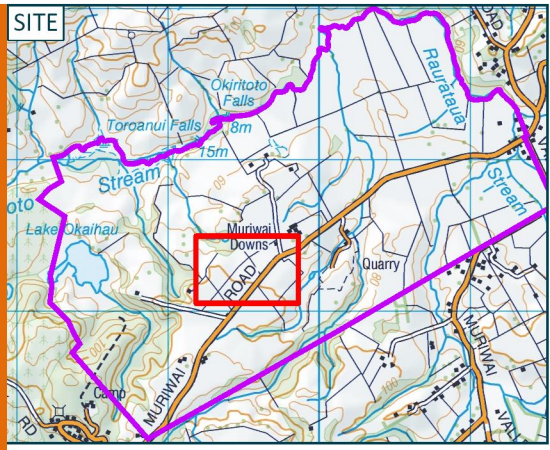
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FIGURE
FIG 3: TREATED TIMBER STORAGE SAMPLING LOCATION PLAN

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KEY :

- SAMPLE LOCATIONS
- SAMPLING AREA
- SITE BOUNDARY
- WATER COURSE



SCALE : 1:1,750 (A3)

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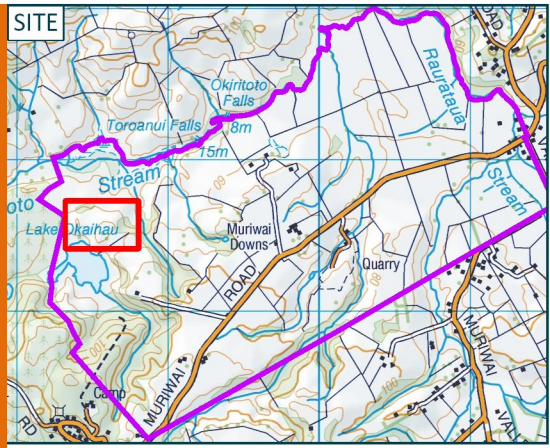
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 2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.

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FIGURE
FIG 4: HISTORICAL KUMARA CROPS SAMPLING LOCATION PLAN

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KEY :

- SAMPLE LOCATIONS
- SAMPLING AREA
- SITE BOUNDARY

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METRES
SCALE : 1:1,250 (A3)
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FIGURE
 FIG 5: FORMER BOARDING HOUSE SAMPLING LOCATION PLAN

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5.1 Soil Sampling Methodology

Soil sampling was undertaken in accordance with the principles contained in *CLMG No.5 – Site Investigation and Analysis of Soils* (MfE, 2021b).

The investigation comprised:

- ∴ Collecting soil samples using a stainless-steel spade from the surface (~0.1 m bgl) and near surface (~0.2 – 0.4 m bgl) across all four sampling areas; and
- ∴ Advancing bore holes with a stainless-steel hand auger to 1 m bgl at all 11 sampling locations in the Sheep Spray Shower & Woolshed area, as well as to 2 m bgl at one location (KC_SS06) in the Historical Kumara Crops area, and to 3 m bgl at one location (BH_SS13) in the Former Boarding House area.

Fresh nitrile gloves were worn at each new sample location. Samples were immediately placed into laboratory supplied glass and plastic jars, and chilled cool storage bins during the site works and subsequent transport to the analysing laboratory. At the completion of the site works, sample bins were sent directly to an IANZ accredited laboratory (Hill Laboratories Limited) in Hamilton and Christchurch under standard PDP Chain of Custody (CoC) procedures for the analyses indicated in Table 1 of the SAP⁴.

6.0 Applicable Guidelines and Criteria

The following assessment guidelines and criteria have been selected to enable a Tier 1 risk assessment of the soil sample results. These guideline values have been selected in accordance with the guidance provided in the MfE's (2011a) *CLMG No. 2 – Hierarchy and Application in New Zealand of Environmental Guideline Values*.

6.1 Background Concentrations

According to Regulation 5(9) of the NESCS, if a DSI can demonstrate that contaminants at a known/potential HAIL area are at/below published background concentrations, then the NESCS regulations do not apply. To assess heavy metal results, Auckland Council Background Concentrations for heavy metals are taken from the Non-volcanic Range Soils of Table E30.6.1.4.2 in the AUP:OP. Concentrations of hydrocarbon compounds (including PAHs) may be present naturally due to natural bush fires, volcanic eruptions and decaying organic matter but, as these are extremely variable, background data is not presented for these compounds. Relevant background concentrations are summarised in Table 2 below in Section 7.2.

Note that for anthropogenic contaminants such as OCPs, PCP or TBT, there are no concentrations above the laboratory limit of reporting (LOR) that can be considered to be 'background'. A detection of these contaminants in a sample equates to an exceedance of background concentrations.

⁴ It should be noted that PDP considers that:

- The high potential for variability of analysis results between duplicate soil samples due to the heterogeneity of soils renders the ability to quantify variability as a result of error due to laboratory analysis or error due to field sampling techniques impractical. On this basis, duplicate samples were not obtained; and
- On the basis of the likely even distribution of COPC across the Historical Kumara Crops area, the primary soil samples collected from 28 surface locations were combined into seven composite soil samples by the laboratory for analysis.

6.2 Soil Contaminant Standards (NESCS)

The NESCS provides SCSs for seven inorganic substances and five organic compounds (or groups of compounds) (the SCSs are published in the *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health* (MfE, 2011b), which is incorporated by reference in to the NESCS). SCSs are available for these substances and compounds when present in soil, for five land use scenarios. The contaminants analysed at this site for which SCSs are available are arsenic, cadmium, chromium, copper, lead, DDT, dieldrin and benzo(a)pyrene (equivalent). As the project intends to establish a golf resort (as described in Section 3.0) and the areas of the site to be disturbed/developed as part of the golf course intersect with the discrete areas across the site with identified potential or known contamination/HAIL sources, commercial/industrial and recreational land use scenarios were adopted, which includes the following source-pathway-receptor assumptions:

- ∴ The selected commercial/industrial and recreational SCSs respectively assume that intended future land use will be:
 - Commercial site with varying degrees of exposed soil. These SCSs have been used to assess the potential risks to outdoor workers carrying out maintenance activities involving soil exposure to surface or near-surface soil through gardening and other landscaping activities, and occasional shallow excavation for routine underground service maintenance activities. This land use has been applied to all of the soil sample results on the basis that no soils are to be removed from the site (with reuse of surplus soils anticipated); and
 - Public/private green areas used for active sport and recreation. These SCSs have been used to assess the potential risks to the general public (i.e. golfers) following the proposed development.
- ∴ Potential receptors include site maintenance personnel and the general public (i.e. golfers) following the development.
- ∴ It has been assumed that the soil pH is 5, and that all lead is present in an inorganic form.

Relevant SCS are summarised in Table 2 below in Section 7.2.

6.3 Other Applicable Human Health Standards

For contaminants of concern that are not priority contaminants, the NESCS references the hierarchy defined in the MfE's *CLMG No.2 – Hierarchy and Application in New Zealand of Environmental Guideline Values* (MfE, 2011b).

In accordance with this hierarchy, the Australian National Environment Protection Council (NEPC) National Environment Protection (Assessment of Site Contamination) Measure (NEPM) *Guidelines on investigation levels for soil and groundwater* (NEPC, 2013) has been used for two heavy metals (nickel and zinc). Health-based investigation levels for 'Recreational C' and 'Commercial/Industrial D' land use have been selected in accordance with the proposed end use of the site and to protect site workers following the development work (and summarised in Table 2 below in Section 7.2). The NEPM describes the health-based investigation levels as being protective of the two selected land use scenarios as follows:

- ∴ 'Recreational C' – Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves) which should be subject to a site-specific assessment where appropriate.
- ∴ 'Commercial/Industrial D' – Commercial/industrial such as shops, offices, factories and industrial sites.

The Regional Screening Levels for Chemical Contaminants at Superfund Sites (US EPA regions 3, 6 and 9 [as of May 2021]) has been selected for PCP, tin and TBT.

In addition, the MfE's Petroleum Hydrocarbon Guidelines (MfE, 1999) has been used for two PAHs compounds (naphthalene and pyrene). The Tier 1 soil acceptance criteria for Commercial/Industrial use, All Pathways, sand, surface (<1 m bgl) depth have been conservatively selected (as Tier 1 soil acceptance criteria for recreational use have not been derived).

Relevant EGVs are summarised in Table 2 below in Section 7.2.

6.4 Auckland Council Criteria

Rule E30.6.1.4 of the AUP:OP sets out the soil acceptance criteria for the discharge of contaminants to comply with the Permitted Activity (PA) standards. The PA soil acceptance criteria referenced in this report have been selected from Table E30.6.1.4.1 and are summarised in Table 2 below in Section 7.2. Where a contaminant has both an associated background concentration and PA value, the higher of the two values is to be used as the appropriate discharge screening criteria.

7.0 Results

Results from sampling observations and laboratory soil analyses are outlined below.

7.1 Sampling Observations

The following observations were made during the collection of soil samples:

- ∴ No visual or olfactory evidence of contamination (including buried refuse and/or fill) was observed in any of the collected soil samples.
- ∴ No groundwater was encountered in any of the hand augered locations down to the target depths but suspected perched groundwater was encountered at two locations within the Sheep Spray Shower & Woolshed area in boreholes WS_SS01 and WS_SS02 at 0.8 m bgl.
- ∴ No fragments of ACM were encountered in any of the hand augered locations down to the target depths.

7.2 Analytical Results

Laboratory analytical results of the analysed soil samples are summarised in Table 2 below. The CoC documentation and laboratory analytical reports are provided in Appendix E.

7.2.1 Sheep Spray Shower & Woolshed Area

- ∴ Soil sample WS_SS04_0.1 (collected from a holding/draining pen) has a reported concentration of arsenic (72 mg/kg) that exceeds the NESCS SCS for commercial/industrial land use (70 mg/kg) and the published background concentrations of non-volcanic soils in the Auckland region (12 mg/kg) but remains below the AUP:OP PA soil acceptance criteria (100 mg/kg). However, the 95% upper confidence limit (UCL) of the arsenic concentration for the 11 analysed surface soil samples from this area has been calculated (as shown in Appendix F) to be 26.7 mg/kg (still above the published background concentration of non-volcanic soils in the Auckland region but below the NESCS SCS for commercial/industrial land use and the AUP:OP PA soil acceptance criteria).
- ∴ The concentrations of copper in soil sample WS_SS04_0.1 and arsenic in soil sample WS_SS09_0.1 (collected from adjacent to the sheep spray shower) exceed the published background concentrations of non-volcanic soils in the Auckland region but are below the NESCS SCSs for recreational and commercial/industrial land use, and the AUP:OP PA soil acceptance criteria.

Table 2: Soil Sample Results - Muriwai Downs Golf Project - Recreation and Commercial/Industrial Land Use - Heavy Metals ¹, Organochlorine Pesticides ¹, Polycyclic Aromatic Hydrocarbons ¹, Pentachlorophenol ¹, Tributyltin ¹ and Asbestos ².

Soil Sample ID	WS_SS01_0.1	WS_SS01_0.3	WS_SS02_0.1	WS_SS03_0.1	WS_SS03_0.3	WS_SS04_0.1	Background Ranges of Trace Elements in Auckland Soils	AUP OP Permitted Activity Criteria ⁴	NESCS SCSs and SGVs ⁵	
Lab Identification Number	2674272.1	2674272.2	2674272.4	2674272.7	2674272.8	2674272.10			Recreational	Commercial / Industrial
Sample Date	6/08/2021	6/08/2021	6/08/2021	6/08/2021	6/08/2021	6/08/2021	Non Volcanic ³			
Sample Depth (mbgl)	0.1	0.3	0.1	0.1	0.3	0.1				
Heavy Metals										
Arsenic	2	3	7	8	2	72	0.4 - 12	100	80	70
Cadmium	0.11	< 0.10	< 0.10	0.11	< 0.10	0.17	<0.1 - 0.65	7.5	400	1,300
Chromium (total)	8	8	15	10	8	14	2 - 55	400	2,700 ⁶	6,300 ⁶
Copper	34	6	18	27	5	100	1 - 45	325	>10,000	>10,000
Lead	7.2	9.4	18.3	32	11.6	32	<5 - 65	250	880 ⁷	3,300 ⁷
Nickel	5	2	5	3	<2	4	0.9 - 35	105	1,200 ⁸	6,000 ⁸
Zinc	109	33	139	68	20	97	9 - 180	400	30,000 ⁸	400,000 ⁸
Organochlorine Pesticides										
Dieldrin	ND	ND	ND	ND	ND	0.043	-	-	70	160
All other OCPs below the laboratory detection limit ⁹	ND	ND	ND	ND	ND	ND	-	-	-	-

34	Concentration above Auckland Council Background Criteria
45.1	Concentration above NES SCS/SGV - Recreational
33	Concentration above NES SCS/SGV - Commercial / Industrial
ND	Concentration below laboratory limit of detection
-	No guideline value available / contaminant not measured

1. Results in mg/kg.
2. Results as presence/absence of asbestos fibres in soil.
3. Criteria from Table E30.6.1.4.2 of the Auckland Unitary Plan Operative in Part (Background Concentrations of Inorganic Elements in Soils from the Auckland Region (AC, 2018)) - Non Volcanic soils.
4. Criteria from Table E30.6.1.4.1 of the Auckland Unitary Plan Operative in Part (Permitted activity soil acceptance criteria (AC 2018)).
5. Criteria from Table B2 and B3, Appendix B of the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NESCS, 2011): Commercial/Industrial outdoor worker (unpaved) and recreational land-use.
6. Guideline value (from NESCS, 2011) is for Chromium VI.
7. SCS value for lead is inorganic.
8. Criteria from "Schedule B(1) Guideline on Investigation Levels for Soils and Groundwater National Environment Protection Measure" (NEPM, 2013). Table 1A(1) Health investigation levels for soil contaminants (mg/kg) - Recreation and Commercial/Industrial use.
9. Due to all contaminants tested being below the laboratory detection limit, no guideline values are presented for comparison.

Table 2 Continued: Soil Sample Results - Muriwai Downs Golf Project - Recreation and Commercial/Industrial Land Use - Heavy Metals ¹, Organochlorine Pesticides ¹, Polycyclic Aromatic Hydrocarbons ¹, Pentachlorophenol ¹, Tributyltin ¹ and Asbestos ².

Soil Sample ID	WS_SS05_0.1	WS_SS06_0.1	WS_SS07_0.1	WS_SS08_0.1	WS_SS09_0.1	WS_SS09_0.3	Background Ranges of Trace Elements in Auckland Soils	AUP OP Permitted Activity Criteria ⁴	NESCS SCSs and SGVs ⁵	
Lab Identification Number	2674272.13	2674272.16	2674272.19	2674272.22	2674272.25	2674272.26			Recreational	Commercial / Industrial
Sample Date	6/08/2021	6/08/2021	6/08/2021	6/08/2021	6/08/2021	6/08/2021	Non Volcanic ³			
Sample Depth (mbgl)	0.1	0.1	0.1	0.1	0.1	0.3				
Heavy Metals										
Arsenic	6	6	9	4	16	5	0.4 - 12	100	80	70
Cadmium	< 0.10	0.17	0.12	< 0.10	0.10	< 0.10	<0.1 - 0.65	7.5	400	1,300
Chromium (total)	7	11	14	9	17	11	2 - 55	400	2,700 ⁶	6,300 ⁶
Copper	28	24	14	7	13	6	1 - 45	325	>10,000	>10,000
Lead	7.0	6.4	6.9	8.7	38	17.5	<5 - 65	250	880 ⁷	3,300 ⁷
Nickel	< 2	6	6	3	5	5	0.9 - 35	105	1,200 ⁸	6,000 ⁸
Zinc	35	69	69	31	100	62	9 - 180	400	30,000 ⁸	400,000 ⁸
Organochlorine Pesticides										
All OCPs below the laboratory detection limit ⁹	ND	ND	ND	ND	ND	ND	-	-	-	-

34	Concentration above Auckland Council Background Criteria
ND	Concentration below laboratory limit of detection
-	No guideline value available / contaminant not measured

1. Results in mg/kg.
2. Results as presence/absence of asbestos fibres in soil.
3. Criteria from Table E30.6.1.4.2 of the Auckland Unitary Plan Operative in Part (Background Concentrations of Inorganic Elements in Soils from the Auckland Region (AC, 2018)) - Non Volcanic soils.
4. Criteria from Table E30.6.1.4.1 of the Auckland Unitary Plan Operative in Part (Permitted activity soil acceptance criteria (AC 2018)).
5. Criteria from Table B2 and B3, Appendix B of the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NESCS, 2011): Commercial/Industrial outdoor worker (unpaved) and recreational land-use.
6. Guideline value (from NESCS, 2011) is for Chromium VI.
7. SCS value for lead is inorganic.
8. Criteria from "Schedule B(1) Guideline on Investigation Levels for Soils and Groundwater National Environment Protection Measure" (NEPM, 2013). Table 1A(1) Health investigation levels for soil contaminants (mg/kg) - Recreation and Commercial/Industrial use.
9. Due to all contaminants tested being below the laboratory detection limit, no guideline values are presented for comparison.

Table 2 Continued: Soil Sample Results - Muriwai Downs Golf Project - Recreation and Commercial/Industrial Land Use - Heavy Metals ¹, Organochlorine Pesticides ¹, Polycyclic Aromatic Hydrocarbons ¹, Pentachlorophenol ¹, Tributyltin ¹ and Asbestos ².

Soil Sample ID	WS_SS10_0.1	WS_SS11_0.1	TT_SS01_0.1	TT_SS02_0.1	TT_SS03_0.1	TT_SS04_0.1	Background Ranges of Trace Elements in Auckland Soils	AUP OP Permitted Activity Criteria ⁴	NESCS SCSs and SGVs ⁵	
Lab Identification Number	2674272.28	2674272.31	2674272.34	2674272.36	2674272.38	2674272.40			Recreational	Commercial / Industrial
Sample Date	6/08/2021	6/08/2021	6/08/2021	6/08/2021	6/08/2021	6/08/2021	Non Volcanic ³			
Sample Depth (mbgl)	0.1	0.1	0.1	0.1	0.1	0.1				
Heavy Metals										
Arsenic	3	6	10	94	10	65	0.4 - 12	100	80	70
Cadmium	< 0.10	0.11	0.35	0.34	0.37	0.37	<0.1 - 0.65	7.5	400	1,300
Chromium (total)	9	10	22	47	21	134	2 - 55	400	2,700 ⁶	6,300 ⁶
Copper	4	14	21	38	22	97	1 - 45	325	>10,000	>10,000
Lead	10.1	11.1	23	14.1	27	19.3	<5 - 65	250	880 ⁷	3,300 ⁷
Nickel	2	4	6	6	7	8	0.9 - 35	105	1,200 ⁸	6,000 ⁸
Zinc	14	43	47	49	57	300	9 - 180	400	30,000 ⁸	400,000 ⁸
Organochlorine Pesticides										
All OCPs below the laboratory detection limit ⁹	ND	ND	ND	ND	ND	ND	-	-	-	-
Polycyclic Aromatic Hydrocarbons										
All PAHs below the laboratory detection limit ⁹	-	-	ND	ND	ND	ND	-	-	-	-

34	Concentration above Auckland Council Background Criteria
45.1	Concentration above NES SCS/SGV - Recreational
33	Concentration above NES SCS/SGV - Commercial / Industrial
ND	Concentration below laboratory limit of detection
-	No guideline value available / contaminant not measured

- Results in mg/kg.
- Results as presence/absence of asbestos fibres in soil.
- Criteria from Table E30.6.1.4.2 of the Auckland Unitary Plan Operative in Part (Background Concentrations of Inorganic Elements in Soils from the Auckland Region (AC, 2018)) - Non Volcanic soils.
- Criteria from Table E30.6.1.4.1 of the Auckland Unitary Plan Operative in Part (Permitted activity soil acceptance criteria (AC 2018)).
- Criteria from Table B2 and B3, Appendix B of the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NESCS, 2011): Commercial/Industrial outdoor worker (unpaved) and recreational land-use.
- Guideline value (from NESCS, 2011) is for Chromium VI.
- SCS value for lead is inorganic.
- Criteria from "Schedule B(1) Guideline on Investigation Levels for Soils and Groundwater National Environment Protection Measure" (NEPM, 2013). Table 1A(1) Health investigation levels for soil contaminants (mg/kg) - Recreation and Commercial/Industrial use.
- Due to all contaminants tested being below the laboratory detection limit, no guideline values are presented for comparison.

Table 2 Continued: Soil Sample Results - Muriwai Downs Golf Project - Recreation and Commercial/Industrial Land Use - Heavy Metals ¹, Organochlorine Pesticides ¹, Polycyclic Aromatic Hydrocarbons ¹, Pentachlorophenol ¹, Tributyltin ¹ and Asbestos ².

Soil Sample ID	TT_SS05_0.1	TT_SS06_0.1	TT_SS07_0.1	TT_SS08_0.1	TT_SS09_0.1	TT_SS10_0.1	Background Ranges of Trace Elements in Auckland Soils	AUP OP Permitted Activity Criteria ⁴	NESCS SCSs and SGVs ⁵	
	2674272.42	2674272.59	2674272.44	2674272.46	2674272.48	2674272.52			Recreational	Commercial / Industrial
Lab Identification Number	2674272.42	2674272.59	2674272.44	2674272.46	2674272.48	2674272.52	Non Volcanic ³			
Sample Date	6/08/2021	6/08/2021	6/08/2021	6/08/2021	6/08/2021	6/08/2021				
Sample Depth (mbgl)	0.1	0.1	0.1	0.1	0.1	0.1				
Heavy Metals										
Arsenic	16	7	59	8	23	67	0.4 - 12	100	80	70
Cadmium	0.31	0.30	0.58	0.21	0.27	0.33	<0.1 - 0.65	7.5	400	1,300
Chromium (total)	24	18	38	27	23	77	2 - 55	400	2,700 ⁶	6,300 ⁶
Copper	22	18	59	15	30	78	1 - 45	325	>10,000	>10,000
Lead	30	25	65	17.1	152	61	<5 - 65	250	880 ⁷	3,300 ⁷
Nickel	8	6	6	8	5	5	0.9 - 35	105	1,200 ⁸	6,000 ⁸
Zinc	93	108	169	72	92	144	9 - 180	400	30,000 ⁸	400,000 ⁸
Organochlorine Pesticides										
All OCPs below the laboratory detection limit ¹⁴	ND	ND	ND	ND	ND	ND	-	-	-	-
Polycyclic Aromatic Hydrocarbons										
Pyrene	ND	ND	ND	ND	ND	0.031	-	-	-	NA ^{10,11}
Naphthalene	ND	ND	ND	ND	ND	ND	-	-	-	(190) ^{10,12,13v}
Benzo[a]pyrene TEQ (LOR) ⁹	ND	ND	ND	ND	ND	0.04	-	20	40	35
All other PAHs below the laboratory detection limit ⁹	ND	ND	ND	ND	ND	ND	-	-	-	-
Pentachlorophenol (PCP)										
All pentachlorophenols below the laboratory detection limit ¹⁴	ND	ND	ND	ND	ND	ND	-	-	-	-
Tributyltin (TBT)										
All tributyltins below the laboratory detection limit ¹⁴	ND	ND	ND	ND	ND	ND	-	-	-	-

34	Concentration above Auckland Council Background Criteria
ND	Concentration below laboratory limit of detection
-	No guideline value available / contaminant not measured

- Results in mg/kg.
- Results as presence/absence of asbestos fibres in soil.
- Criteria from Table E30.6.1.4.2 of the Auckland Unitary Plan Operative in Part (Background Concentrations of Inorganic Elements in Soils from the Auckland Region (AC, 2018)) - Non Volcanic soils.
- Criteria from Table E30.6.1.4.1 of the Auckland Unitary Plan Operative in Part (Permitted activity soil acceptance criteria (AC 2018)).
- Criteria from Table B2 and B3, Appendix B of the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NESCS, 2011): Commercial/Industrial outdoor worker (unpaved) and recreational land-use.
- Guideline value (from NESCS, 2011) is for Chromium VI.
- SCS value for lead is inorganic.
- Criteria from "Schedule B(1) Guideline on Investigation Levels for Soils and Groundwater National Environment Protection Measure" (NEPM, 2013). Table 1A(1) Health investigation levels for soil contaminants (mg/kg) - Recreation and Commercial/Industrial use.
- Risk associated with mixture of carcinogenic PAHs assessed by comparison with the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. Where a result is reported as less than the limit of reporting (LOR) the LOR value is used to calculate the toxic equivalent (TEQ) for that PAH.
- Values from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MFE, 2011) - Tier 1 guidelines Table 4.11 Tier 1 Soil acceptance criteria for PAHs Commercial/Industrial use - ALL PATHWAYS, Sand, <1m.
- NA indicates contaminant not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site.
- Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons. For further explanation refer to Appendix 4M in Values from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MFE, 2011).
- The following note indicates the limiting pathway for each criterion: v - Volatilisation.
- Due to all contaminants tested being below the laboratory detection limit, no guideline values are presented for comparison.

Table 2 Continued: Soil Sample Results - Muriwai Downs Golf Project - Recreation and Commercial/Industrial Land Use - Heavy Metals ¹, Organochlorine Pesticides ¹, Polycyclic Aromatic Hydrocarbons ¹, Pentachlorophenol ¹, Tributyltin ¹ and Asbestos ².

Soil Sample ID	TT_SS11_0.1	TT_SS12_0.1	BH_SS01_0.1	BH_SS02_0.3	BH_SS03_0.1	BH_SS04_0.3	Background Ranges of Trace Elements in Auckland Soils	AUP OP Permitted Activity Criteria ⁴	NESCS SCSs and SGVs ⁵	
Lab Identification Number	2674272.54	2674272.56	2677154.57	2677154.60	2677154.61	2677154.64			Recreational	Commercial / Industrial
Sample Date	6/08/2021	6/08/2021	10/08/2021	11/08/2021	11/08/2021	11/08/2021				
Sample Depth (mbgl)	0.1	0.1	0.1	0.3	0.1	0.3	Non Volcanic ³			
Heavy Metals										
Arsenic	31	4	4	3	4	3	0.4 - 12	100	80	70
Cadmium	0.38	< 0.10	0.3	0.14	0.48	0.15	<0.1 - 0.65	7.5	400	1,300
Chromium (total)	26	16	23	22	21	18	2 - 55	400	2,700 ⁶	6,300 ⁶
Copper	29	4	13	8	14	7	1 - 45	325	>10,000	>10,000
Lead	43	19.8	10.3	11.4	210	24	<5 - 65	250	880 ⁷	3,300 ⁷
Nickel	8	4	8	8	7	6	0.9 - 35	105	1,200 ⁸	6,000 ⁸
Zinc	210	39	73	67	230	54	9 - 180	400	30,000 ⁸	400,000 ⁸
Organochlorine Pesticides										
All OCPs below the laboratory detection limit ¹⁴	ND	ND	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons										
Pyrene	0.099	ND	-	-	-	-	-	-	-	NA ^{10,11}
Naphthalene	NA	ND	-	-	-	-	-	-	-	(190) ^{10,12,13v}
Benzo[a]pyrene TEQ (LOR) ⁹	0.09	ND	-	-	-	-	-	20	40	35
All other PAHs below the laboratory detection limit ⁹	ND	ND	-	-	-	-	-	-	-	-
Pentachlorophenol (PCP)										
All pentachlorophenols below the laboratory detection limit ¹⁴	ND	ND	-	-	-	-	-	-	-	-
Tributyltin (TBT)										
All tributyltins below the laboratory detection limit ¹⁴	ND	ND	-	-	-	-	-	-	-	-
Asbestos Presence / Absence										
Lab Identification Number	-	-	2677351.1	2677351.2	2677351.3	2677351.4	-	-	-	-
Present (Y/N) ¹⁵	-	-	N	N	N	N	-	-	-	-

34	Concentration above Auckland Council Background Criteria
ND	Concentration below laboratory limit of detection
-	No guideline value available / contaminant not measured

- Results in mg/kg.
- Results as presence/absence of asbestos fibres in soil.
- Criteria from Table E30.6.1.4.2 of the Auckland Unitary Plan Operative in Part (Background Concentrations of Inorganic Elements in Soils from the Auckland Region (AC, 2018)) - Non Volcanic soils.
- Criteria from Table E30.6.1.4.1 of the Auckland Unitary Plan Operative in Part (Permitted activity soil acceptance criteria (AC 2018)).
- Criteria from Table B2 and B3, Appendix B of the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NESCS, 2011): Commercial/industrial outdoor worker (unpaved) and recreational land-use.
- Guideline value (from NESCS, 2011) is for Chromium VI.
- SCS value for lead is inorganic.
- Criteria from "Schedule B(1) Guideline on Investigation Levels for Soils and Groundwater National Environment Protection Measure" (NEPM, 2013). Table 1A(1) Health investigation levels for soil contaminants (mg/kg) - Recreation and Commercial/Industrial use.
- Risk associated with mixture of carcinogenic PAHs assessed by comparison with the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. Where a result is reported as less than the limit of reporting (LOR) the LOR value is used to calculate the toxic equivalent (TEQ) for that PAH.
- Values from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MFE, 2011) - Tier 1 guidelines Table 4.11 Tier 1 Soil acceptance criteria for PAHs Commercial/Industrial use - ALL PATHWAYS, Sand, <1m.
- NA indicates contaminant not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site.
- Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons. For further explanation refer to Appendix 4M in Values from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MFE, 2011).
- The following note indicates the limiting pathway for each criterion: v - Volatilisation.
- Due to all contaminants tested being below the laboratory detection limit, no guideline values are presented for comparison.
- Asbestos presence/absence from analytical testing ('Y' = yes or 'N' = no).

Table 2 Continued: Soil Sample Results - Muriwai Downs Golf Project - Recreation and Commercial/Industrial Land Use - Heavy Metals ¹, Organochlorine Pesticides ¹, Polycyclic Aromatic Hydrocarbons ¹, Pentachlorophenol ¹, Tributyltin ¹ and Asbestos ².

Soil Sample ID	BH_SS05_0.1	BH_SS06_0.3	BH_SS07_0.3	BH_SS08_0.1	BH_SS09_0.3	BH_SS10_0.1	Background Ranges of Trace Elements in Auckland Soils	AUP OP Permitted Activity Criteria ⁴	NESCS SCSs and SGVs ⁵	
Lab Identification Number	2677154.65	2677154.68	2677154.70	2677154.71	2677154.74	2677154.75			Recreational	Commercial / Industrial
Sample Date	11/08/2021	11/08/2021	11/08/2021	11/08/2021	11/08/2021	11/08/2021				
Sample Depth (mbgl)	0.1	0.3	0.3	0.1	0.3	0.1	Non Volcanic ³			
Heavy Metals										
Arsenic	3	3	5	4	5	3	0.4 - 12	100	80	70
Cadmium	0.35	0.13	0.11	0.25	0.15	0.26	<0.1 - 0.65	7.5	400	1,300
Chromium (total)	18	20	27	21	21	18	2 - 55	400	2,700 ⁶	6,300 ⁶
Copper	11	7	7	12	8	9	1 - 45	325	>10,000	>10,000
Lead	27	19.2	11.2	32	25	29	<5 - 65	250	880 ⁷	3,300 ⁷
Nickel	6	6	6	7	5	6	0.9 - 35	105	1,200 ⁸	6,000 ⁸
Zinc	63	54	57	77	66	70	9 - 180	400	30,000 ⁸	400,000 ⁸
Asbestos Presence / Absence										
Lab Identification Number	2677351.5	2677351.6	2677351.7	2677351.8	2677351.9	2677351.10	-	-	-	-
Present (Y/N) ⁹	N	N	N	N	N	N	-	-	-	-

- No guideline value available / contaminant not measured

1. Results in mg/kg.
2. Results as presence/absence of asbestos fibres in soil.
3. Criteria from Table E30.6.1.4.2 of the Auckland Unitary Plan Operative in Part (Background Concentrations of Inorganic Elements in Soils from the Auckland Region (AC, 2018)) - Non Volcanic soils.
4. Criteria from Table E30.6.1.4.1 of the Auckland Unitary Plan Operative in Part (Permitted activity soil acceptance criteria (AC 2018)).
5. Criteria from Table B2 and B3, Appendix B of the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NESCS, 2011): Commercial/Industrial outdoor worker (unpaved) and recreational land-use.
6. Guideline value (from NESCS, 2011) is for Chromium VI.
7. SCS value for lead is inorganic.
8. Criteria from "Schedule B(1) Guideline on Investigation Levels for Soils and Groundwater National Environment Protection Measure" (NEPM, 2013). Table 1A(1) Health investigation levels for soil contaminants (mg/kg) - Recreation and Commercial/Industrial use.
9. Asbestos presence/absence from analytical testing ('Y' = yes or 'N' = no).

Table 2 Continued: Soil Sample Results - Muriwai Downs Golf Project - Recreation and Commercial/Industrial Land Use - Heavy Metals ¹, Organochlorine Pesticides ¹, Polycyclic Aromatic Hydrocarbons ¹, Pentachlorophenol ¹, Tributyltin ¹ and Asbestos ².

Soil Sample ID	BH_SS11_0.3	BH_SS12_0.3	BH_SS13_0.1	BH_SS14_0.3	BH_SS15_0.1	BH_SS16_0.1	Background Ranges of Trace Elements in Auckland Soils	AUP OP Permitted Activity Criteria ⁴	NESCS SCSs and SGVs ⁵	
Lab Identification Number	2677154.78	2677154.80		2677154.84	2677154.85	2677154.87			Recreational	Commercial / Industrial
Sample Date	11/08/2021	10/08/2021		11/08/2021	11/08/2021	11/08/2021				
Sample Depth (mbgl)	0.3	0.3		0.3	0.1	0.1	Non Volcanic ³			
Heavy Metals										
Arsenic	5	4		3	3	3	0.4 - 12	100	80	70
Cadmium	0.17	0.12		< 0.10	0.27	0.32	<0.1 - 0.65	7.5	400	1,300
Chromium (total)	24	23		20	18	17	2 - 55	400	2,700 ⁶	6,300 ⁶
Copper	11	8		6	12	9	1 - 45	325	>10,000	>10,000
Lead	22	8.5		7.3	42	24	<5 - 65	250	880 ⁷	3,300 ⁷
Nickel	6	8		6	6	6	0.9 - 35	105	1,200 ⁸	6,000 ⁸
Zinc	77	72		55	71	86	9 - 180	400	30,000 ⁸	400,000 ⁸
Asbestos Presence / Absence										
Lab Identification Number	2677351.11	2677351.12	2677351.13	2677351.14	2677351.15	2677351.16	-	-	-	-
Present (Y/N) ⁹	N	N	N	N	N	N	-	-	-	-

- No guideline value available / contaminant not measured

1. Results in mg/kg.
2. Results as presence/absence of asbestos fibres in soil.
3. Criteria from Table E30.6.1.4.2 of the Auckland Unitary Plan Operative in Part (Background Concentrations of Inorganic Elements in Soils from the Auckland Region (AC, 2018)) - Non Volcanic soils.
4. Criteria from Table E30.6.1.4.1 of the Auckland Unitary Plan Operative in Part (Permitted activity soil acceptance criteria (AC 2018)).
5. Criteria from Table B2 and B3, Appendix B of the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NESCS, 2011): Commercial/Industrial outdoor worker (unpaved) and recreational land-use.
6. Guideline value (from NESCS, 2011) is for Chromium VI.
7. SCS value for lead is inorganic.
8. Criteria from "Schedule B(1) Guideline on Investigation Levels for Soils and Groundwater National Environment Protection Measure" (NEPM, 2013). Table 1A(1) Health investigation levels for soil contaminants (mg/kg) - Recreation and Commercial/Industrial use.
9. Asbestos presence/absence from analytical testing ('Y' = yes or 'N' = no).

Table 2 Continued: Soil Sample Results - Muriwai Downs Golf Project - Recreation and Commercial/Industrial Land Use - Heavy Metals ¹, Organochlorine Pesticides ¹, Polycyclic Aromatic Hydrocarbons ¹, Pentachlorophenol ¹, Tributyltin ¹ and Asbestos ².

Soil Sample ID	BH_SS17_0.1	BH_SS18_0.1	BH_SS19_0.3	BH_SS20_0.1	BH_SS21_0.3	BH_SS22_0.1	Background Ranges of Trace Elements in Auckland Soils	AUP OP Permitted Activity Criteria ⁴	NESCS SCSs and SGVs ⁵	
Lab Identification Number	2677154.89	2677154.91	2677154.94	2677154.95	2677154.98	2677154.99			Recreational	Commercial / Industrial
Sample Date	11/08/2021	10/08/2021	11/08/2021	11/08/2021	11/08/2021	11/08/2021	Non Volcanic ³			
Sample Depth (mbgl)	0.1	0.1	0.3	0.1	0.3	0.1				
Heavy Metals										
Arsenic	4	4	3	4	4	4	0.4 - 12	100	80	70
Cadmium	0.30	0.23	0.11	0.27	< 0.10	0.27	<0.1 - 0.65	7.5	400	1,300
Chromium (total)	20	17	19	17	19	19	2 - 55	400	2,700 ⁶	6,300 ⁶
Copper	10	10	7	10	6	8	1 - 45	325	>10,000	>10,000
Lead	21	7.9	77	8.9	15.1	12.7	<5 - 65	250	880 ⁷	3,300 ⁷
Nickel	7	7	5	6	5	8	0.9 - 35	105	1,200 ⁸	6,000 ⁸
Zinc	83	62	53	60	40	58	9 - 180	400	30,000 ⁸	400,000 ⁸
Asbestos Presence / Absence										
Lab Identification Number	2677351.17	2677351.18	2677351.19	2677351.2	2677351.21	2677351.22	-	-	-	-
Present (Y/N) ⁹	N	N	N	N	N	N	-	-	-	-

- No guideline value available / contaminant not measured

1. Results in mg/kg.
2. Results as presence/absence of asbestos fibres in soil.
3. Criteria from Table E30.6.1.4.2 of the Auckland Unitary Plan Operative in Part (Background Concentrations of Inorganic Elements in Soils from the Auckland Region (AC, 2018)) - Non Volcanic soils.
4. Criteria from Table E30.6.1.4.1 of the Auckland Unitary Plan Operative in Part (Permitted activity soil acceptance criteria (AC 2018)).
5. Criteria from Table B2 and B3, Appendix B of the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NESCS, 2011): Commercial/Industrial outdoor worker (unpaved) and recreational land-use.
6. Guideline value (from NESCS, 2011) is for Chromium VI.
7. SCS value for lead is inorganic.
8. Criteria from "Schedule B(1) Guideline on Investigation Levels for Soils and Groundwater National Environment Protection Measure" (NEPM, 2013). Table 1A(1) Health investigation levels for soil contaminants (mg/kg) - Recreation and Commercial/Industrial use.
9. Asbestos presence/absence from analytical testing ('Y' = yes or 'N' = no).

Table 2 Continued: Soil Sample Results - Muriwai Downs Golf Project - Recreation and Commercial/Industrial Land Use - Heavy Metals ¹, Organochlorine Pesticides ¹, Polycyclic Aromatic Hydrocarbons ¹, Pentachlorophenol ¹, Tributyltin ¹ and Asbestos ².

Soil Sample ID	KC_SS01_0.1 - KC_SS04_0.1	KC_SS05_0.1 - KC_SS08_0.1	KC_SS09_0.1 - KC_SS12_0.1	KC_SS13_0.1 - KC_SS16_0.1	KC_SS17_0.1 - KC_SS20_0.1	KC_SS21_0.1 - KC_SS24_0.1	Background Ranges of Trace Elements in Auckland Soils	AUP OP Permitted Activity Criteria ⁴	NESCS SCSs and SGVs ⁵	
Lab Identification Number	2677154.101	2677154.102	2677154.103	2677154.104	2677154.105	2677154.106			Recreational	Commercial / Industrial
Sample Type	Lab Composite	Lab Composite	Lab Composite	Lab Composite	Lab Composite	Lab Composite	Non Volcanic ³			
Sample Date	10/08/2021	10/08/2021	10/08/2021	10/08/2021	10/08/2021	10/08/2021				
Sample Depth (mbgl)	0.1	0.1	0.1	0.1	0.1	0.1				
Heavy Metals										
Arsenic	3	4	6	5	5	7	0.4 - 12	100	80	70
Cadmium	0.32	0.36	0.4	0.41	0.4	0.34	<0.1 - 0.65	7.5	400	1,300
Chromium (total)	11	11	17	16	16	17	2 - 55	400	2,700 ⁶	6,300 ⁶
Copper	7	9	9	13	12	9	1 - 45	325	>10,000	>10,000
Lead	10.2	8.7	11.5	11.7	15.5	13.1	<5 - 65	250	880 ⁷	3,300 ⁷
Nickel	3	4	4	5	6	6	0.9 - 35	105	1,200 ⁸	6,000 ⁸
Zinc	24	29	32	52	40	31	9 - 180	400	30,000 ⁸	400,000 ⁸
Organochlorine Pesticides										
All OCPs below the laboratory detection limit ⁹	ND	ND	ND	ND	ND	ND	-	-	-	-

ND Concentration below laboratory limit of detection
 - No guideline value available / contaminant not measured

1. Results in mg/kg.
2. Results as presence/absence of asbestos fibres in soil.
3. Criteria from Table E30.6.1.4.2 of the Auckland Unitary Plan Operative in Part (Background Concentrations of Inorganic Elements in Soils from the Auckland Region (AC, 2018)) - Non Volcanic soils.
4. Criteria from Table E30.6.1.4.1 of the Auckland Unitary Plan Operative in Part (Permitted activity soil acceptance criteria (AC 2018)).
5. Criteria from Table B2 and B3, Appendix B of the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NESCS, 2011): Commercial/Industrial outdoor worker (unpaved) and recreational land-use.
6. Guideline value (from NESCS, 2011) is for Chromium VI.
7. SCS value for lead is inorganic.
8. Criteria from "Schedule B(1) Guideline on Investigation Levels for Soils and Groundwater National Environment Protection Measure" (NEPM, 2013). Table 1A(1) Health investigation levels for soil contaminants (mg/kg) - Recreation and Commercial/Industrial use.
9. Due to all contaminants tested being below the laboratory detection limit, no guideline values are presented for comparison.

Table 2 Continued: Soil Sample Results - Muriwai Downs Golf Project - Recreation and Commercial/Industrial Land Use - Heavy Metals ¹, Organochlorine Pesticides ¹, Polycyclic Aromatic Hydrocarbons ¹, Pentachlorophenol ¹, Tributyltin ¹ and Asbestos ².

Soil Sample ID	KC_SS25_0.1 - KC_SS28_0.1	Background Ranges of Trace Elements in Auckland Soils	AUP OP Permitted Activity Criteria ⁴	NESCS SCSs and SGVs ⁵	
				Recreational	Commercial / Industrial
Sample Type	Lab Composite	Non Volcanic ³			
Sample Date	10/08/2021				
Lab Identification Number	2677154.107				
Sample Depth (mbgl)	0.1				
Heavy Metals					
Arsenic	5	0.4 - 12	100	80	70
Cadmium	0.37	<0.1 - 0.65	7.5	400	1,300
Chromium (total)	16	2 - 55	400	2,700 ⁶	6,300 ⁶
Copper	19	1 - 45	325	>10,000	>10,000
Lead	12.8	<5 - 65	250	880 ⁷	3,300 ⁷
Nickel	6	0.9 - 35	105	1,200 ⁸	6,000 ⁸
Zinc	80	9 - 180	400	30,000 ⁸	400,000 ⁸
Organochlorine Pesticides					
All OCPs below the laboratory detection limit ⁹	ND	-	-	-	-

ND	Concentration below laboratory limit of detection
-	No guideline value available / contaminant not measured

1. Results in mg/kg.
2. Results as presence/absence of asbestos fibres in soil.
3. Criteria from Table E30.6.1.4.2 of the Auckland Unitary Plan Operative in Part (Background Concentrations of Inorganic Elements in Soils from the Auckland Region (AC, 2018)) - Non Volcanic soils.
4. Criteria from Table E30.6.1.4.1 of the Auckland Unitary Plan Operative in Part (Permitted activity soil acceptance criteria (AC 2018)).
5. Criteria from Table B2 and B3, Appendix B of the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations (NESCS, 2011): Commercial/Industrial outdoor worker (unpaved) and recreational land-use.
6. Guideline value (from NESCS, 2011) is for Chromium VI.
7. SCS value for lead is inorganic.
8. Criteria from "Schedule B(1) Guideline on Investigation Levels for Soils and Groundwater National Environment Protection Measure" (NEPM, 2013). Table 1A(1) Health investigation levels for soil contaminants (mg/kg) - Recreation and Commercial/Industrial use.
9. Due to all contaminants tested being below the laboratory detection limit, no guideline values are presented for comparison.

- ∴ Dieldrin was also detected (and therefore considered an exceedance of background concentrations) in soil sample WS_SS04_0.1 at a concentration below the NESCS SCSs for recreational and commercial/industrial land use, and the AUP:OP PA soil acceptance criteria.
- ∴ Apart from the above, the concentrations of heavy metals and OCPs in the analysed soil samples collected from this area are below their respective NESCS SCSs/EGVs for recreational and commercial/industrial land use, AUP:OP PA soil acceptance criteria and background concentrations of non-volcanic soils in the Auckland region.

7.2.2 Treated Timber Storage Area

- ∴ Soil sample TT_SS02_0.1 has a reported concentration of arsenic (94 mg/kg) that exceeds the NESCS SCS for recreational (80 mg/kg) and commercial/industrial land use (70 mg/kg), and the published background concentration of non-volcanic soils in the Auckland region (12 mg/kg) but remains below the AUP:OP PA soil acceptance criteria (100 mg/kg). However, the 95% upper confidence limit (UCL) of the arsenic concentration for the 12 analysed surface soil samples from this area has been calculated (as shown in Appendix G) to be 48.6 mg/kg (still above the published background concentration of non-volcanic soils in the Auckland region but below the NESCS SCS for recreational and commercial/industrial land use, and the AUP:OP PA soil acceptance criteria).
- ∴ A further six analysed soil samples (TT_SS04_0.1, TT_SS05_0.1, TT_SS07_0.1, TT_SS09_0.1, TT_SS10_0.1 and TT_SS11_0.1) collected from 12 locations within this area have reported concentrations of arsenic, chromium, copper, lead and/or zinc that exceed the published background concentrations of non-volcanic soils in the Auckland region but are below the NESCS SCSs/EGVs for recreational and commercial/industrial land use, and the AUP:OP PA soil acceptance criteria.
- ∴ Various compounds of PAHs were detected (and therefore considered an exceedance of background concentrations) in two of the analysed soil samples (TT_SS10_0.1 and TT_SS11_0.1) including:
 - Benzo(a)pyrene (equivalent) at concentrations below the NESCS SCS for recreational and commercial/industrial land use, and AUP:OP PA soil acceptance criteria; and
 - Pyrene, which is not a limiting contaminant as the estimated health-based criterion is significantly higher than that likely to be encountered onsite and therefore, the detected concentrations are not expected to be a risk to human health.
- ∴ At all other locations, the concentrations of heavy metals, OCPs and PAHs in the analysed soil samples collected from this area are below their respective NESCS SCSs/EGVs for recreational and commercial/industrial land use, AUP:OP PA soil acceptance criteria and background concentrations of non-volcanic soils in the Auckland region.
- ∴ PCP and TBT have not been reported at concentrations above the laboratory LOR in all analysed soil samples collected from 12 locations within this area.

7.2.3 Historical Kumara Crops Area

- ∴ All seven composite samples combined from soil samples collected from 28 locations within this area did not detect any OCPs and have concentrations of heavy metals⁵ that are below the NESCS SCSs/EGVs for recreational and commercial/industrial land use, the AUP:OP PA soil acceptance criteria and the published background concentrations of non-volcanic soils in the Auckland region.

7.2.4 Former Boarding House Area

- ∴ Soil sample BH_SS03_0.1 has reported concentrations of lead and zinc that exceeds the published background concentrations of non-volcanic soils in the Auckland region but remain below the NESCS SCSs/EGVs for recreational and commercial/industrial land use, and AUP:OP PA soil acceptance criteria.
- ∴ Apart from the above, the concentrations of heavy metals in the analysed soil samples collected from this area are below their respective NESCS SCSs/EGVs for recreational and commercial/industrial land use, AUP:OP PA soil acceptance criteria and background concentrations of non-volcanic soils in the Auckland region.
- ∴ Asbestos is absent from all analysed soil samples collected from 22 locations within this area.

8.0 Conceptual Site Model and Risk Assessment

A conceptual site model (CSM) was developed using the information acquired in the preparation of the Updated PSI report (PDP, 2021a). The CSM has been updated to reflect the findings of this DSI, as summarised below in Table 3.

As PCP, TBT and asbestos have not been detected in the analysed soil samples, and none of the analysed soil samples have concentrations of heavy metals, OCPs or PAHs that are above the AUP:OP PA soil acceptance criteria, the soil at the site is not considered to pose an unacceptable risk to the environment.

While the arsenic concentrations of one surface soil sample collected from the Sheep Spray Shower & Woolshed and Treated Timber Storage areas exceeds the NESCS SCSs/EGVs for recreational and/or commercial/industrial land use, the 95% upper confidence limit of the arsenic concentrations for the analysed surface soil samples from each of these two areas have been calculated to be below the NESCS SCSs/EGVs for recreational land and/or commercial/industrial use. As none of the sampling areas are considered to have concentrations of heavy metals, OCPs or PAHs that are above the NESCS SCSs/EGVs for recreational and commercial/industrial land use, the soil at the site is not considered to pose an unacceptable risk to human health for the proposed development.

⁵ On the basis of the likely uniform distribution of COPC across the Historical Kumara Crops area (from aerial spraying), the concentrations of heavy metals of the composite samples have not been adjusted for comparison to the SCS/EGVs (i.e. they have not been multiplied by 4 [the number of primary soil samples that were combined into each of the composite soil samples]).

Table 3: Updated Conceptual Site Model for Muriwai Downs

Source	Pathway	Receptor	Pathway Linkage
Storage of treated timber (potential contaminants could include PCBs, copper, arsenic, chromium, boron, PAHs and OCPs – HAIL Category A18)	Ingestion of soil	Site users (maintenance personnel/golfers)	Incomplete – due to none of the analysed soil samples having concentrations of COPC that are above the NESCS SCSs/EGVs for recreational and commercial/industrial land use or the AUP:OP PA soil acceptance criteria.
	Dermal contact with soil	Site users (maintenance personnel/golfers)	
	Infiltration to groundwater	Groundwater users	
	Runoff to surface water	Surface water	
Application of agrichemicals to crops (Historical Kumara Crops) (potential contaminants could include OCPs, acid herbicides, arsenic, lead and copper) – HAIL Category A10	Ingestion of soil	Site users (maintenance personnel/golfers)	Incomplete – due to none of the analysed soil samples having concentrations of COPC that are above the NESCS SCSs/EGVs for recreational and commercial/industrial land use or the AUP:OP PA soil acceptance criteria.
	Dermal contact with soil	Site users (maintenance personnel/golfers)	
	Infiltration to groundwater	Groundwater users	
	Runoff to surface water	Surface water	
Sheep Spray Shower & Woolshed (potential contaminants could include arsenic, organochlorines (including DDT, lindane, dieldrin and aldrin) and organophosphates) – HAIL Category A8	Ingestion of soil	Site users (maintenance personnel/golfers)	Incomplete – due to none of the analysed soil samples having concentrations of COPC that are above the NESCS SCSs/EGVs for recreational and commercial/industrial land use or the AUP:OP PA soil acceptance criteria.
	Dermal contact with soil	Site users (maintenance personnel/golfers)	
	Infiltration to groundwater	Groundwater users	
	Runoff to surface water	Surface water	
Localised impacts from painted surfaces on current/historic structures (Former Boarding House; potential contaminants could include lead and arsenic) – potential HAIL Category I	Ingestion of soil	Site users (maintenance personnel/golfers)	Incomplete – due to none of the analysed soil samples having concentrations of COPC that are above the NESCS SCSs/EGVs for recreational and commercial/industrial land use or the AUP:OP PA soil acceptance criteria.
	Dermal contact with soil	Site users (maintenance personnel/golfers)	
	Infiltration to groundwater	Groundwater users	
	Runoff to surface water	Surface water	

Table 3: Updated Conceptual Site Model for Muriwai Downs

Source	Pathway	Receptor	Pathway Linkage
Asbestos building products in a deteriorated condition (Former Boarding House) – HAIL Category E1	Inhalation of air borne asbestos fibres	Site users (maintenance personnel/golfers)	Incomplete – due to asbestos being absent from all analysed soil samples.

9.0 Regulatory Assessment (Contaminated Land)

9.1 NESCS

The NESCS regulations apply to the activities of soil disturbance and change of land use on a piece of land where HAIL activity is being, has been or is more likely than not to have been undertaken. The results of the historical review identified a number of potential and confirmed HAIL land uses at discrete areas across the site (including those outlined in Table 3 above).

For those discrete areas of the site where HAIL activities have occurred and COPC have been detected in soil samples at concentrations above the published background concentrations of non-volcanic soils in the Auckland region but below the NESCS SCSs/EGVs for recreational and commercial/industrial land use, a **controlled activity** consent under Regulation 9 of the NESCS will be required for the proposed soil disturbance and change in land use. This will require a Site Management Plan (SMP) to be prepared prior to undertaking any earthworks at the following areas:

- ∴ Former Boarding House.
- ∴ Sheep Spray Shower & Woolshed.
- ∴ Treated Timber Storage.

The NESCS does not apply to the soil disturbance associated with the development of the Historical Kumara Crops area as the COPC that have been detected in the soil samples are at concentrations below the published background concentrations of non-volcanic soils in the Auckland region in compliance with Regulation 5(9) of the NESCS.

The NESCS also does not apply to the areas of the site that are proposed to be developed (i.e. change in land use and/or soil disturbance) but no contamination/HAIL sources have been identified, or where production land continues to be used for that purposes as part of the operational farm.

9.2 AUP:OP

Discharges of contaminants into air, or into water, or onto or into land from disturbing soil on land containing elevated levels of contaminants are regulated by AUP:OP contaminated land rules (Chapter E30).

As all analysed soil samples from the site have concentrations of COPC that are below the AUP:OP PA soil acceptance criteria, it is considered that the site does not contain elevated levels of contaminants (as defined by the AUP:OP) and a consent under the contaminated land rules of the AUP:OP is **not required** and the soil disturbance associated with the project can be undertaken outside of the contaminated land rules (Chapter E30).

10.0 Conclusions and Recommendations

PDP has been engaged by GSG to undertake a DSI to support the consenting of the project, which includes the properties located at 451, 610, 614, 670, 680 and 697 Muriwai Road, Waimauku. The objectives of this DSI were to assess the likelihood of human health and environmental risk associated with the proposed soil disturbance and change of land use, and to assess the requirements for potential resource consents in relation to the NESCS and the AUP:OP contaminated land rules.

The investigation, as detailed in the SAP (PDP, 2021b), included sampling observations, collection and selective analysis of soil samples for heavy metals, OCPs, PAHs, PCP, TBT and/or presence/absence asbestos in shallow soils from 73 locations across four discrete areas within the site with potential or known contamination/HAIL sources⁶ that are proposed to be disturbed/developed as part of the golf course (as outlined in Section 3.0).

The key findings of this DSI are as follows:

- ∴ No visual or olfactory evidence of contamination (including buried refuse and/or fill) was observed in any of the collected soil samples.
- ∴ No groundwater was encountered in any of the hand augered locations down to the target depths though suspected perched groundwater was encountered at two locations within the Sheep Spray Shower & Woolshed area.
- ∴ No fragments of ACM were encountered in any of the hand augered locations down to the target depths.
- ∴ All analysed soil samples have concentrations of COPC that are below the AUP:OP PA soil acceptance criteria.
- ∴ All seven composite samples combined from soil samples collected from 28 locations within the Historical Kumara Crops area did not report any OCPs or concentrations of heavy metals that are above the NESCS SCSs/EGVs for recreational and commercial/industrial land use, and the published background concentration of non-volcanic soils in the Auckland region.
- ∴ Three of the 33 analysed surface soil samples collected from the Former Boarding House and Sheep Spray Shower & Woolshed areas reported concentrations of arsenic, copper, lead and/or zinc that exceed the published background concentrations of non-volcanic soils in the Auckland region but are below the NESCS SCS for recreational and commercial/industrial land use. While one of these surface soil samples collected from a holding/draining pen at the Sheep Spray Shower & Woolshed area also has a concentration of arsenic that also exceeds the NESCS SCS for commercial/industrial land use, the 95% UCL of the arsenic concentration for the 11 analysed surface soil samples from this area has been calculated to be above the published background concentration of non-volcanic soils in the Auckland region but below the NESCS SCS for commercial/industrial land use and the AUP:OP PA soil acceptance criteria.
- ∴ Asbestos is absent from all analysed soil samples collected from 22 locations within the Former Boarding House area.

⁶ Including the areas where the historical kumara crops, treated timber storage, sheep spray shower and woolshed, and former boarding house were/are located. The other discrete areas across the site with identified potential or known contamination/HAIL sources (including the timber stored within a building in the workshop area and under the woolshed; other current/historical houses/structures constructed prior to the mid-1970s; bulk storage of diesel and petrol in un-bunded ASTs, the storage of old fuel drums and fuel/chemicals, and burning of refuse in the workshop area; and the storage of chemicals in the hazardous chemicals storage shed located in the workshop area) were not assessed as part of this DSI as no soil disturbance and/or land use change has been proposed at those locations.

- ∴ Dieldrin was detected (and therefore considered an exceedance of background concentration) in one surface soil sample collected from the Sheep Spray Shower & Woolshed area at a concentration below the NESCS SCS for recreational and commercial/industrial land use, and the AUP:OP PA soil acceptance criteria.
- ∴ Half of the analysed surface soil samples collected from 12 locations within the Treated Timber Storage area have concentrations of arsenic, chromium, copper, lead and/or zinc that exceed the published background concentrations of non-volcanic soils in the Auckland region but are below the NESCS SCS for recreational and commercial/industrial land use. While one additional surface soil sample collected from this area has a concentration of arsenic that also exceeds the NESCS SCS for recreational and commercial/industrial land use, the 95% UCL of the arsenic concentration for the 12 analysed surface soil samples from this area has been calculated to be above the published background concentration of non-volcanic soils in the Auckland region but below the NESCS SCS for recreational and commercial/industrial land use and the AUP:OP PA soil acceptance criteria.
- ∴ PCP and TBT have not been detected in all analysed soil samples collected from 12 locations within the Treated Timber Storage area.

Based on the findings of this investigation, the following conclusions and recommendations have been made in relation to the objectives of this DSI:

- ∴ The soil disturbance and change of land use associated with the proposed development at the site is not considered to pose an unacceptable risk to human health (in the context of commercial/industrial and recreational land use) nor the environment.
- ∴ The proposed development:
 - Does not require a consent for contaminated land rules under the AUP:OP;
 - Will require a controlled activity consent under Regulation 9 of the NESCS for the proposed soil disturbance and change in land use at the discrete areas described below; and
 - Will require a Site Management Plan (SMP) prior to undertaking any earthworks within the discrete areas of the site where HAIL activities have occurred and COPC have been detected in soil samples at concentrations above the published background concentrations of non-volcanic soils in the Auckland region (i.e. the Former Boarding House, Sheep Spray Shower & Woolshed, and Treated Timber Storage areas). The SMP should detail the appropriate soils handling and disposal measures that must be implemented, commensurate with the concentrations of contaminants observed at these areas of the site as well as to manage any unexpected discovery of previously unidentified contamination at the site.
- ∴ The soil from the Former Boarding House, Sheep Spray Shower & Woolshed, and Treated Timber Storage areas cannot be considered as cleanfill and any excess soil not reused onsite will require disposal at an appropriately licensed disposal facility.
- ∴ The NESCS does not apply to the soil disturbance associated with the development of the Historical Kumara Crops area as the COPC that have been detected in the soil samples are at concentrations below the published background concentrations of non-volcanic soils in the Auckland region in compliance with Regulation 5(9) of the NESCS.
- ∴ The NESCS also does not apply to the areas of the site that are proposed to be developed (i.e. change in land use and/or soil disturbance) but no contamination/HAIL sources have been identified, or where production land use will continue.

11.0 References

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12.0 Limitations

This document has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Golf Strategy Group Limited and others (not directly contracted by PDP for the work), including Buddle Findlay and Mitchell Daysh Limited. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the document. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This document has been prepared based on the collection and laboratory analysis of 55 soil samples from 73 locations across four discrete areas within the site for heavy metals, OCPs, PAHs, PCP, TBT and/or the presence/absence of asbestos in soil. The site conditions as described in this document have been interpreted from, and are subject to, this information and its limitations and accordingly PDP does not represent that its interpretation accurately represents the full site conditions.

This assessment is limited to collection and analysis of soil samples from discrete sampling locations. Interpretations of subsurface conditions, including contaminant concentrations, are not guaranteed at distance away from the specific points of sampling.

The information contained within this document applies to soil sampling undertaken on the dates stated in this document, or if none is stated, the date of this document. With time, the site conditions and environmental standards may change. Accordingly, the reported assessments and conclusions are not guaranteed to apply at a later date.

This document has been prepared by PDP on the specific instructions of Golf Strategy Group Limited for the limited purposes described in the document. PDP accepts no liability if the document is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

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Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED

Prepared by



Tom Harvey

Environmental Geologist

Reviewed by



Stefan Yap

Service Leader - Contaminated Land

Approved by



Erin Richards

Technical Director - Contaminated Land

Appendix A: Certifying Statement

I, Erin Richards of Pattle Delamore Partners, certify that:

1. This detailed site investigation meets the requirements of the Resource Management (*National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*) Regulations 2011 ('the NESCS') because it has been:
 - a. Done by a suitably qualified and experienced practitioner;
 - b. Done in accordance with the current edition of the Ministry for the Environment's (MfE's) *Contaminated Land Management Guidelines No.5 – Site Investigation and Analysis of Soils*;
 - c. Reported on in accordance with the current edition of the MfE's *Contaminated Land Management Guidelines No.1 – Reporting on Contaminated Sites in New Zealand*; and
 - d. Certified by a suitably qualified and experienced practitioner.
2. This detailed site investigation concludes that the soil disturbance and change in land use associated with the proposed development at the site do not exceed the applicable standard in Regulation 7 of the NESCS.

Evidence of the qualifications and experience of the suitably qualified and experienced practitioner(s) who have done this investigation and certified this report is provided below.

This certification applies to the date of this report.

Signed



Erin Richards

Technical Director - Contaminated Land

Erin Richards – Project Director

Erin is a geologist with over 19 years of experience in geological and contaminated land assessments. She has a MSc in Geology (1st class hon) from the University of Auckland. Erin has extensive experience in contaminated land assessments and has undertaken as a consultant (either directly herself or as a project manager/director) hundreds of assessments across a variety of contaminated sites, which have ranged from greenfield sites (identified for development) through to complex brownfield assessments, including assessment/decommissioning of bulk storage fuel depots/terminals and large-scale redevelopment of commercial/industrial sites. Assessments have been widespread and have involved soil, groundwater and soil-gas investigations, resource consenting (NESCS through to long term discharge consenting under regional rules), spill response works, remediation (including development of remedial options assessments), dewatering assessments, development of management plans, Tier 2 risk assessments and ongoing compliance monitoring works. Erin was a primary author of the 2021 Contaminated Land Management Guidelines: CLMG No.1 and contributed to the updates of CLMG No.5. As such, she has a good familiarity with and understanding of the current contaminated land regulations and practice in New Zealand including assessments against the NESCS.

Stefan Yap – Project Manager and Preliminary Site Investigation Report Reviewer

Stefan is an environmental scientist with over 19 years of diverse experience within the environmental field throughout New Zealand and Asia Pacific with practical expertise in contaminated land management, environmental regulatory compliance and hazardous waste management. He has a BEnvSc (Hons) from Murdoch University. Stefan has prepared detailed assessments of contaminated sites, conceptual site models, remedial action plans, long-term management & monitoring plans and risk assessments. He has worked as a contaminated land specialist with small and large clients across a wide variety of industries including large-scale infrastructure, transport, oil & gas, energy, telecommunication, construction, education, manufacturing, recreation, agriculture & horticulture, and solid waste.

Tom Harvey – Investigation Field Operative and Author

Tom is an environmental geologist with 3 years' experience in undertaking environmental and contaminated land assessments. He has a BSc in Geology and Environmental Science and an MSc in Physical Geography (1st Class Hons) from Victoria University of Wellington. Tom has practical experience in a variety of contaminated land assessment techniques and has gained relevant experience in carrying out (and recently leading) and reporting on both Preliminary and Detailed Site Investigations.



Appendix B: Master Site Layout Plan



Sept. 30, 2021

Revision Date:	1.	2.	3.	4.	5.

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Scale: 0m 100m 200m 400m

SITE PLAN

MURIWAI DOWNS
Muriwai, New Zealand



Appendix C: Bore Logs

HAND AUGER LOG

Job No.: A03582101

Test No.: KC_SS06

Sheet: 1 of 1

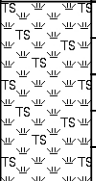
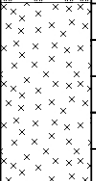
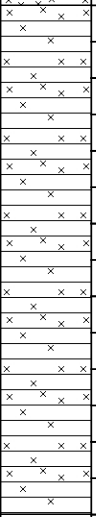
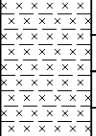
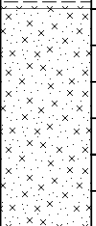
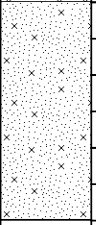

Date: 10/08/21

Ground Level mRL:

98m

Client:
Golf Strategy Group
Project:
Muriwai Downs DSI

Site Address:
Muriwai Road
Coordinates:
5925238.9mE, 1729433.1mN (NZTM)

Interpretation	Geological Description	Graphic Log	Depth (m)	RL (m)	Samples	PID	Water
	Soil and Rock logged in accordance with New Zealand Geotechnical Society field description of soil and rock. 2005.						
	SILT & SAND; brown. Soft, moist, non-plastic.				0.10m, KC_SS06_0.1		
	SILT, with some sand, with minor clay; brown yellowy orange. Firm, moist, low plasticity.				0.30m, KC_SS06_0.3		
	Silty CLAY, with trace sand; orange yellowy brown. Firm, moist, moderate plasticity.		0.5	97.5			
	Clayey SILT, with some sand; orange brown. Soft - firm, moist, low plasticity.						
	Sandy SILT; orange/brown. Soft - firm, moist, non-plastic; some inclusions of grey pumicious sand / gravel and orange sand.		1.5	96.5			
	Silty SAND, with trace organics; orange/red. Soft - loose, moist to wet.						
	EOH: 2.00m Target Depth Achieved		2.0	96.0			




Groundwater Not Encountered

Remarks

Investigation Type

Water

- Hand Auger
- Test Pit

-  Standing Water Level
-  In flow
-  Out flow

Contractor:

PDP

Rig/Plant Used:

Hand Auger

Logged By:

TH

Checked By:

MB

Hole Depth:

2.00 m



Appendix D: Sampling and Analysis Plan



2 August 2021

David Moore
Director
Golf Strategy Group Ltd
60 Clearwater Avenue
CHRISTCHURCH 8051

Dear David,

SAMPLING AND ANALYSIS PLAN FOR THE MURIWAI DOWNS GOLF PROJECT, WAIMAUKU

1.0 Introduction

Golf Strategy Group Limited (GSG) has engaged Pattle Delamore Partners Limited (PDP) to undertake a high-level contaminated land assessment (similar to a Preliminary Site Investigation [PSI]) of the properties located at (the northern section of) 451, 610, 614, 670 and 680 Muriwai Road, Waimauku ('the site'¹). PDP completed the PSI report for the site on 12 February 2021, which identified several potential contamination sources at discrete locations across the site including:

- ∴ HAIL² Area 1 - Potential impacts of various contaminants (including persistent organic pollutants) from historical horticultural activities (kumara crops) in the central south of the site (current paddocks between the workshop area and the "Kumara Shed");
- ∴ HAIL Area 2 - Potential impacts of various contaminants from long-term storage of treated timber in the paddocks to the west of the workshop;
- ∴ HAIL Area 3 - Potential impacts of various contaminants (including persistent organic pollutants) from the sheep spray shower, holding/draining pens and exit races located near the woolshed and the potential historical storage of these chemicals in the woolshed itself;
- ∴ HAIL Area 4 - Potential hydrocarbon impacts from bulk storage of diesel and petrol in un-bunded aboveground storage tanks (ASTs) in the workshop area (including a recent spill from the diesel AST) and from fuel drums stored adjacent to the ASTs;
- ∴ HAIL Area 5 - Potential hydrocarbon impacts from the storage of old fuel drums in the workshop;

¹ As clarified in Mason Jackson's email dated 27 November 2020, while 614 and 680 Muriwai Road are currently owned by third parties, the client is considering acquiring these properties (to this extent, the assessment of these two properties had been limited to a desktop review). Mason Jackson's subsequent emails dated 29 April, 22, 23 and 29 July 2021 indicated that the client has since acquired 614 Muriwai Road and the proposed option 2 water reservoir site (reservoir 1) have been recently confirmed to be located adjacent to the south of Muriwai Road straddling 697 and (the southern section of) 451 Muriwai Road, which will need to be incorporated into an updated PSI report.

² The Hazardous Activities and Industries List (HAIL) is a compilation of activities and industries that are considered likely to cause land contamination resulting from hazardous substance use, storage or disposal. The HAIL is intended to identify most situations in New Zealand where hazardous substances could cause, and in many cases have caused, land contamination. The most recent version of the HAIL was published by the Ministry for the Environment (MfE) in 2011.

- ∴ HAIL Area 5 - Potential heavy metal and hydrocarbon impacts from the storage of fuel/chemicals and burning of refuse in (and with respect to the refuse; adjacent to) the main workshop building;
- ∴ Potential impacts of various contaminants from storage of chemicals in the hazardous chemicals storage shed located in the workshop area;
- ∴ Localised lead (and potentially arsenic) impacts from painted surfaces on current/historical houses/structures (including the former boarding house – Feature 5) constructed prior to the mid-1970s; and
- ∴ Asbestos/ACM impacts to soils from current/historical building materials that are observed to be in a deteriorated condition or could have been potentially removed (including from the former boarding house – Feature 5) using inappropriate practises (and not to current standards).

The PSI report also concluded that the *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (NESCS) and its regulations apply to the piece of land where these potential contamination sources have been found, and would be triggered by the proposed activities anticipated to be undertaken in the future, which are expected to include: change of land-use (from rural to a combination of residential, rural residential, commercial or recreational) and soil disturbance.

A detailed site investigation (DSI) was recommended by PDP and requested by Mitchell Daysh Limited (email from Mason Jackson dated 20 January and 29 April 2021) to:

- ∴ Determine the nature and extent of impacts of the contaminants of potential concern (COPC) to ground (that is to be disturbed/developed, as indicated in the latest 'Current Water Supply & Storage Concept' and 'Golf Master Plan' as shown in Figure 1 and Appendix 1, respectively of the *Project Description Update – Muriwai Downs Golf Project* [Mitchell Daysh, 5 July 2021]) as a result of these current/historical activities prior to undertaking any soil disturbance activities on the site; and
- ∴ Incorporate the recently acquired 614 Muriwai Road property as well as the properties at 697 and (the southern section of) 451 Muriwai Road into the PSI report.

PDP has prepared this sampling and analysis plan (SAP) to formalise the DSI's scope of work.

2.0 DSI Objectives

The objectives of the DSI are to:

- ∴ Assess the likelihood of human health and environmental risk associated with the proposed soil disturbance through targeted soil sampling and comparison of analytical results against relevant guidelines/criteria; and
- ∴ Assess the requirements for potential contaminated land consents in relation to the NESCS and the Auckland Unitary Plan – Operative in Part (AUP:OP) (Auckland Council, 2016).

3.0 DSI Scope of Work

The Ministry for the Environment's (MfE's) Contaminated Land Management Guidelines (CLMG, revised 2021) promote a nationally consistent approach to the investigation and assessment of contaminated land. The NESCS incorporates by reference the MfE's CLMG No.'s 1, 2 and 5. The proposed DSI has been scoped in accordance with the requirements of the MfE's CLMGs and the NESCS.

The investigation (including the reporting) will be overseen and certified by Suitably Qualified and Experienced Practitioners (SQEPs) and undertaken in accordance with the MfE's CLMG No. 1 and 5.

The proposed scope of work (SOW) is set out below and includes undertaking soil sampling to characterise the COPC (if any) in shallow soils (to a maximum depth of 3 m below ground level [bgl]) at discrete locations across the site and documenting the findings in a DSI report.

3.1 Stage 1 – Sampling & Analysis Plan and PSI Update

This SAP has been prepared to formalise the DSI's scope of work through the collection and analysis of soil samples to investigate the possible/probable 'source-pathway-receptor' linkages identified during the PSI completed in February 2021. This SAP and cost estimate may need to be refined if any additional possible/probable 'source-pathway-receptor' linkages are identified during the site walkover/interview of the recently acquired property at 614 Muriwai Road and the recently confirmed location of the water reservoir site (reservoir 1) straddling 697 and (the southern section of) 451 Muriwai Road.

We propose undertaking a site walkover of the property at 614, (the northeast corner of) 697 and (the southern section of) 451 Muriwai Road and interviewing its previous landowner/s (and/or other appropriate parties as identified by the previous owner or nominated representative) about their knowledge of past activities on the property. The findings of the site walkover and interview will be incorporated into the updated PSI. If any additional soil sampling is found to be required to further investigate any additional possible/probable 'source-pathway-receptor' linkages at these properties, we would be able to complete them while the resource consent application is being processed.

While onsite for the PSI site walkover/interview, we propose to also carry out the underground utility clearance work required for Stage 2.

3.2 Stage 2 – Fieldwork

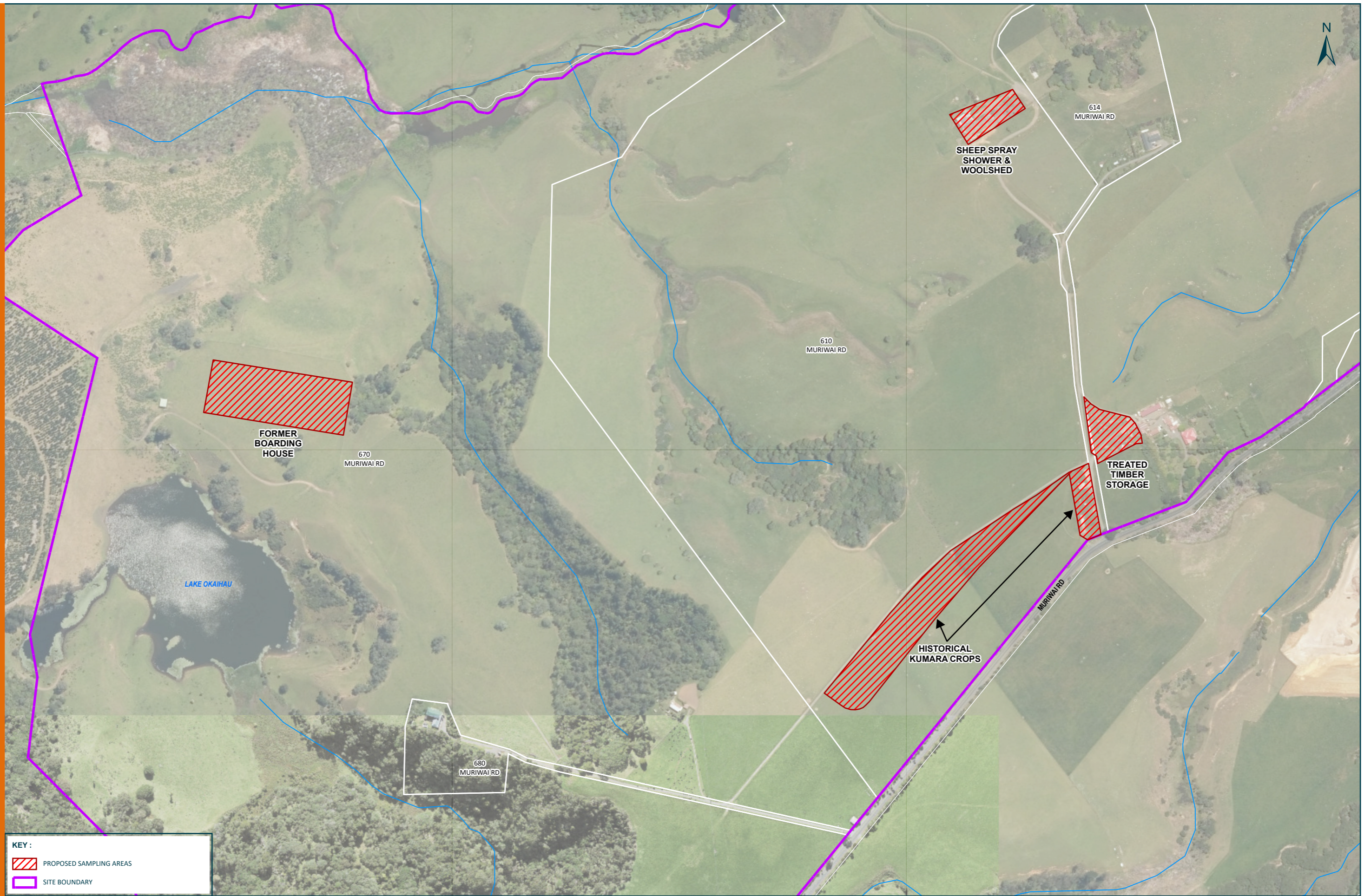
The following SOW is proposed based on the PSI completed in February 2021³ and in accordance with the requirements set out in the MfE's CLMG No.5 (revised 2021):

- ∴ Based on the total area of the site to be disturbed/developed⁴ that intersects with the discrete areas across the site with potential contamination/HAIL sources⁵ (as shown in Figure 1), the MfE sampling guidelines recommend a minimum of 73 sampling locations. From our experience and understanding of the project, the following soil sampling and analysis programme is proposed:
 - Collection of soil samples from a total of 73 sampling locations within the discrete areas.
 - Soil samples will be collected:
 - From the ground surface (0-0.1 m bgl);
 - At changes to lithology (currently assumed to comprise of topsoil/fill and natural material) to approximately 0.2 m below the maximum depth to which construction excavation will likely occur (assumed, from the information provided, to be approximately ranging between 0 and 3 m bgl) (i.e. to a maximum depth of 3 m bgl at certain locations as shown in Table 1 below); and/or
 - At any horizons with stains and/or odours.

³ Which does not include any additional possible/probable 'source-pathway-receptor' linkages that may be identified during the site walkover/interview of the recently acquired property at 614 Muriwai Road and the recently confirmed location of the water reservoir site (reservoir 1) straddling 697 and (the southern section of) 451 Muriwai Road.

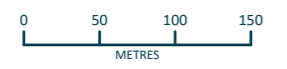
⁴ As indicated in the latest 'Golf Master Plan' as shown in Appendix 1 of the *Project Description Update – Muriwai Downs Golf Project* (Mitchell Daysh, 5 July 2021).

⁵ Including the areas where historical kumara crops (~18,200 m²); treated timber storage (~4,400 m²), sheep spray shower, holding/draining pens, exit races and woolshed (~3,900 m²); and the former boarding house (~11,500 m²) were/are located.



KEY :

- PROPOSED SAMPLING AREAS
- SITE BOUNDARY



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NO.	REVISION	DATE	BY
B	ISSUED FOR REVIEW	JUL 21	NE
A	ISSUED FOR REVIEW	APR 21	NE

SOURCE:
 1. AERIAL IMAGERY (FLOWN 2010 TO 2017) SOURCED FROM THE LINZ DATA SERVICE www.linz.govt.nz/about/linz-data-service/help/using-linz-data/attributing-aerial-imagery-data AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 NEW ZEALAND LICENCE.
 2. CADASTRAL/TPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.

CLIENT
GOLF STRATEGY GROUP LIMITED

FIGURE
FIG 1: PROPOSED SAMPLING AREA PLAN

PROJECT
MURIWAI DOWNS GOLF PROJECT - DETAILED SITE INVESTIGATION

- ∴ All soil samples will be couriered (with Chain of Custody documentation) to Hill Laboratories (Hills) in Hamilton for the analyses shown in Table 1 below (with the number of samples to be analysed as shown for the purposes of cost estimating):

Table 1: Sampling and Analysis Plan				
Sampling Area	Area (m ²)	Sampling Locations	Analytes	Proposed Soil Disturbance Within Sampling Area ¹
Historical Kumara Crops	18,200	28 ²	7x [metals ³ and organochlorine pesticides (OCPs)]	Cuts ranging from 0 to a maximum of 2 m bgl for the large area and only fill for the small area. 27 locations to be hand augered to natural material (assumed to be at 0.2 m bgl) and 1 location to be hand augered to maximum cut depth (2 m bgl), assuming only natural soil samples are encountered during the shallow hand augers.
Treated Timber Storage	4,400	12	12x [metals ³ , OCPs, polycyclic aromatic hydrocarbons (PAHs), pentachlorophenol (PCP) and tributyltin (TBT)]	Small area of fill and no cuts. 12 locations to be hand augered to natural material (assumed to be at 0.2 m bgl).
Sheep Spray Shower & Woolshed	3,900	11	14x [metals ³ and OCPs] ⁴	Maximum cut to 1 m bgl. 11 locations to be hand augered to maximum cut depth (1 m bgl).
Former Boarding House	11,500	22	22x [metals ³ and presence/absence asbestos in soil (P/A AsblnS)] ⁵	Cuts ranging from 0 to a maximum of 3 m bgl. 21 locations to be hand augered to natural material (assumed to be at 0.3 m bgl) and 1 location to be hand augered to maximum cut depth (3 m bgl), assuming only natural soil samples are encountered during the shallow hand augers.

Notes:

- As indicated in Mark Thawley's email dated 21 July 2021.
- On the basis of the likely even distribution of COPC across the historical kumara crops area, the primary soil samples collected from the 28 surface locations will be combined into seven composite soil samples for analysis.
- Arsenic, cadmium, chromium, copper, lead, nickel and zinc.
- Two soil samples (one each from the topsoil/fill and natural material horizon) at three targeted sampling locations (collected at and downgradient of the sheep spray shower and downgradient of the woolshed) and one soil sample (from the topsoil) at another eight systematic sampling locations (collected at regular intervals within the holding/drainage pens and exit races).
- One soil sample (from the topsoil/fill or natural material horizon, based on site observations) from each of the 22 systematic sampling locations at regular intervals within the former boarding house area. If asbestos is found to be present, the samples will also be analysed for semi-quantitative asbestos in soil (SQ AsblnS) - we have provisionally allowed for asbestos to be present in 10 soil samples.

If unforeseen issues arise (e.g. additional sampling and/or analyses is required) based on field observations, and more time is likely to be required, we will discuss these with you and agree on an approach and expected costs prior to proceeding.

3.3 Stage 3 – Reporting

Our findings will be documented as a DSI report in accordance with the MfE's CLMG No.1 and will include an updated conceptual site model (CSM) to ensure that the potential pathways and receptors are considered.

The report will assess the likelihood of human health and environmental risk associated with the proposed change in land-use and soil disturbance by assessing the soil results against relevant guidelines/criteria. The tabulated results (included in the DSI report) will inform conclusions regarding whether there are any specialist soils handling and disposal requirements for the project – for example:

- ∴ Are measures required to protect the health of site workers, site neighbours and/or environmental receptors during the works?
- ∴ Should excess excavated soils be disposed of to a managed or licenced landfill, or is reuse of soils onsite a possibility (from a contaminated land perspective)?

The report will also provide recommendations relating to:

- ∴ The requirement for contaminated land consents (under the NESCS and the AUP:OP); and
- ∴ Whether any further investigation work is necessary to inform site management and/or consenting and/or construction requirements (which will be scoped and costed for separately).

The DSI report will be provided electronically as a PDF document. Allowance has been made for minor formatting on the draft DSI report prior to issuing a final report (following receipt of feedback from the client).

4.0 Limitations

This document has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Golf Strategy Group Ltd and others (not directly contracted by PDP for the work), including Auckland Council, Mitchell Daysh Ltd and Muriwai Downs Ltd. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the document. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This document has been prepared by PDP on the specific instructions of Golf Strategy Group Ltd for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

© 2021 Pattle Delamore Partners Limited.

Yours faithfully,

PATTLE DELAMORE PARTNERS LIMITED

Prepared by



Stefan Yap

Service Leader - Contaminated Land

Reviewed & Approved by

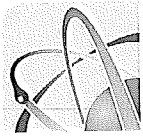


Erin Richards

Technical Director - Contaminated Land



Appendix E: COCs and Laboratory Reports



Hill Laboratories

TRIED, TESTED AND TRUSTED

Quote No 109925

Primary Contact Stefan Yap 259737

Submitted By Tom Harvey 247841

Client Name Pattle Delamore Partners Limited 59

Address PO Box 9528, Newmarket
Auckland 1149

Phone 09 523 6900 Mobile 0223144248

Email tom.harvey@pdp.co.nz

Charge To Pattle Delamore Partners Limited 59

Client Reference Muriwai

Order No A03582101

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 stefan.yap@pdp.co.nz
 Other

Dates of testing are not routinely included in the Certificates of Analysis.
Please inform the laboratory if you would like this information reported.

ADDITIONAL INFORMATION / KNOWN HAZARDS

Empty box for additional information / known hazards.

Quoted Sample Types

Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required		
1	WS-SS01-0.1	5.8.21	S	HM7, OCPs		
2	WS-SS01-0.3	↓	↓	Hold Cold HM7, OCPs		
3	WS-SS01-0.8			Hold Cold		
4	WS-SS02-0.1			HM7, OCPs		
5	WS-SS02-0.3			Hold Cold		
6	WS-SS02-0.8			Hold Cold		
7	WS-SS03-0.1			HM7, OCPs		
8	WS-SS03-0.3			Hold Cold HM7, OCPs		
9	WS-SS03-1.0			Hold Cold		
10	WS-SS04-0.1			↓	↓	HM7, OCPs

ANALYSIS REQUEST

R J Hill Laboratories Limited Job No: Date Recv: 10-Aug-21 07:50
 28 Duke Street Frankton 3204
 Private Bag 3205
 Hamilton 3240 New Zealand

267 4272

T 0508 HILL LAB (44 555 2
 T +64 7 858 2000
 E mail@hill-labs.co.nz
 W www.hill-laboratories.com

Received by: Jonas Eyskens



CHAIN OF CUSTODY RECORD

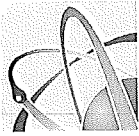
Sent to Hill Laboratories Date & Time: 9/8/21
 Name: Tom Harvey
 Tick if you require COC to be emailed back
 Signature: [Signature]

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

Condition Temp: 6.6
 Room Temp Chilled Frozen
 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: _____



Hill Laboratories

TRIED, TESTED AND TRUSTED

Quote No 109925

Primary Contact Stefan Yap 259737

Submitted By Tom Harvey 247841

Client Name Pattle Delamore Partners Limited 59

Address PO Box 9528, Newmarket
Auckland 1149

Phone 09 523 6900 Mobile 0223144248

Email tom.harvey@pdp.co.nz

Charge To Pattle Delamore Partners Limited 59

Client Reference Muriwai

Order No A03582101

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 Email Primary Contact Email Submitter Email Client
 Email Other stefan.yap@pdp.co.nz
 Other

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

ADDITIONAL INFORMATION / KNOWN HAZARDS

Empty box for additional information.

Quoted Sample Types

Soil (Soil)

ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

Office use only
(Job No)

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 9.8.21
 Name: Tom Harvey
 Tick if you require COC to be emailed back
 Signature: [Signature]

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

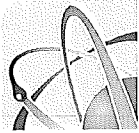
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 Room Temp Chilled Frozen
 Sample & Analysis details checked
 Signature:

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:

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	WS-SS04-0.3	6.8.21	S	Hold Cold
2	WS-SS04-1.0	↓	↓	Hold Cold
3	WS-SS05-0.1			Hm7, OCPs
4	WS-SS05-0.3			Hold Cold
5	WS-SS05-1.0			Hold Cold
6	WS-SS06-0.1			Hm7, OCPs
7	WS-SS06-0.3			Hold Cold
8	WS-SS06-1.0			Hold Cold
9	WS-SS07-0.1			Hm7, OCPs
10	WS-SS07-0.3			Hold Cold



Hill Laboratories

TRIED, TESTED AND TRUSTED

Quote No 109925

Primary Contact Stefan Yap 259737

Submitted By Tom Harvey 247841

Client Name Pattle Delamore Partners Limited 59

Address PO Box 9528, Newmarket
Auckland 1149

Phone 09 523 6900 Mobile 022 3144248

Email tom.harvey@pdp.co.nz

Charge To Pattle Delamore Partners Limited 59

Client Reference Muriwai

Order No A03582101

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Additional Reports will be sent as specified below.

Email Primary Contact Email Submitter Email Client
 Email Other stefan.yap@pdp.co.nz
 Other

Dates of testing are not routinely included in the Certificates of Analysis.
Please inform the laboratory if you would like this information reported.

ADDITIONAL INFORMATION / KNOWN HAZARDS

ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

Office use only
(Job No)

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 9.8.21
 Tick if you require COC to be emailed back Name: Tom Harvey
 Signature: [Signature]

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

Condition Temp:

Room Temp Chilled Frozen

Sample & Analysis details checked
 Signature:

Priority Low Normal High
 Urgent (ASAP, extra charge applies, please contact lab first)

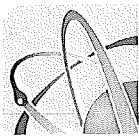
NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date: _____

Quoted Sample Types

Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
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2	WS_5508-0.1	↓	↓	HM7, OCPs
3	WS_5508-0.3			Hold Cold
4	WS_5508-1.0			Hold Cold
5	WS_5509-0.1			HM7, OCPs
6	WS_5509-0.3			Hold Cold HM7 OCPs
7	WS_5509-1.0			Hold Cold
8	WS_5510-0.1			HM7, OCPs
9	WS_5510-0.3			Hold Cold
10	WS_5510-1.0			Hold Cold



Hill Laboratories

TRIED, TESTED AND TRUSTED

Quote No 109925
 Primary Contact Stefan Yap 259737
 Submitted By Tom Harvey 247841
 Client Name Pattle Delamore Partners Limited 59

Address PO Box 9528, Newmarket
 Auckland 1149

Phone 09 523 6900 Mobile 0223144248

Email tom.harvey@pdp.co.nz

Charge To Pattle Delamore Partners Limited 59

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ADDITIONAL INFORMATION / KNOWN HAZARDS

ANALYSIS REQUEST

R J Hill Laboratories Limited
 28 Duke Street Frankton 3204
 Private Bag 3205
 Hamilton 3240 New Zealand

Office use only
 (Job No)

T 0508 HILL LAB (44 555 22)
 T +64 7 858 2000
 E mail@hill-labs.co.nz
 W www.hill-laboratories.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 9.8.21
 Name: Tom Harvey
 Tick if you require COC to be emailed back
 Signature: [Signature]

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

Condition Temp:
 Room Temp Chilled Frozen
 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)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	WS_S511_0.1	6.8.21	S	AMZ, OCPs
2	WS_S511_0.3	↓	↓	Hold Cold
3	WS_S511_1.0			Hold Cold
4				AMZ, PAA, PCP, TBT
5	TT_S501_0.1			AMZ, PAA, PCP, TBT
6	TT_S501_0.2			Hold Cold
7	TT_S502_0.1			AMZ, PAA, PCP, TBT
8	TT_S502_0.2			Hold Cold
9	TT_S503_0.1			AMZ, PAA, PCP, TBT
10	TT_S503_0.2			Hold Cold



Hill Laboratories

TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

Quote No 109925
 Primary Contact Stefan Yap 259737
 Submitted By Tom Harvey 247841
 Client Name Pattle Delamore Partners Limited 59

R J Hill Laboratories Limited
 28 Duke Street Frankton 3204
 Private Bag 3205
 Hamilton 3240 New Zealand
 T 0508 HILL LAB (44 555 22)
 T +64 7 858 2000
 E mail@hill-labs.co.nz
 W www.hill-laboratories.com

Office use only
 (Job No)

Address PO Box 9528, Newmarket
 Auckland 1149
 Phone 09 523 6900 Mobile *See page 1*
 Email

Charge To Pattle Delamore Partners Limited 59
 Client Reference Muriwai
 Order No A03582101

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 *See page 1*
 Other

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: *9.8.21*
 Name: *Tom Harvey*
 Tick if you require COC to be emailed back
 Signature: *[Signature]*

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

Condition Temp:
 Room Temp Chilled Frozen
 Sample & Analysis details checked
 Signature:

ADDITIONAL INFORMATION / KNOWN HAZARDS

[Empty box for additional information]

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)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	TT_5504_0.1	<i>6.8.21</i>	<i>S</i>	<i>HMZ, PAAs, PCP, TBT</i>
2	TT_5504_0.2	<i> </i>	<i> </i>	<i>Hold Cold</i>
3	TT_5505_0.1	<i> </i>	<i> </i>	<i>HMZ, PAAs, PCP, TBT</i>
4	TT_5506_0.2	<i> </i>	<i> </i>	<i>Hold Cold</i>
5	TT_5507_0.1	<i> </i>	<i> </i>	<i>HMZ, PAAs, PCP, TBT</i>
6	TT_5507_0.2	<i> </i>	<i> </i>	<i>Hold Cold</i>
7	TT_5508_0.1	<i> </i>	<i> </i>	<i>HMZ, PAAs, PCP, TBT</i>
8	TT_5508_0.2	<i> </i>	<i> </i>	<i>HMZ, PAAs, PCP, TBT</i> <i>Hold Cold</i>
9	TT_5509_0.1	<i> </i>	<i> </i>	<i>HMZ, PAAs, PCP, TBT</i>
10	TT_5509_0.2	<i> </i>	<i> </i>	<i>Hold Cold</i>



Job Information Summary

Page 1 of 4

Client:	Pattle Delamore Partners Limited	Lab No:	2674272
Contact:	Stefan Yap C/- Pattle Delamore Partners Limited PO Box 9528 Newmarket Auckland 1149	Date Registered:	10-Aug-2021 2:44 pm
		Priority:	High
		Quote No:	109925
		Order No:	A03582101
		Client Reference:	Muriwai
		Add. Client Ref:	
		Submitted By:	Tom Harvey
		Charge To:	Pattle Delamore Partners Limited
		Target Date:	18-Aug-2021 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	WS_SS01_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
2	WS_SS01_0.3 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
3	WS_SS01_0.8 06-Aug-2021	Soil	cGSoil	Hold Cold
4	WS_SS02_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
5	WS_SS02_0.3 06-Aug-2021	Soil	cGSoil	Hold Cold
6	WS_SS02_0.8 06-Aug-2021	Soil	cGSoil	Hold Cold
7	WS_SS03_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
8	WS_SS03_0.3 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
9	WS_SS03_1.0 06-Aug-2021	Soil	cGSoil	Hold Cold
10	WS_SS04_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
11	WS_SS04_0.3 06-Aug-2021	Soil	cGSoil	Hold Cold
12	WS_SS04_1.0 06-Aug-2021	Soil	cGSoil	Hold Cold
13	WS_SS05_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
14	WS_SS05_0.3 06-Aug-2021	Soil	cGSoil	Hold Cold
15	WS_SS05_1.0 06-Aug-2021	Soil	cGSoil	Hold Cold
16	WS_SS06_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
17	WS_SS06_0.3 06-Aug-2021	Soil	cGSoil	Hold Cold
18	WS_SS06_1.0 06-Aug-2021	Soil	cGSoil	Hold Cold
19	WS_SS07_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
20	WS_SS07_0.3 06-Aug-2021	Soil	cGSoil	Hold Cold
21	WS_SS07_1.0 06-Aug-2021	Soil	cGSoil	Hold Cold
22	WS_SS08_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
23	WS_SS08_0.3 06-Aug-2021	Soil	cGSoil	Hold Cold
24	WS_SS08_1.0 06-Aug-2021	Soil	cGSoil	Hold Cold
25	WS_SS09_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
26	WS_SS09_0.3 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
27	WS_SS09_1.0 06-Aug-2021	Soil	cGSoil	Hold Cold
28	WS_SS10_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
29	WS_SS10_0.3 06-Aug-2021	Soil	cGSoil	Hold Cold

Samples				
No	Sample Name	Sample Type	Containers	Tests Requested
30	WS_SS10_1.0 06-Aug-2021	Soil	cGSoil	Hold Cold
31	WS_SS11_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
32	WS_SS11_0.3 06-Aug-2021	Soil	cGSoil	Hold Cold
33	WS_SS11_1.0 06-Aug-2021	Soil	cGSoil	Hold Cold
34	TT_SS01_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS; Organochlorine Pesticides Screening in Soil
35	TT_SS01_0.2 06-Aug-2021	Soil	cGSoil	Hold Cold
36	TT_SS02_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS; Organochlorine Pesticides Screening in Soil
37	TT_SS02_0.2 06-Aug-2021	Soil	cGSoil	Hold Cold
38	TT_SS03_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS; Organochlorine Pesticides Screening in Soil
39	TT_SS03_0.2 06-Aug-2021	Soil	cGSoil	Hold Cold
40	TT_SS04_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS; Organochlorine Pesticides Screening in Soil
41	TT_SS04_0.2 06-Aug-2021	Soil	cGSoil	Hold Cold
42	TT_SS05_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS; Organochlorine Pesticides Screening in Soil
43	TT_SS06_0.2 06-Aug-2021	Soil	cGSoil	Hold Cold
44	TT_SS07_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS; Organochlorine Pesticides Screening in Soil
45	TT_SS07_0.2 06-Aug-2021	Soil	cGSoil	Hold Cold
46	TT_SS08_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS; Organochlorine Pesticides Screening in Soil
47	TT_SS08_0.2 06-Aug-2021	Soil	cGSoil	Hold Cold
48	TT_SS09_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS; Organochlorine Pesticides Screening in Soil
49	TT_SS09_0.2 06-Aug-2021	Soil	cGSoil	Hold Cold
52	TT_SS10_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS; Organochlorine Pesticides Screening in Soil
53	TT_SS10_0.2 06-Aug-2021	Soil	cGSoil	Hold Cold
54	TT_SS11_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS; Organochlorine Pesticides Screening in Soil
55	TT_SS11_0.2 06-Aug-2021	Soil	cGSoil	Hold Cold

Samples				
No	Sample Name	Sample Type	Containers	Tests Requested
56	TT_SS12_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS; Organochlorine Pesticides Screening in Soil
57	TT_SS12_0.2 06-Aug-2021	Soil	cGSoil	Hold Cold
58	TT_SS05_0.2 06-Aug-2021	Soil	cGSoil	
59	TT_SS06_0.1 06-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil; Polycyclic Aromatic Hydrocarbons Screening in Soil; Pentachlorophenol Screening in Soil by LCMSMS; Tributyl Tin Trace in Soil samples by GCMS

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-2, 4, 7-8, 10, 13, 16, 19, 22, 25-26, 28, 31, 34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Soil Prep Dry for Organics,Trace	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-2, 4, 7-8, 10, 13, 16, 19, 22, 25-26, 28, 31, 34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	1-2, 4, 7-8, 10, 13, 16, 19, 22, 25-26, 28, 31, 34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Pentachlorophenol Screening in Soil by LCMSMS	Solvent extraction, LC-MS/MS analysis. Tested on dried sample. In-house.	0.010 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Tributyl Tin Trace in Soil samples by GCMS	Solvent extraction, derivitisation, GC-MS analysis. Tested on dried sample. In-house.	0.003 - 0.007 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-2, 4, 7-8, 10, 13, 16, 19, 22, 25-26, 28, 31, 34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Benzo[a]pyrene Toxic Equivalence (TEF)	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59



Certificate of Analysis

Client:	Pattle Delamore Partners Limited	Lab No:	2674272	SPV1
Contact:	Stefan Yap	Date Received:	10-Aug-2021	
	C/- Pattle Delamore Partners Limited	Date Reported:	17-Aug-2021	
	PO Box 9528	Quote No:	109925	
	Newmarket	Order No:	A03582101	
	Auckland 1149	Client Reference:	Muriwai	
		Submitted By:	Tom Harvey	

Sample Type: Soil

Sample Name:	WS_SS01_0.1	WS_SS01_0.3	WS_SS02_0.1	WS_SS03_0.1	WS_SS03_0.3
	06-Aug-2021	06-Aug-2021	06-Aug-2021	06-Aug-2021	06-Aug-2021
Lab Number:	2674272.1	2674272.2	2674272.4	2674272.7	2674272.8

Individual Tests

Dry Matter	g/100g as rcvd	78	82	66	66	84
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Heavy Metals, Screen Level

Test	Unit	WS_SS01_0.1	WS_SS01_0.3	WS_SS02_0.1	WS_SS03_0.1	WS_SS03_0.3
Total Recoverable Arsenic	mg/kg dry wt	2	3	7	8	2
Total Recoverable Cadmium	mg/kg dry wt	0.11	< 0.10	< 0.10	0.11	< 0.10
Total Recoverable Chromium	mg/kg dry wt	8	8	15	10	8
Total Recoverable Copper	mg/kg dry wt	34	6	18	27	5
Total Recoverable Lead	mg/kg dry wt	7.2	9.4	18.3	32	11.6
Total Recoverable Nickel	mg/kg dry wt	5	2	5	3	< 2
Total Recoverable Zinc	mg/kg dry wt	109	33	139	68	20

Organochlorine Pesticides Screening in Soil

Test	Unit	WS_SS01_0.1	WS_SS01_0.3	WS_SS02_0.1	WS_SS03_0.1	WS_SS03_0.3
Aldrin	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
alpha-BHC	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
beta-BHC	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
delta-BHC	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
gamma-BHC (Lindane)	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
cis-Chlordane	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
trans-Chlordane	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
2,4'-DDD	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
4,4'-DDD	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
2,4'-DDE	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
4,4'-DDE	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
2,4'-DDT	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
4,4'-DDT	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
Total DDT Isomers	mg/kg dry wt	< 0.08	< 0.08	< 0.09	< 0.09	< 0.07
Dieldrin	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
Endosulfan I	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
Endosulfan II	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
Endosulfan sulphate	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
Endrin	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
Endrin aldehyde	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
Endrin ketone	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
Heptachlor	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
Heptachlor epoxide	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
Hexachlorobenzene	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012
Methoxychlor	mg/kg dry wt	< 0.013	< 0.013	< 0.015	< 0.015	< 0.012



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.

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

Sample Type: Soil						
Sample Name:		WS_SS04_0.1	WS_SS05_0.1	WS_SS06_0.1	WS_SS07_0.1	WS_SS08_0.1
		06-Aug-2021	06-Aug-2021	06-Aug-2021	06-Aug-2021	06-Aug-2021
Lab Number:		2674272.10	2674272.13	2674272.16	2674272.19	2674272.22
Individual Tests						
Dry Matter	g/100g as rcvd	68	79	75	75	82
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	72	6	6	9	4
Total Recoverable Cadmium	mg/kg dry wt	0.17	< 0.10	0.17	0.12	< 0.10
Total Recoverable Chromium	mg/kg dry wt	14	7	11	14	9
Total Recoverable Copper	mg/kg dry wt	100	28	24	14	7
Total Recoverable Lead	mg/kg dry wt	32	7.0	6.4	6.9	8.7
Total Recoverable Nickel	mg/kg dry wt	4	< 2	6	6	3
Total Recoverable Zinc	mg/kg dry wt	97	35	69	69	31
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
alpha-BHC	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
beta-BHC	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
delta-BHC	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
gamma-BHC (Lindane)	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
cis-Chlordane	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
trans-Chlordane	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
2,4'-DDD	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
4,4'-DDD	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
2,4'-DDE	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
4,4'-DDE	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
2,4'-DDT	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
4,4'-DDT	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
Total DDT Isomers	mg/kg dry wt	< 0.09	< 0.08	< 0.08	< 0.08	< 0.07
Dieldrin	mg/kg dry wt	0.043	< 0.013	< 0.013	< 0.013	< 0.012
Endosulfan I	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
Endosulfan II	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
Endosulfan sulphate	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
Endrin	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
Endrin aldehyde	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
Endrin ketone	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
Heptachlor	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
Heptachlor epoxide	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
Hexachlorobenzene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
Methoxychlor	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.013	< 0.012
Sample Name:						
		WS_SS09_0.1	WS_SS09_0.3	WS_SS10_0.1	WS_SS11_0.1	TT_SS01_0.1
		06-Aug-2021	06-Aug-2021	06-Aug-2021	06-Aug-2021	06-Aug-2021
Lab Number:		2674272.25	2674272.26	2674272.28	2674272.31	2674272.34
Individual Tests						
Dry Matter	g/100g as rcvd	74	75	84	73	68
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	16	5	3	6	10
Total Recoverable Cadmium	mg/kg dry wt	0.10	< 0.10	< 0.10	0.11	0.35
Total Recoverable Chromium	mg/kg dry wt	17	11	9	10	22
Total Recoverable Copper	mg/kg dry wt	13	6	4	14	21
Total Recoverable Lead	mg/kg dry wt	38	17.5	10.1	11.1	23
Total Recoverable Nickel	mg/kg dry wt	5	5	2	4	6
Total Recoverable Zinc	mg/kg dry wt	100	62	14	43	47
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
alpha-BHC	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
beta-BHC	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
delta-BHC	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
gamma-BHC (Lindane)	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
cis-Chlordane	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015

Sample Type: Soil						
Sample Name:	WS_SS09_0.1	WS_SS09_0.3	WS_SS10_0.1	WS_SS11_0.1	TT_SS01_0.1	
	06-Aug-2021	06-Aug-2021	06-Aug-2021	06-Aug-2021	06-Aug-2021	
Lab Number:	2674272.25	2674272.26	2674272.28	2674272.31	2674272.34	
Organochlorine Pesticides Screening in Soil						
trans-Chlordane	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
2,4'-DDD	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
4,4'-DDD	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
2,4'-DDE	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
4,4'-DDE	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
2,4'-DDT	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
4,4'-DDT	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Total DDT Isomers	mg/kg dry wt	< 0.08	< 0.08	< 0.08	< 0.08	< 0.09
Dieldrin	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Endosulfan I	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Endosulfan II	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Endosulfan sulphate	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Endrin	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Endrin aldehyde	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Endrin ketone	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Heptachlor	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Heptachlor epoxide	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Hexachlorobenzene	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Methoxychlor	mg/kg dry wt	< 0.014	< 0.013	< 0.012	< 0.014	< 0.015
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	-	-	-	-	< 0.4
1-Methylnaphthalene	mg/kg dry wt	-	-	-	-	< 0.015
2-Methylnaphthalene	mg/kg dry wt	-	-	-	-	< 0.015
Acenaphthylene	mg/kg dry wt	-	-	-	-	< 0.015
Acenaphthene	mg/kg dry wt	-	-	-	-	< 0.015
Anthracene	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[a]anthracene	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	-	-	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	-	-	< 0.04
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[e]pyrene	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[k]fluoranthene	mg/kg dry wt	-	-	-	-	< 0.015
Chrysene	mg/kg dry wt	-	-	-	-	< 0.015
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	-	-	< 0.015
Fluoranthene	mg/kg dry wt	-	-	-	-	< 0.015
Fluorene	mg/kg dry wt	-	-	-	-	< 0.015
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	-	-	< 0.015
Naphthalene	mg/kg dry wt	-	-	-	-	< 0.08
Perylene	mg/kg dry wt	-	-	-	-	< 0.015
Phenanthrene	mg/kg dry wt	-	-	-	-	< 0.015
Pyrene	mg/kg dry wt	-	-	-	-	< 0.015
Pentachlorophenol Screening in Soil by LCMSMS						
Pentachlorophenol (PCP)	mg/kg dry wt	-	-	-	-	< 0.05
2,3,4,6-Tetrachlorophenol (TCP)	mg/kg dry wt	-	-	-	-	< 0.05
Tributyl Tin Trace in Soil samples by GCMS						
Dibutyltin (as Sn)	mg/kg dry wt	-	-	-	-	< 0.005
Monobutyltin (as Sn)	mg/kg dry wt	-	-	-	-	< 0.007
Tributyltin (as Sn)	mg/kg dry wt	-	-	-	-	< 0.004
Triphenyltin (as Sn)	mg/kg dry wt	-	-	-	-	< 0.003

Sample Type: Soil						
Sample Name:	TT_SS02_0.1 06-Aug-2021	TT_SS03_0.1 06-Aug-2021	TT_SS04_0.1 06-Aug-2021	TT_SS05_0.1 06-Aug-2021	TT_SS07_0.1 06-Aug-2021	
Lab Number:	2674272.36	2674272.38	2674272.40	2674272.42	2674272.44	
Individual Tests						
Dry Matter	g/100g as rcvd	71	70	71	72	75
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	94	10	65	16	59
Total Recoverable Cadmium	mg/kg dry wt	0.34	0.37	0.37	0.31	0.58
Total Recoverable Chromium	mg/kg dry wt	47	21	134	24	38
Total Recoverable Copper	mg/kg dry wt	38	22	97	22	59
Total Recoverable Lead	mg/kg dry wt	14.1	27	19.3	30	65
Total Recoverable Nickel	mg/kg dry wt	6	7	8	8	6
Total Recoverable Zinc	mg/kg dry wt	49	57	300	93	169
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
alpha-BHC	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
beta-BHC	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
delta-BHC	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
gamma-BHC (Lindane)	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
cis-Chlordane	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
trans-Chlordane	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
2,4'-DDD	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
4,4'-DDD	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
2,4'-DDE	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
4,4'-DDE	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
2,4'-DDT	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
4,4'-DDT	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Total DDT Isomers	mg/kg dry wt	< 0.09	< 0.09	< 0.09	< 0.09	< 0.08
Dieldrin	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Endosulfan I	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Endosulfan II	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Endosulfan sulphate	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Endrin	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Endrin aldehyde	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Endrin ketone	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Heptachlor	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Heptachlor epoxide	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Hexachlorobenzene	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Methoxychlor	mg/kg dry wt	< 0.014	< 0.014	< 0.014	< 0.014	< 0.013
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
1-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Acenaphthylene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Acenaphthene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Anthracene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Benzo[a]anthracene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Benzo[e]pyrene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Benzo[k]fluoranthene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Chrysene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013

Sample Type: Soil						
Sample Name:		TT_SS02_0.1 06-Aug-2021	TT_SS03_0.1 06-Aug-2021	TT_SS04_0.1 06-Aug-2021	TT_SS05_0.1 06-Aug-2021	TT_SS07_0.1 06-Aug-2021
Lab Number:		2674272.36	2674272.38	2674272.40	2674272.42	2674272.44
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Fluoranthene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Fluorene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Naphthalene	mg/kg dry wt	< 0.07	< 0.08	< 0.07	< 0.07	< 0.07
Perylene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Phenanthrene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Pyrene	mg/kg dry wt	< 0.014	< 0.015	< 0.014	< 0.014	< 0.013
Pentachlorophenol Screening in Soil by LCMSMS						
Pentachlorophenol (PCP)	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,3,4,6-Tetrachlorophenol (TCP)	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Tributyl Tin Trace in Soil samples by GCMS						
Dibutyltin (as Sn)	mg/kg dry wt	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Monobutyltin (as Sn)	mg/kg dry wt	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
Tributyltin (as Sn)	mg/kg dry wt	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Triphenyltin (as Sn)	mg/kg dry wt	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Sample Name:		TT_SS08_0.1 06-Aug-2021	TT_SS09_0.1 06-Aug-2021	TT_SS10_0.1 06-Aug-2021	TT_SS11_0.1 06-Aug-2021	TT_SS12_0.1 06-Aug-2021
Lab Number:		2674272.46	2674272.48	2674272.52	2674272.54	2674272.56
Individual Tests						
Dry Matter	g/100g as rcvd	79	72	75	76	77
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	8	23	67	31	4
Total Recoverable Cadmium	mg/kg dry wt	0.21	0.27	0.33	0.38	< 0.10
Total Recoverable Chromium	mg/kg dry wt	27	23	77	26	16
Total Recoverable Copper	mg/kg dry wt	15	30	78	29	4
Total Recoverable Lead	mg/kg dry wt	17.1	152	61	43	19.8
Total Recoverable Nickel	mg/kg dry wt	8	5	5	8	4
Total Recoverable Zinc	mg/kg dry wt	72	92	144	210	39
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
alpha-BHC	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
beta-BHC	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
delta-BHC	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
gamma-BHC (Lindane)	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
cis-Chlordane	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
trans-Chlordane	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
2,4'-DDD	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
4,4'-DDD	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
2,4'-DDE	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
4,4'-DDE	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
2,4'-DDT	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
4,4'-DDT	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
Total DDT Isomers	mg/kg dry wt	< 0.08	< 0.09	< 0.08	< 0.08	< 0.08
Dieldrin	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
Endosulfan I	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
Endosulfan II	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
Endosulfan sulphate	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
Endrin	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
Endrin aldehyde	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
Endrin ketone	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
Heptachlor	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
Heptachlor epoxide	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
Hexachlorobenzene	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013
Methoxychlor	mg/kg dry wt	< 0.013	< 0.014	< 0.014	< 0.013	< 0.013

Sample Type: Soil						
Sample Name:	TT_SS08_0.1 06-Aug-2021	TT_SS09_0.1 06-Aug-2021	TT_SS10_0.1 06-Aug-2021	TT_SS11_0.1 06-Aug-2021	TT_SS12_0.1 06-Aug-2021	
Lab Number:	2674272.46	2674272.48	2674272.52	2674272.54	2674272.56	
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.4	< 0.4	0.7	< 0.4
1-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.014	< 0.013	< 0.013	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.014	< 0.013	< 0.013	< 0.013
Acenaphthylene	mg/kg dry wt	< 0.013	< 0.014	< 0.013	0.021	< 0.013
Acenaphthene	mg/kg dry wt	< 0.013	< 0.014	< 0.013	< 0.013	< 0.013
Anthracene	mg/kg dry wt	< 0.013	< 0.014	< 0.013	0.014	< 0.013
Benzo[a]anthracene	mg/kg dry wt	< 0.013	< 0.014	0.022	0.058	< 0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.013	< 0.014	0.035	0.061	< 0.013
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.03	< 0.04	0.04	0.09	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.03	< 0.04	0.04	0.09	< 0.04
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.013	< 0.014	0.030	0.067	< 0.013
Benzo[e]pyrene	mg/kg dry wt	< 0.013	< 0.014	0.018	0.036	< 0.013
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.013	< 0.014	0.026	0.031	< 0.013
Benzo[k]fluoranthene	mg/kg dry wt	< 0.013	< 0.014	0.013	0.029	< 0.013
Chrysene	mg/kg dry wt	< 0.013	< 0.014	0.017	0.061	< 0.013
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013	< 0.014	< 0.013	< 0.013	< 0.013
Fluoranthene	mg/kg dry wt	< 0.013	< 0.014	0.027	0.097	< 0.013
Fluorene	mg/kg dry wt	< 0.013	< 0.014	< 0.013	< 0.013	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.013	< 0.014	0.022	0.034	< 0.013
Naphthalene	mg/kg dry wt	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07
Perylene	mg/kg dry wt	< 0.013	< 0.014	< 0.013	< 0.013	< 0.013
Phenanthrene	mg/kg dry wt	< 0.013	< 0.014	< 0.013	0.060	< 0.013
Pyrene	mg/kg dry wt	< 0.013	< 0.014	0.031	0.099	< 0.013
Pentachlorophenol Screening in Soil by LCMSMS						
Pentachlorophenol (PCP)	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,3,4,6-Tetrachlorophenol (TCP)	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Tributyl Tin Trace in Soil samples by GCMS						
Dibutyltin (as Sn)	mg/kg dry wt	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Monobutyltin (as Sn)	mg/kg dry wt	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
Tributyltin (as Sn)	mg/kg dry wt	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Triphenyltin (as Sn)	mg/kg dry wt	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Sample Name:	TT_SS06_0.1 06-Aug-2021					
Lab Number:	2674272.59					
Individual Tests						
Dry Matter	g/100g as rcvd	77	-	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	7	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.30	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	18	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	18	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	25	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	6	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	108	-	-	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.013	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.013	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.013	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.013	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.013	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.013	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.013	-	-	-	-

Sample Type: Soil

Sample Name:		TT_SS06_0.1				
		06-Aug-2021				
Lab Number:		2674272.59				
Organochlorine Pesticides Screening in Soil						
2,4'-DDD	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.013	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.013	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.013	-	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.08	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.013	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.013	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.013	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.013	-	-	-	-
Endrin	mg/kg dry wt	< 0.013	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.013	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.013	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.013	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.013	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.013	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.013	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.4	-	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.013	-	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.013	-	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.013	-	-	-	-
Acenaphthene	mg/kg dry wt	< 0.013	-	-	-	-
Anthracene	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.04	-	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.04	-	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.013	-	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.013	-	-	-	-
Chrysene	mg/kg dry wt	< 0.013	-	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013	-	-	-	-
Fluoranthene	mg/kg dry wt	< 0.013	-	-	-	-
Fluorene	mg/kg dry wt	< 0.013	-	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.013	-	-	-	-
Naphthalene	mg/kg dry wt	< 0.07	-	-	-	-
Perylene	mg/kg dry wt	< 0.013	-	-	-	-
Phenanthrene	mg/kg dry wt	< 0.013	-	-	-	-
Pyrene	mg/kg dry wt	< 0.013	-	-	-	-
Pentachlorophenol Screening in Soil by LCMSMS						
Pentachlorophenol (PCP)	mg/kg dry wt	< 0.05	-	-	-	-
2,3,4,6-Tetrachlorophenol (TCP)	mg/kg dry wt	< 0.05	-	-	-	-
Tributyl Tin Trace in Soil samples by GCMS						
Dibutyltin (as Sn)	mg/kg dry wt	< 0.005	-	-	-	-
Monobutyltin (as Sn)	mg/kg dry wt	< 0.007	-	-	-	-
Tributyltin (as Sn)	mg/kg dry wt	< 0.004	-	-	-	-
Triphenyltin (as Sn)	mg/kg dry wt	< 0.003	-	-	-	-

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-2, 4, 7-8, 10, 13, 16, 19, 22, 25-26, 28, 31, 34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Soil Prep Dry for Organics, Trace*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-2, 4, 7-8, 10, 13, 16, 19, 22, 25-26, 28, 31, 34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	1-2, 4, 7-8, 10, 13, 16, 19, 22, 25-26, 28, 31, 34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Pentachlorophenol Screening in Soil by LCMSMS	Solvent extraction, LC-MS/MS analysis. Tested on dried sample. In-house.	0.010 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Tributyl Tin Trace in Soil samples by GCMS	Solvent extraction, derivitisation, GC-MS analysis. Tested on dried sample. In-house.	0.003 - 0.007 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-2, 4, 7-8, 10, 13, 16, 19, 22, 25-26, 28, 31, 34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	34, 36, 38, 40, 42, 44, 46, 48, 52, 54, 56, 59

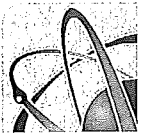
These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 11-Aug-2021 and 17-Aug-2021. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental



Hill Laboratories

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ANALYSIS REQUEST

Quote No 109925

R J Hill Laboratories Limited Job No: Date Recv: 13-Aug-21 07:50
 28 Duke Street Frankton
 Private Bag 3205
 Hamilton 3240 New Zealand

267 7154

Primary Contact Stefan Yap 259737

T 0508 HILL LAB (44
 T +64 7 858 2000
 E mail@hill-labs.co.nz
 W www.hill-laboratories

Submitted By Tom Harvey 247841

Received by: Jonas Eyskens
 312677 1544

Client Name Pattle Delamore Partners Limited 59

CHAIN OF CUSTODY RECORD

Address PO Box 9528, Newmarket

Sent to Hill Laboratories Date & Time: 11/8/21

Auckland 1149

Phone 09 523 6900 Mobile 0223144248

Name: Tom Harvey
 Signature:

Email tom.harvey@pdp.co.nz

Received at Hill Laboratories Date & Time:

Charge To Pattle Delamore Partners Limited 59

Client Reference Muriwai

Order No A03582101

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

Dates of testing are not routinely included in the Certificates of Analysis.
 Please inform the laboratory if you would like this information reported.

Condition Room Temp Chilled Frozen Temp: 12.2

Sample & Analysis details checked
 Signature:

ADDITIONAL INFORMATION / KNOWN HAZARDS

Priority Low Normal High
 Urgent (ASAP, extra charge applies, please contact lab first)

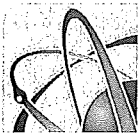
NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Quoted Sample Types

Soil (Soil)

Requested Reporting Date:

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	KC_S501_0.1	10.8.21	}	Lab Composite
2	KC_S502_0.1			
3	KC_S503_0.1			
4	KC_S504_0.1			
5	KC_S501_0.3		}	Hold Cold
6	KC_S502_0.3			
7	KC_S503_0.3			
8	KC_S504_0.3			
9	KC_S505_0.1		}	Lab Comp (with KC_S507)
10	KC_S508_0.1			



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ANALYSIS REQUEST

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 28 Duke Street Frankton 3204
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 Hamilton 3240 New Zealand
 T 0508 HILL LAB (44 555 22)
 T +64 7 858 2000
 E mail@hill-labs.co.nz
 W www.hill-laboratories.com

Office use only
 (Job No)

Quote No 109925
 Primary Contact Stefan Yap 259737
 Submitted By Tom Harvey 247841
 Client Name Pattle Delamore Partners Limited 59

Address PO Box 9528, Newmarket
 Auckland 1149

Phone 09 523 6900 Mobile *See Page 1*

Email

Charge To Pattle Delamore Partners Limited 59

Client Reference Muriwai

Order No A03582101

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 *See page 1*
 Other

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 11/18/12
 Name: Tom Harvey
 Signature: *[Signature]*
 Tick if you require COC to be emailed back

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

Condition Room Temp Chilled Frozen Temp:
 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:

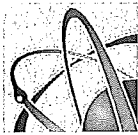
ADDITIONAL INFORMATION / KNOWN HAZARDS

[Empty box for additional information]

Quoted Sample Types

Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	KL-SS07-0.1	10/18/12	S	} HM7 + OCP Lab Comp with SS05-0.1 + SS06-0.1 Hold Cold ↓ Lab Composite HM7 + OCP
2	KL-SS08-0.1			
3	KL-SS05-0.3			
4	KL-SS06-0.3			
5	KL-SS07-0.3			
6	KL-SS08-0.3			
7	KL-SS09-0.1			
8	KL-SS10-0.1			
9	KL-SS11-0.1			
10	KL-SS12-0.1			



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ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

Office use only
(Job No)

Quote No 109925

Primary Contact Stefan Yap 259737

Submitted By Tom Harvey 247841

Client Name Pattle Delamore Partners Limited 59

Address PO Box 9528, Newmarket
Auckland 1149

Phone 09 523 6900 Mobile See page 1

Email

Charge To Pattle Delamore Partners Limited 59

Client Reference Muriwai

Order No A03582101

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 Email Other *See page 1*
 Other

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T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 11/18/21
 Name: Tom Harvey
 Tick if you require COC to be emailed back
 Signature: *[Signature]*

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

Condition Temp:
 Room Temp Chilled Frozen
 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.

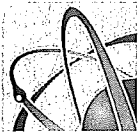
Requested Reporting Date:

ADDITIONAL INFORMATION / KNOWN HAZARDS

Quoted Sample Types

Soil (soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	KL-SS15-0.3	10/18/21	S	Hold Cold
2	KL-SS16-0.4	↓	↓	Lab Comp HM7 + OCPs
3	KL-SS17-0.1			
4	KL-SS18-0.1			
5	KL-SS19-0.1			
6	KL-SS20-0.1			
7	KL-SS17-0.3			
8	KL-SS18-0.3	↓	↓	↓
9	KL-SS19-0.25			
10	KL-SS20-0.3			



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 Email Primary Contact Email Submitter Email Client
 Email Other
 Other

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 11/18/21
 Name: Tom Harvey
 Tick if you require COC to be emailed back
 Signature: *[Signature]*

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

Condition Temp:
 Room Temp Chilled Frozen
 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.

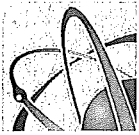
Requested Reporting Date:

ADDITIONAL INFORMATION / KNOWN HAZARDS

Quoted Sample Types

Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	KC_5527_0.1	10/18/21	S	} Lab Comp with 5525+5526 } HM7 + OCPs Hold Cold
2	KC_5528_0.1			
3	KC_5525_0.3			
4	KC_5526_0.3			
5	KC_5527_0.3			
6	KC_5528_0.3			
7	BH_5501_0.1			HM7
8	BH_5501_0.3			Hold Cold
9	BH_5502_0.1	11/18/21		HM7
10	BH_5502_0.3			Hold Cold



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ANALYSIS REQUEST

Quote No 109925
 Primary Contact Stefan Yap 259737
 Submitted By Tom Harvey 247841
 Client Name Pattle Delamore Partners Limited 59

R J Hill Laboratories Limited
 28 Duke Street Frankton 3204
 Private Bag 3205
 Hamilton 3240 New Zealand
 T 0508 HILL LAB (44 555 22)
 T +64 7 858 2000
 E mail@hill-labs.co.nz
 W www.hill-laboratories.com

Office use only
 (Job No)

Address PO Box 9528, Newmarket
 Auckland 1149

Phone 09 523 6900 Mobile

Email

Charge To Pattle Delamore Partners Limited 59

Client Reference Muriwai

Order No A03582101

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 Email Primary Contact Email Submitter Email Client
 Email Other _____
 Other _____

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

ADDITIONAL INFORMATION / KNOWN HAZARDS

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 11/8/21
 Name: Tom Harvey
 Tick if you require COC to be emailed back
 Signature: *[Signature]*

Received at Hill Laboratories Date & Time: *[Signature]*
 Name: _____
 Signature: _____

Condition Room Temp Chilled Frozen Temp: _____

Sample & Analysis details checked
 Signature: _____

Priority Low Normal High
 Urgent (ASAP, extra charge applies, please contact lab first)

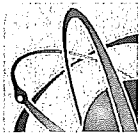
NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date: _____

Quoted Sample Types

Soil (soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	BH-SS03-0.1	11/8/21	S	HM7
2	BH-SS03-0.3	↓	↓	Hold Cold
3	BH-SS04-0.1			HM7
4	BH-SS04-0.3			Hold Cold
5	BH-SS05-0.1			HM7
6	BH-SS05-0.3			Hold Cold
7	BH-SS06-0.1			HM7
8	BH-SS06-0.3			Hold Cold
9	BH-SS07-0.1			HM7
10	BH-SS07-0.3			Hold Cold



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Quote No 109925

Primary Contact Stefan Yap 259737

Submitted By Tom Harvey 247841

Client Name Pattle Delamore Partners Limited 59

Address PO Box 9528, Newmarket
Auckland 1149

Phone 09 523 6900 Mobile

Email

Charge To Pattle Delamore Partners Limited 59

Client Reference Muriwai

Order No A03582101

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 Email Primary Contact Email Submitter Email Client
 Email Other _____
 Other _____

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ADDITIONAL INFORMATION / KNOWN HAZARDS

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
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Hamilton 3240 New Zealand
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T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Office use only
(Job No)

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 11/8/21
 Tick if you require COC to be emailed back Name: Tom Harvey
 Signature: [Signature]

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

Condition Temp:
 Room Temp Chilled Frozen
 Sample & Analysis details checked
 Signature:

Priority Low Normal High
 Urgent (ASAP, extra charge applies, please contact lab first)

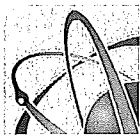
NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date: _____

Quoted Sample Types

Soil (soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	BH-SS13-0.1	11/8/21	S	HM7
2	BH-SS13-0.3	↓	↓	HC
3	BH-SS14-0.1			HM7
4	BH-SS14-0.3			HC
5	BH-SS15-0.1			HM7
6	BH-SS15-0.3			HC
7	BH-SS16-0.1			HM7
8	BH-SS16-0.3			HC
9	BH-SS17-0.1			HM7
10	BH-SS17-0.3			HC



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Quote No 109925

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

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(Job No)

Primary Contact Stefan Yap 259737

T 0508 HILL LAB (44 555 22)

Submitted By Tom Harvey 247841

T +64 7 858 2000

Client Name Pattle Delamore Partners Limited 59

E mail@hill-labs.co.nz

W www.hill-laboratories.com

Address PO Box 9528, Newmarket

CHAIN OF CUSTODY RECORD

Auckland 1149

Sent to Hill Laboratories Date & Time: 11/18/12

Phone 09 523 6900 Mobile

Name: Tom Harvey

Email

Signature: [Handwritten Signature]

Charge To Pattle Delamore Partners Limited 59

Tick if you require COC to be emailed back

Client Reference Muriwai

Received at Hill Laboratories Date & Time:

Order No A03582101

Name:

Results To Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.

Signature:

- Email Primary Contact Email Submitter Email Client
- Email Other
- Other

Condition Temp:

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

- Room Temp Chilled Frozen

Sample & Analysis details checked

ADDITIONAL INFORMATION / KNOWN HAZARDS

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.

Quoted Sample Types

Requested Reporting Date: _____

Soil (soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	BH_5518_0.1	10/18/12	S	HM7
2	BH_5518_0.3	↓		HC
3	BH_5519_0.1	11/18/12		HM7
4	BH_5519_0.3			HC
5	BH_5520_0.1			HM7
6	BH_5520_0.3			HC
7	BH_5521_0.1			HM7
8	BH_5521_0.3			HC
9	BH_5522_0.1			HM7
10	BH_5522_0.3	↓	↓	HC



Hill Laboratories

TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

Office use only
(Job No)

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Quote No 109925
Primary Contact Stefan Yap 259737
Submitted By Tom Harvey 247841
Client Name Pattle Delamore Partners Limited 59

Address PO Box 9528, Newmarket
Auckland 1149

Phone 09 523 6900 Mobile

Email

Charge To Pattle Delamore Partners Limited 59

Client Reference Muriwai

Order No A03582101

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 _____

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

ADDITIONAL INFORMATION / KNOWN HAZARDS

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 11/8/21
 Tick if you require COC to be emailed back Name: Tom Harvey
 Signature: *[Signature]*

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

Condition Temp:
 Room Temp Chilled Frozen
 Sample & Analysis details checked
 Signature:

Priority Low Normal High
 Urgent (ASAP, extra charge applies, please contact lab first)

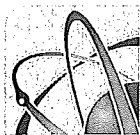
NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date: _____

Quoted Sample Types

Soil (soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required	
1	BH-5508-0.1	11/8/21	S	HM7	
2	BH-5508-0.3	↓	↓	Hold Cold	
3	BH-5509-0.1			HM7	
4	BH-5509-0.3			HC	
5	BH-5510-0.1			HM7	
6	BH-5510-0.3			HC	
7	BH-5511-0.1			HM7	
8	BH-5511-0.3			HC	
9	BH-5512-0.1			10/8/21	HM7
10	BH-5512-0.3			↓	HC



Hill Laboratories

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ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

Office use only
(Job No)

Quote No 109925

Primary Contact Stefan Yap 259737

Submitted By Tom Harvey 247841

Client Name Pattle Delamore Partners Limited 59

Address PO Box 9528, Newmarket
Auckland 1149

Phone 09 523 6900 Mobile *See Page 1*

Email *See Page 1*

Charge To Pattle Delamore Partners Limited 59

Client Reference Muriwai

Order No A03582101

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 *See Page 1*
 Other

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 11/18/21
 Name: Tom Harvey
 Tick if you require COC to be emailed back
 Signature: *[Signature]*

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

Condition Temp:
 Room Temp Chilled Frozen
 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:

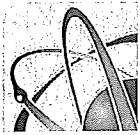
ADDITIONAL INFORMATION / KNOWN HAZARDS

[Empty box for additional information]

Quoted Sample Types

Soil (Soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	KC-SS21-0.1	10/18/21	S	} Lab Camp HM7 + OCPs
2	KC-SS22-0.1	↓	↓	
3	KC-SS23-0.1			
4	KC-SS24-0.1			
5	KC-SS21-0.25			
6	KC-SS22-0.25			} Lab Camp (PTO with SS27 + SS28) HM7 + OCPs
7	KC-SS23-0.3			
8	KC-SS24-0.2			
9	KC-SS25-0.1			
10	KC-SS26-0.1			



Hill Laboratories

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ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

Office use only
(Job No)

Quote No 109925

Primary Contact Stefan Yap 259737

T 0508 HILL LAB (44 555 22)

Submitted By Tom Harvey 247841

T +64 7 858 2000

E mail@hill-labs.co.nz

Client Name Pattle Delamore Partners Limited 59

W www.hill-laboratories.com

Address PO Box 9528, Newmarket

CHAIN OF CUSTODY RECORD

Auckland 1149

Phone 09 523 6900 Mobile See Page 1

Sent to Hill Laboratories Date & Time: 11/8/21

Email

Name: Tom Harvey

Charge To Pattle Delamore Partners Limited 59

Signature: [Signature]

Tick if you require COC to be emailed back

Client Reference Muriwai

Received at Hill Laboratories Date & Time:

Order No A03582101

Name:

Results To Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.

Signature:

- Email Primary Contact Email Submitter Email Client
- Email Other See Page 1
- Other

Condition Room Temp Chilled Frozen Temp:

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

Sample & Analysis details checked

ADDITIONAL INFORMATION / KNOWN HAZARDS

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.

Quoted Sample Types

Requested Reporting Date:

Soil (soil)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	KC_S504_0.3	10/8/21	S	Hold Cold
2	KC_S510_0.3	↓	↓	↓
3	KC_S511_0.3			
4	KC_S512_0.3			
5	KC_S513_0.1			
6	KC_S514_0.1			
7	KC_S515_0.1			
8	KC_S516_0.1			
9	KC_S513_0.3			
10	KC_S514_0.3			

Lab Composite
HM7 + OCPs



Job Information Summary

Client:	Pattle Delamore Partners Limited	Lab No:	2677154
Contact:	Stefan Yap	Date Registered:	13-Aug-2021 1:59 pm
	C/- Pattle Delamore Partners Limited	Priority:	High
	PO Box 9528	Quote No:	109925
	Newmarket	Order No:	A03582101
	Auckland 1149	Client Reference:	Muriwai
		Add. Client Ref:	
		Submitted By:	Tom Harvey
		Charge To:	Pattle Delamore Partners Limited
		Target Date:	18-Aug-2021 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	KC_SS01_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
2	KC_SS02_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
3	KC_SS03_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
4	KC_SS04_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
5	KC_SS01_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
6	KC_SS02_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
7	KC_SS03_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
8	KC_SS04_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
9	KC_SS05_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
10	KC_SS06_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
11	KC_SS07_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
12	KC_SS08_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
13	KC_SS05_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
14	KC_SS06_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
15	KC_SS07_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
16	KC_SS08_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
17	KC_SS09_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
18	KC_SS10_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
19	KC_SS11_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
20	KC_SS12_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
21	KC_SS09_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
22	KC_SS10_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
23	KC_SS11_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
24	KC_SS12_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
25	KC_SS13_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
26	KC_SS14_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
27	KC_SS15_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
28	KC_SS16_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
29	KC_SS13_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
30	KC_SS14_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
31	KC_SS15_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
32	KC_SS16_0.4 10-Aug-2021	Soil	cGSoil	Hold Cold
33	KC_SS17_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
34	KC_SS18_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
35	KC_SS19_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
36	KC_SS20_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
37	KC_SS17_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
38	KC_SS18_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
39	KC_SS19_0.25 10-Aug-2021	Soil	cGSoil	Hold Cold
40	KC_SS20_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
41	KC_SS21_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
42	KC_SS22_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
43	KC_SS23_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
44	KC_SS24_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
45	KC_SS21_0.25 10-Aug-2021	Soil	cGSoil	Hold Cold
46	KC_SS22_0.25 10-Aug-2021	Soil	cGSoil	Hold Cold
47	KC_SS23_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
48	KC_SS24_0.2 10-Aug-2021	Soil	cGSoil	Hold Cold
49	KC_SS25_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
50	KC_SS26_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
51	KC_SS27_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
52	KC_SS28_0.1 10-Aug-2021	Soil	cGSoil	Composite Environmental Solid Samples
53	KC_SS25_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
54	KC_SS26_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
55	KC_SS27_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
56	KC_SS28_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
57	BH_SS01_0.1 10-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
58	BH_SS01_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
59	BH_SS02_0.1 10-Aug-2021	Soil	cGSoil	Hold Cold
60	BH_SS02_0.3 10-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
61	BH_SS03_0.1 10-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
62	BH_SS03_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
63	BH_SS04_0.1 10-Aug-2021	Soil	cGSoil	Hold Cold
64	BH_SS04_0.3 10-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
65	BH_SS05_0.1 10-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
66	BH_SS05_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
67	BH_SS06_0.1 10-Aug-2021	Soil	cGSoil	Hold Cold
68	BH_SS06_0.3 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
69	BH_SS07_0.1 11-Aug-2021	Soil	cGSoil	Hold Cold
70	BH_SS07_0.3 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
71	BH_SS08_0.1 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
72	BH_SS08_0.3 11-Aug-2021	Soil	cGSoil	Hold Cold
73	BH_SS09_0.1 11-Aug-2021	Soil	cGSoil	Hold Cold
74	BH_SS09_0.3 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
75	BH_SS10_0.1 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
76	BH_SS10_0.3 11-Aug-2021	Soil	cGSoil	Hold Cold
77	BH_SS11_0.1 11-Aug-2021	Soil	cGSoil	Hold Cold
78	BH_SS11_0.3 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
79	BH_SS12_0.1 11-Aug-2021	Soil	cGSoil	Hold Cold
80	BH_SS12_0.3 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
81	BH_SS13_0.1 11-Aug-2021	Soil	cGSoil	Hold Cold
82	BH_SS13_0.4 11-Aug-2021	Soil	cGSoil	Hold Cold
83	BH_SS14_0.1 11-Aug-2021	Soil	cGSoil	Hold Cold
84	BH_SS14_0.3 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
85	BH_SS15_0.1 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
86	BH_SS15_0.3 11-Aug-2021	Soil	cGSoil	Hold Cold
87	BH_SS16_0.1 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
88	BH_SS16_0.3 11-Aug-2021	Soil	cGSoil	Hold Cold
89	BH_SS17_0.1 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
90	BH_SS17_0.3 10-Aug-2021	Soil	cGSoil	Hold Cold
91	BH_SS18_0.1 10-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
92	BH_SS18_0.3 11-Aug-2021	Soil	cGSoil	Hold Cold

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
93	BH_SS19_0.1 11-Aug-2021	Soil	cGSoil	Hold Cold
94	BH_SS19_0.3 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
95	BH_SS20_0.1 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
96	BH_SS20_0.3 11-Aug-2021	Soil	cGSoil	Hold Cold
97	BH_SS21_0.1 11-Aug-2021	Soil	cGSoil	Hold Cold
98	BH_SS21_0.3 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
99	BH_SS22_0.1 11-Aug-2021	Soil	cGSoil	Heavy Metals, Screen Level
100	BH_SS22_0.3 11-Aug-2021	Soil	cGSoil	Hold Cold
101	Composite of KC_SS01_0.1, KC_SS02_0.1, KC_SS03_0.1 and KC_SS04_0.1	Soil	OrgComp	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
102	Composite of KC_SS05_0.1, KC_SS06_0.1, KC_SS07_0.1 and KC_SS08_0.1	Soil	OrgComp	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
103	Composite of KC_SS09_0.1, KC_SS10_0.1, KC_SS11_0.1 and KC_SS12_0.1	Soil	OrgComp	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
104	Composite of KC_SS13_0.1, KC_SS14_0.1, KC_SS15_0.1 and KC_SS16_0.1	Soil	OrgComp	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
105	Composite of KC_SS17_0.1, KC_SS18_0.1, KC_SS19_0.1 and KC_SS20_0.1	Soil	OrgComp	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
106	Composite of KC_SS21_0.1, KC_SS22_0.1, KC_SS23_0.1 and KC_SS24_0.1	Soil	OrgComp	Heavy Metals, Screen Level; Organochlorine Pesticides Screening in Soil
107	Composite of KC_SS25_0.1, KC_SS26_0.1, KC_SS27_0.1 and KC_SS28_0.1	Soil	OrgComp	Heavy Metals, 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 simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	57, 60-61, 64-65, 68, 70-71, 74-75, 78, 80, 84-85, 87, 89, 91, 94-95, 98-99, 101-107
Heavy Metals, 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	57, 60-61, 64-65, 68, 70-71, 74-75, 78, 80, 84-85, 87, 89, 91, 94-95, 98-99, 101-107
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	101-107
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	101-107



Certificate of Analysis

Client:	Pattle Delamore Partners Limited	Lab No:	2677154	SPV3
Contact:	Stefan Yap	Date Received:	13-Aug-2021	
	C/- Pattle Delamore Partners Limited	Date Reported:	18-Aug-2021	
	PO Box 9528	Quote No:	109925	
	Newmarket	Order No:	A03582101	
	Auckland 1149	Client Reference:	Muriwai	
		Submitted By:	Tom Harvey	

Sample Type: Soil

Sample Name:	BH_SS01_0.1	BH_SS02_0.3	BH_SS03_0.1	BH_SS04_0.3	BH_SS05_0.1
	10-Aug-2021	10-Aug-2021	10-Aug-2021	10-Aug-2021	10-Aug-2021
Lab Number:	2677154.57	2677154.60	2677154.61	2677154.64	2677154.65

Heavy Metals, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	4	3	4	3	3
Total Recoverable Cadmium	mg/kg dry wt	0.30	0.14	0.48	0.15	0.35
Total Recoverable Chromium	mg/kg dry wt	23	22	21	18	18
Total Recoverable Copper	mg/kg dry wt	13	8	14	7	11
Total Recoverable Lead	mg/kg dry wt	10.3	11.4	210	24	27
Total Recoverable Nickel	mg/kg dry wt	8	8	7	6	6
Total Recoverable Zinc	mg/kg dry wt	73	67	230	54	63

Sample Name:	BH_SS06_0.3	BH_SS07_0.3	BH_SS08_0.1	BH_SS09_0.3	BH_SS10_0.1
	11-Aug-2021	11-Aug-2021	11-Aug-2021	11-Aug-2021	11-Aug-2021
Lab Number:	2677154.68	2677154.70	2677154.71	2677154.74	2677154.75

Heavy Metals, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	3	5	4	5	3
Total Recoverable Cadmium	mg/kg dry wt	0.13	0.11	0.25	0.15	0.26
Total Recoverable Chromium	mg/kg dry wt	20	27	21	21	18
Total Recoverable Copper	mg/kg dry wt	7	7	12	8	9
Total Recoverable Lead	mg/kg dry wt	19.2	11.2	32	25	29
Total Recoverable Nickel	mg/kg dry wt	6	6	7	5	6
Total Recoverable Zinc	mg/kg dry wt	54	57	77	66	70

Sample Name:	BH_SS11_0.3	BH_SS12_0.3	BH_SS14_0.3	BH_SS15_0.1	BH_SS16_0.1
	11-Aug-2021	11-Aug-2021	11-Aug-2021	11-Aug-2021	11-Aug-2021
Lab Number:	2677154.78	2677154.80	2677154.84	2677154.85	2677154.87

Heavy Metals, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	5	4	3	3	3
Total Recoverable Cadmium	mg/kg dry wt	0.17	0.12	< 0.10	0.27	0.32
Total Recoverable Chromium	mg/kg dry wt	24	23	20	18	17
Total Recoverable Copper	mg/kg dry wt	11	8	6	12	9
Total Recoverable Lead	mg/kg dry wt	22	8.5	7.3	42	24
Total Recoverable Nickel	mg/kg dry wt	6	8	6	6	6
Total Recoverable Zinc	mg/kg dry wt	77	72	55	71	86

Sample Name:	BH_SS17_0.1	BH_SS18_0.1	BH_SS19_0.3	BH_SS20_0.1	BH_SS21_0.3
	11-Aug-2021	10-Aug-2021	11-Aug-2021	11-Aug-2021	11-Aug-2021
Lab Number:	2677154.89	2677154.91	2677154.94	2677154.95	2677154.98

Heavy Metals, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	4	4	3	4	4
Total Recoverable Cadmium	mg/kg dry wt	0.30	0.23	0.11	0.27	< 0.10
Total Recoverable Chromium	mg/kg dry wt	20	17	19	17	19
Total Recoverable Copper	mg/kg dry wt	10	10	7	10	6
Total Recoverable Lead	mg/kg dry wt	21	7.9	77	8.9	15.1



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Sample Type: Soil						
Sample Name:	BH_SS17_0.1 11-Aug-2021	BH_SS18_0.1 10-Aug-2021	BH_SS19_0.3 11-Aug-2021	BH_SS20_0.1 11-Aug-2021	BH_SS21_0.3 11-Aug-2021	
Lab Number:	2677154.89	2677154.91	2677154.94	2677154.95	2677154.98	
Heavy Metals, Screen Level						
Total Recoverable Nickel	mg/kg dry wt	7	7	5	6	5
Total Recoverable Zinc	mg/kg dry wt	83	62	53	60	40
Sample Name:	BH_SS22_0.1 11-Aug-2021	Composite of KC_SS01_0.1, KC_SS02_0.1, KC_SS03_0.1 and KC_SS04_0.1	Composite of KC_SS05_0.1, KC_SS06_0.1, KC_SS07_0.1 and KC_SS08_0.1	Composite of KC_SS09_0.1, KC_SS10_0.1, KC_SS11_0.1 and KC_SS12_0.1	Composite of KC_SS13_0.1, KC_SS14_0.1, KC_SS15_0.1 and KC_SS16_0.1	
Lab Number:	2677154.99	2677154.101	2677154.102	2677154.103	2677154.104	
Individual Tests						
Dry Matter	g/100g as rcvd	-	75	73	73	71
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	3	4	6	5
Total Recoverable Cadmium	mg/kg dry wt	0.27	0.32	0.36	0.40	0.41
Total Recoverable Chromium	mg/kg dry wt	19	11	11	17	16
Total Recoverable Copper	mg/kg dry wt	8	7	9	9	13
Total Recoverable Lead	mg/kg dry wt	12.7	10.2	8.7	11.5	11.7
Total Recoverable Nickel	mg/kg dry wt	8	3	4	4	5
Total Recoverable Zinc	mg/kg dry wt	58	24	29	32	52
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
alpha-BHC	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
beta-BHC	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
delta-BHC	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
cis-Chlordane	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
trans-Chlordane	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
2,4'-DDD	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
4,4'-DDD	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
2,4'-DDE	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
4,4'-DDE	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
2,4'-DDT	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
4,4'-DDT	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Total DDT Isomers	mg/kg dry wt	-	< 0.08	< 0.08	< 0.09	< 0.09
Dieldrin	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Endosulfan I	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Endosulfan II	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Endosulfan sulphate	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Endrin	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Endrin aldehyde	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Endrin ketone	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Heptachlor	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Heptachlor epoxide	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Hexachlorobenzene	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Methoxychlor	mg/kg dry wt	-	< 0.013	< 0.014	< 0.014	< 0.014
Sample Name:	Composite of KC_SS17_0.1, KC_SS18_0.1, KC_SS19_0.1 and KC_SS20_0.1	Composite of KC_SS21_0.1, KC_SS22_0.1, KC_SS23_0.1 and KC_SS24_0.1	Composite of KC_SS25_0.1, KC_SS26_0.1, KC_SS27_0.1 and KC_SS28_0.1			
Lab Number:	2677154.105	2677154.106	2677154.107			
Individual Tests						
Dry Matter	g/100g as rcvd	72	73	71	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	7	5	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.40	0.34	0.37	-	-

Sample Type: Soil						
Sample Name:		Composite of KC_SS17_0.1, KC_SS18_0.1, KC_SS19_0.1 and KC_SS20_0.1	Composite of KC_SS21_0.1, KC_SS22_0.1, KC_SS23_0.1 and KC_SS24_0.1	Composite of KC_SS25_0.1, KC_SS26_0.1, KC_SS27_0.1 and KC_SS28_0.1		
Lab Number:		2677154.105	2677154.106	2677154.107		
Heavy Metals, Screen Level						
Total Recoverable Chromium	mg/kg dry wt	16	17	16	-	-
Total Recoverable Copper	mg/kg dry wt	12	9	19	-	-
Total Recoverable Lead	mg/kg dry wt	15.5	13.1	12.8	-	-
Total Recoverable Nickel	mg/kg dry wt	6	6	6	-	-
Total Recoverable Zinc	mg/kg dry wt	40	31	80	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
alpha-BHC	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
beta-BHC	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
delta-BHC	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
cis-Chlordane	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
trans-Chlordane	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
2,4'-DDD	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
4,4'-DDD	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
2,4'-DDE	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
4,4'-DDE	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
2,4'-DDT	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
4,4'-DDT	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
Total DDT Isomers	mg/kg dry wt	< 0.09	< 0.08	< 0.09	-	-
Dieldrin	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
Endosulfan I	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
Endosulfan II	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
Endrin	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
Endrin aldehyde	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
Endrin ketone	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
Heptachlor	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-
Methoxychlor	mg/kg dry wt	< 0.014	< 0.014	< 0.014	-	-

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	57, 60-61, 64-65, 68, 70-71, 74-75, 78, 80, 84-85, 87, 89, 91, 94-95, 98-99, 101-107
Heavy Metals, 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	57, 60-61, 64-65, 68, 70-71, 74-75, 78, 80, 84-85, 87, 89, 91, 94-95, 98-99, 101-107

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	101-107
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	101-107

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

Testing was completed between 17-Aug-2021 and 18-Aug-2021. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Kim Harrison MSc
Client Services Manager - Environmental



Certificate of Analysis

Client:	Pattle Delamore Partners Limited	Lab No:	2677351	A2PV1
Contact:	Stefan Yap	Date Received:	13-Aug-2021	
	C/- Pattle Delamore Partners Limited	Date Reported:	17-Aug-2021	
	PO Box 9528	Quote No:	109925	
	Newmarket	Order No:	A03582101	
	Auckland 1149	Client Reference:	Muriwai	
		Submitted By:	Tom Harvey	

Sample Type: Soil

Sample Name	Lab Number	As Received Weight (g)	Dry Weight (g)	<2mm Subsample Weight (g dry wt)	Asbestos Presence / Absence	Description of Asbestos Form
BH_SS01_0.1	2677351.1	851.1	651.8	58.0	Asbestos NOT detected.	-
BH_SS02_0.3	2677351.2	922.4	747.2	57.3	Asbestos NOT detected.	-
BH_SS03_0.1	2677351.3	827.5	636.3	59.9	Asbestos NOT detected.	-
BH_SS04_0.3	2677351.4	958.0	787.1	50.6	Asbestos NOT detected.	-
BH_SS05_0.1	2677351.5	883.8	680.4	53.8	Asbestos NOT detected.	-
BH_SS06_0.3	2677351.6	1,012.2	833.6	55.3	Asbestos NOT detected.	-
BH_SS07_0.3	2677351.7	892.4	740.5	58.4	Asbestos NOT detected.	-
BH_SS08_0.1	2677351.8	845.0	635.6	57.3	Asbestos NOT detected.	-
BH_SS09_0.3	2677351.9	964.4	810.9	55.3	Asbestos NOT detected.	-
BH_SS10_0.1	2677351.10	863.9	661.5	52.1	Asbestos NOT detected.	-
BH_SS11_0.3	2677351.11	935.0	777.8	54.6	Asbestos NOT detected.	-
BH_SS12_0.3	2677351.12	970.5	814.6	56.1	Asbestos NOT detected.	-
BH_SS13_0.1	2677351.13	760.8	587.5	56.0	Asbestos NOT detected.	-
BH_SS14_0.3	2677351.14	1,064.8	876.3	52.1	Asbestos NOT detected.	-
BH_SS15_0.1	2677351.15	805.3	589.9	57.1	Asbestos NOT detected.	-
BH_SS16_0.1	2677351.16	944.4	715.4	56.1	Asbestos NOT detected.	-
BH_SS17_0.1	2677351.17	904.3	718.1	56.8	Asbestos NOT detected.	-
BH_SS18_0.1	2677351.18	936.7	702.7	58.1	Asbestos NOT detected.	-
BH_SS19_0.3	2677351.19	916.8	747.8	57.7	Asbestos NOT detected.	-
BH_SS20_0.1	2677351.20	802.0	608.8	53.6	Asbestos NOT detected.	-
BH_SS21_0.3	2677351.21	1,004.6	835.8	59.6	Asbestos NOT detected.	-
BH_SS22_0.1	2677351.22	793.2	608.5	54.4	Asbestos NOT detected.	-

Glossary of Terms

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

For further details, please contact the Asbestos Team.

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Asbestos in Soil			



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Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1-22
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1-22
<2mm Subsample Weight	Sample dried at 100 to 105°C, weight of <2mm sample fraction taken for asbestos identification if less than entire fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	1-22
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-22
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1-22

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

Testing was completed on 17-Aug-2021. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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John Keneth Paglingayen BAPSc
Laboratory Technician - Asbestos



Appendix F: UCL Calculation of Arsenic Concentrations of Soil within the Sheep Spray Shower & Woolshed Area

A	B	C	D	E	F	G	H	I	J	K	L	
1	UCL Statistics for Uncensored Full Data Sets											
2												
3	User Selected Options											
4	Date/Time of Computation	20/10/2021 10:37:04 am										
5	From File	WorkSheet.xls										
6	Full Precision	OFF										
7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10												
11	C0											
12												
13	General Statistics											
14	Total Number of Observations	11						Number of Distinct Observations	9			
15								Number of Missing Observations	0			
16	Minimum	2						Mean	12.64			
17	Maximum	72						Median	6			
18	SD	20.04						Std. Error of Mean	6.041			
19	Coefficient of Variation	1.586						Skewness	3.119			
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic	0.504						Shapiro Wilk GOF Test				
23	5% Shapiro Wilk Critical Value	0.85						Data Not Normal at 5% Significance Level				
24	Lilliefors Test Statistic	0.39						Lilliefors GOF Test				
25	5% Lilliefors Critical Value	0.267						Data Not Normal at 5% Significance Level				
26	Data Not Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL					95% UCLs (Adjusted for Skewness)						
30	95% Student's-t UCL	23.59				95% Adjusted-CLT UCL (Chen-1995)	28.64					
31						95% Modified-t UCL (Johnson-1978)	24.53					
32												
33	Gamma GOF Test											
34	A-D Test Statistic	1.197						Anderson-Darling Gamma GOF Test				
35	5% A-D Critical Value	0.751						Data Not Gamma Distributed at 5% Significance Level				
36	K-S Test Statistic	0.314						Kolmogrov-Smirnoff Gamma GOF Test				
37	5% K-S Critical Value	0.262						Data Not Gamma Distributed at 5% Significance Level				
38	Data Not Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)	1.04						k star (bias corrected MLE)	0.817			
42	Theta hat (MLE)	12.15						Theta star (bias corrected MLE)	15.47			
43	nu hat (MLE)	22.88						nu star (bias corrected)	17.97			
44	MLE Mean (bias corrected)	12.64						MLE Sd (bias corrected)	13.98			
45								Approximate Chi Square Value (0.05)	9.372			
46	Adjusted Level of Significance	0.0278						Adjusted Chi Square Value	8.377			
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50))	24.23						95% Adjusted Gamma UCL (use when n<50)	27.11			
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic	0.884						Shapiro Wilk Lognormal GOF Test				
53	5% Shapiro Wilk Critical Value	0.85						Data appear Lognormal at 5% Significance Level				
54	Lilliefors Test Statistic	0.229						Lilliefors Lognormal GOF Test				
55	5% Lilliefors Critical Value	0.267						Data appear Lognormal at 5% Significance Level				
56	Data appear Lognormal at 5% Significance Level											
57												
58	Lognormal Statistics											



Appendix G: UCL Calculation of Arsenic Concentrations of Soil within the Treated Timber Storage Area

A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets										
2											
3	User Selected Options										
4	Date/Time of Computation	1/09/2021 12:21:16 pm									
5	From File	WorkSheet.xls									
6	Full Precision	OFF									
7	Confidence Coefficient	95%									
8	Number of Bootstrap Operations	2000									
9											
10											
11	C0										
12											
13	General Statistics										
14	Total Number of Observations			12		Number of Distinct Observations			11		
15							Number of Missing Observations			0	
16	Minimum			4		Mean			32.83		
17	Maximum			94		Median			19.5		
18	SD			30.41		Std. Error of Mean			8.777		
19	Coefficient of Variation			0.926		Skewness			0.908		
20											
21	Normal GOF Test										
22	Shapiro Wilk Test Statistic			0.842		Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value			0.859		Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic			0.21		Lilliefors GOF Test					
25	5% Lilliefors Critical Value			0.256		Data appear Normal at 5% Significance Level					
26	Data appear Approximate Normal at 5% Significance Level										
27											
28	Assuming Normal Distribution										
29	95% Normal UCL					95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL			48.6		95% Adjusted-CLT UCL (Chen-1995)			49.73		
31						95% Modified-t UCL (Johnson-1978)			48.98		
32											
33	Gamma GOF Test										
34	A-D Test Statistic			0.497		Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value			0.752		Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic			0.197		Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value			0.251		Detected data appear Gamma Distributed at 5% Significance Level					
38	Detected data appear Gamma Distributed at 5% Significance Level										
39											
40	Gamma Statistics										
41	k hat (MLE)			1.223		k star (bias corrected MLE)			0.973		
42	Theta hat (MLE)			26.84		Theta star (bias corrected MLE)			33.75		
43	nu hat (MLE)			29.35		nu star (bias corrected)			23.35		
44	MLE Mean (bias corrected)			32.83		MLE Sd (bias corrected)			33.29		
45						Approximate Chi Square Value (0.05)			13.35		
46	Adjusted Level of Significance			0.029		Adjusted Chi Square Value			12.21		
47											
48	Assuming Gamma Distribution										
49	95% Approximate Gamma UCL (use when n>=50))			57.41		95% Adjusted Gamma UCL (use when n<50)			62.76		
50											
51	Lognormal GOF Test										
52	Shapiro Wilk Test Statistic			0.933		Shapiro Wilk Lognormal GOF Test					
53	5% Shapiro Wilk Critical Value			0.859		Data appear Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic			0.174		Lilliefors Lognormal GOF Test					
55	5% Lilliefors Critical Value			0.256		Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level										
57											
58	Lognormal Statistics										

