



**Work Instruction**

**6-10 Orr Street, Ashburton**

**Prepared for**  
Kāinga Ora Homes and Communities  
**Prepared by**  
Tonkin & Taylor Ltd

**Date**  
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## Document control

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### Distribution:

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# 1 Introduction

## 1.1 General

Tonkin & Taylor Ltd (T+T) has been engaged by Kāinga Ora Homes and Communities (Kāinga Ora) to prepare a Work Instruction (WI) for 6-10 Orr Street, Ashburton ('the site'). This report has been prepared in accordance with our Housing Delivery System (HDS) Christchurch contract and Variation #1 initiated 21 November 2022.

The site measures 2,697 m<sup>2</sup> in area and presently contains 3 dwellings with ancillary structures at the side and rear of each dwelling (e.g., sheds, concrete driveways, footpaths).

Kāinga Ora plans to redevelop the site for high-density residential land use.

## 1.2 Redevelopment earthwork

The site will undergo a scrape to 0.4 m below ground level (bgl) for geotechnical/constructability reasons. The HDS Christchurch geotechnical engineers<sup>1</sup> have stated the preferred foundations will consist of TC1 waffle slabs on engineered fill rafts (and that additional soil removal may be required at parts of the site depending on the thickness of topsoil), details they have provided for the foundations are summarised in Table 1.1 (below).

**Table 1.1: Foundation excavation details**

House number <sup>2</sup>	Existing ground level elevation (m RL)	Base of gravel pad/excavation level (m RL)	Excavation required, <i>after</i> 0.4 m site scrape, to base of pad/excavation level (m)
Houses 1 & 2	95.9	95.55	0.0
Houses 3 & 4	96.1	95.70	0.0
Houses 5 & 6	96.0	95.59	0.0 *
House 7	95.6	95.31	0.0
Houses 8 & 9	95.6	95.30	0.0

\*Rounded to the nearest 0.1 m.

In summary, after the proposed site scrape no additional excavation is required for the proposed house foundations.

The installation of civil services may require localised deeper excavation to >0.5 m below ground level (bgl).

This WI sets out the minimum earthwork related requirements to enable the appropriate management and disposal of the excavated soil from the redevelopment earthwork.

<sup>1</sup> BECA Limited (25 March 2024). 06 - 10 Orr Street, Netherby, Ashburton - Geotechnical Design Report, prepared for Kāinga Ora.

<sup>2</sup> Hierarchy Group Limited (12 March 2024). Bulk and Location Plan – Ground Floor, 6 – 10 Orr Street, Netherby, Ashburton.

## 2 Site investigation

T+T has completed a Preliminary and Detailed Site Investigation (PSI/DSI)<sup>3</sup> for the site, which reported the following:

- Asbestos was not detected in the soil samples analysed; however, one fragment of asbestos containing material (ACM) was found in surficial soil at 6 Orr Street, location 6HA2. The fragment was removed from the site by sampling. Redevelopment earthwork at this location, based on the Asbestos in Soil Guidelines<sup>4</sup> shall be undertaken as **unlicensed asbestos work** pursuant to the Asbestos Regulations<sup>5</sup>.
- Analysed soil samples recorded concentrations of the metals analysed under the NESCS<sup>6</sup> soil contaminant standard (SCS) for commercial/industrial land use (conservatively adopted for the protection of construction workers involved in soil disturbance), however, two surficial soil (i.e., to 0.3 m bgl) samples collected at 8 Orr Street location 8HA5 and the 8 Orr Street dwelling halo recorded concentrations of arsenic or lead above the NESCS SCS for high-density residential land use.
- Petroleum hydrocarbons (TPH) were recorded at two locations at 10 Orr Street in isolated areas where oil staining and odour was observed on the soil surface (i.e., <20 mm depth at 10HA3 and 10HA7), in concentrations below the NESCS high-density residential and commercial/industrial SCS.
- A site history review indicates that the site is not recorded on Environment Canterbury's (ECan's) Listed Land Use Register (LLUR) of potentially contaminated land.
- Soils displaced by, and surplus to the site's redevelopment earthworks, require disposal to cleanfill, managed fill, or landfill depending on their location and depth (refer to Section 3.3 and Appendix B, Figures 2-4).
- Based on previous HDS redevelopment projects at Ashburton, Ashburton District Council (ADC) considers that the recorded arsenic and lead results means a NESCS restricted discretionary resource consent is needed for this site's redevelopment earthwork.
- The site is not considered to require contaminated land consents under the Land and Water Regional Plan (LWRP).

A summary of the results and laboratory reports containing the soil testing results from the PSI/DSI are presented in Appendix A to assist contractor negotiations with consented off-site disposal facilities regarding disposal of excavated soil. The T+T PSI/DSI sample locations are illustrated on Figure 1, Appendix B.

## 3 Excavation and disposal management

### 3.1 General

The intent of this WI is to assist the Contractor with waste classification and disposal of in-situ soils generated from the site's redevelopment.

Based on the PSI/DSI results, remediation of the site (beyond the planned site scrape to remove topsoil for geotechnical/constructability reasons) is *not* required. The planned 0.4 m site scrape will

<sup>3</sup> T+T reference 1018898.2000 (April 2024). Preliminary Site Investigation and Detailed Site Investigation 6-10 Orr Street, Ashburton. Version 2. Prepared for Kāinga Ora Homes and Communities.

<sup>4</sup> New Zealand Guidelines for Assessing and Managing Asbestos in Soil - BRANZ, November 2017.

<sup>5</sup> Health and Safety at Work (Asbestos) Regulations, 2016.

<sup>6</sup> Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

remove soils where a fragment of asbestos was found, and where arsenic and lead were recorded above their respective NESCS high density residential land use SCS.

### 3.2 Staging and checklist

Kāinga Ora plans the soil removal will be undertaken by two Contractors, as follows:

**Table 3.1: Earthwork staging**

Stage of removal	Task	Contractor
Stage 1	Demolition of dwellings and their ancillary structures, excavation of soils within dwelling halos and footprint to 0.3 m bgl, <i>including</i> the removal of: <ul style="list-style-type: none"> <li>8 Orr Street dwelling's footprint and halo (lead in soil).</li> </ul>	Demolition Contractor
Stage 2A	Excavation and offsite disposal of asbestos or petroleum hydrocarbon (TPH) impacted soils at: <ul style="list-style-type: none"> <li>6 Orr Street, location 6HA2 (asbestos fragment in soil), to 0.3 m bgl.</li> <li>10 Orr Street, visibly oil-stained surface soil at 10 HA3 and 10 HA5 (&lt;0.1 m bgl).</li> </ul>	Demolition Contractor
Stage 2B	Site scrape to 0.4 m bgl, including removal of impacted soils at: <ul style="list-style-type: none"> <li>8 Orr Street, location 8HA5 (arsenic in soil).</li> </ul>	Demolition Contractor
Stage 3	Preparation and excavation for civil services etc.	Earthwork Contractor

Upon completion of **each** stage of earthwork, the site foreman/manager is to inspect the earthwork undertaken and confirm that soil excavation has been completed in the correct areas, to the required depth and disposed of appropriately, by completing the Site Earthwork Completion Checklist (see Appendix C).

The completed checklist should be provided to T+T within two weeks of completion of the earthwork.

### 3.3 Soil disposal

Note that the below options are based on the inferred lowest cost disposal option (gate fee) for the different areas/cells onsite, and not necessarily the optimal practicality of excavation/transport or costs associated with transport to a disposal facility. It should be noted that all offsite disposal is subject to the prior written approval from a disposal facility operator. Additionally, if a cleanfill facility does not accept material, additional quantities may require disposal to managed fill.

This WI should be provided to each disposal facility operator for their prior consideration and written approval *before* movement of material from the site. A copy of the operator's written approval to accept materials from the site's redevelopment earthwork shall be provided to Kāinga Ora's project manager before disposal of materials commences.

Actual soil excavation volumes and subsequent removal costs could change based on site specific redevelopment plans. Unexpected contamination discoveries during site clearance and/or earthwork may also result in additional quantities of material requiring disposal to higher cost facilities.

Soil disposal options split across the various known stages of earthwork are as follows:

Table 3.2: Soil disposal options across earthwork stages

Area of site / sample cell	Depth (m bgl)	Contamination condition	Disposal option (subject to operator approval)	Estimated soil volume (+/- 20%) (m³)
STAGE 1 – Clearance of dwellings and halos to 0.3 m bgl (Demolition Contractor)				
6, 8 and 10 Orr Street dwelling footprints	0.0 – 0.3	Based on laboratory data from each dwelling’s halo, one or more of the metals analysed recorded above published background concentrations for the site, but below Burwood Landfill managed fill acceptance criteria. Asbestos in soil not detected.	Based on current data collected at each dwelling’s halo, disposal to <b>Burwood Landfill managed fill</b> is currently assumed <u>pending post-demolition asbestos clearance by a Competent Person<sup>7</sup></u> .	75 - 110
6, 8 and 10 Orr Street dwelling halos	0.0 – 0.3	One or more of the metals analysed recorded above published background concentrations for the site but below Burwood Landfill managed fill acceptance criteria. Asbestos in soil not detected.	Burwood Landfill.	230 - 340
6 Orr Street shed footprint and halo (6HA6)	0.0 – 0.3			15 - 20
8 Orr Street shed footprint and halo (8HA5)	0.0 – 0.3			5 - 15
10 Orr Street shed footprint and halo (10HA6)	0.0 – 0.3			5 - 15
STAGE 2A – Removal of asbestos or TPH impacted soil (Demolition Contractor)				
6 Orr Street, 6HA2	0.0 – 0.3	One asbestos fragment identified within soil. One or more of the metals analysed recorded above Leggett Road facility’s acceptance criteria, but below Class A Landfill screening criteria.	Landfill (e.g. Redruth) as asbestos waste.	10 - 15

<sup>7</sup> Competent person as defined in the Asbestos Regulations 2016, Regulation 41(3).



Area of site / sample cell	Depth (m bgl)	Contamination condition	Disposal option (subject to operator approval)	Estimated soil volume (+/- 20%) (m <sup>3</sup> )
<b>Oil stained surface soil at 10 Orr Street, 10HA3 &amp; 10HA7</b>	0.0 – 0.05	Visibly stained soils on surface recorded TPH concentrations above Burwood Landfill acceptance criteria. Asbestos in soil not detected.	<b>Landfill (e.g. Redruth).</b>	<2
<b>STAGE 2B – Site scrape to 0.4 m bgl (Demolition Contractor)</b>				
<b>8 Orr Street, 8HA2</b>	0.0 – 0.3	Concentration of the metals analysed recorded below published background concentrations for the site. Asbestos in soil not detected.	<b>Cleanfill.</b>	10 - 15
<b>Rest of site</b> (i.e., 6HA1, 6HA3-6HA5, 8HA1, 8HA3-8HA4, 8HA6, 10HA1-10HA5, 10HA7)	0.0 – 0.3	One or more of the metals analysed recorded above published background concentrations for the site but below Wheatsheaf managed fill's acceptance criteria. Asbestos in soil not detected.	<b>Wheatsheaf managed fill.</b>	395 - 590
<b>6, 8 and 10 Orr Street dwelling halos and footprints</b>	0.3 – 0.4	One or more of the metals analysed recorded above published background concentrations for the site but below Burwood Landfill's acceptance criteria. Asbestos in soil not detected.	<b>Burwood Landfill.</b>	50 - 75
<b>8 Orr Street, 8HA4 &amp; 8HA5 and 6 Orr Street, 6HA3-6HA6</b>	0.3 – 0.4	One or more of the metals analysed recorded above published background concentrations for the site but below Wheatsheaf managed fill's acceptance criteria.	<b>Wheatsheaf managed fill.</b>	60 - 90
<b>Rest of site</b> (i.e., 6HA1-6HA2, 8HA1-8HA3, 8HA6, 10HA1-10HA7)	0.3 – 0.4	The average recorded concentrations of the metals analysed were below published background concentrations for the site.	<b>Cleanfill</b> <i>(when soils are excavated and transported in bulk).</i>	90 - 135
<b>FUTURE STAGES (e.g. civil earthwork)</b>				
<b>All of site</b>	If excess soils are generated and require offsite disposal, the soil disposal plans in Figures 2-3 (Appendix B) shall be followed, depending on the area of site and depth the soil originates from.			

Notes:

Approximate values have been rounded to nearest whole 5 m<sup>3</sup>.

Estimates are based on visual estimate of site areas, assessment of laboratory results and information provided by the HDS Christchurch geotechnical engineers, civil engineers and architects.

Additional quantities of soil may require disposal to managed fill/landfill if prior approval for disposal to cleanfill is not obtained, and/or if unexpected contamination is encountered.

Assumes that soils below current structure footprints can be disposed in line with those outside (i.e., the halo) and do not require disposal as asbestos waste.  
Soil volumes have been estimated by multiplying the approximate removal area by the understood depth of removal at the time of reporting (see Appendix D).

**Volumes for civil earthworks/service installations such as drainage/utilities are not included.**

**Volumes for civil grading and retaining walls are not included.**

## 4 Roles and responsibilities

The personnel and contracting organisations listed below in Table 4.1 will have the following roles in the soil excavation work.

**Table 4.1: Roles and responsibilities**

Role	Company name	Project personnel	Contact details
Project Manager	Kāinga Ora	TBC	TBC
Contaminated Land Specialist	T+T	Mark Morley	MMorley@tonkintaylor.co.nz 021 114 3395
Regulatory environmental agencies	Environment Canterbury and Ashburton District Council (ADC)	TBC	TBC
Review and implementation of the WI	Contractor(s)	TBC	TBC

## 5 Earthwork controls and checklist

### 5.1 Asbestos controls

Following demolition of the dwellings and ancillary structures on site, a hold point should occur prior to soil disturbance at these footprints, for a *competent person* to inspect that ACM/asbestos material is not present in these areas.

As a fragment of ACM was identified in topsoil at 6 Orr Street (6HA2 at 0.15 m bgl), soil disturbance at this location between 0.0 and 0.3 m bgl needs to be in accordance with the Asbestos Regulations. In accordance with the Asbestos Regulations and as described in the Asbestos in Soil Guidelines, based on the laboratory data, soil disturbance at 6HA2 (0.0 to 0.3 m bgl) will be undertaken as **'Unlicensed asbestos work'**.

Across the rest (and majority) of the site, asbestos in soil was not detected across the site and other tested parameters recorded concentrations below commercial/industrial criteria, and so standard earthworks health and safety controls are suitable for workers involved in soil disturbance **outside** of 6HA2 (refer Figure 2, Appendix B).

Contractors undertaking soil disturbance should be vigilant and alert for the presence of any indicators of contamination such as ACM during the earthwork, particularly within the footprints of the existing dwellings and ancillary structures.

Soil from beneath the dwelling and/or ancillary structures may contain asbestos, common building practices during the construction and/or maintenance of these structures could have resulted in ACM, asbestos in soil to have been discarded in these areas.

If ACM and/or asbestos in soil is present, removal of these soils may require asbestos-specific work controls as above, or further controls depending on the conditions and quantities encountered. This will be undertaken in accordance with the Asbestos in Soil Guidelines and Asbestos Regulations.

**If ACM and/or asbestos in soil are discovered, the contractor shall immediately cease excavation in that area and contact the Contaminated Land Specialist to discuss/confirm handling and disposal requirements.**

## 5.2 Other controls

The other key measures and controls the Contractor shall adopt are:

- Sediment and erosion controls shall be installed and maintained in accordance with the Environment Canterbury Erosion and Sediment Control Toolbox guidance<sup>8</sup>.
- Trucks removing soil from the site shall be sheeted/covered and the wheels washed if they have had contact with site soils before leaving to avoid tracking soil debris on to roadways. Should soil discharge from the site, the Contractor shall be responsible for immediate clean up, including street sweeping if necessary.
- In the event of an accidental discovery of contaminated materials during the redevelopment earthworks, the contractor shall adhere to Kāinga Ora's Contaminated Soil Discovery Guideline (Appendix E).
- Any other controls required by the consents issued by ADC for the works.

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<sup>8</sup> Erosion Control Tools to Minimise Soil Erosion - [www.esccanterbury.co.nz](http://www.esccanterbury.co.nz)

## 6 Applicability

This report has been prepared for the exclusive use of our client Kāinga Ora Homes and Communities, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Recommendations and opinions in this report are based on discrete sampling data. The nature and continuity of subsoil away from the sampling points are inferred and it must be appreciated that actual conditions could vary from the assumed model.

In accordance with your instructions, in carrying out our services we have relied upon, and presumed accurate, the information in:

- The reports produced by EHS Support New Zealand Limited titled “Kainga Ora Conceptual Site Model Residential Properties” (Version 4) & “Residential Property Soil Sampling and Analysis Plan” (Version 7) both dated July 2022.
- The architectural drawings produced by Hierarchy Group Ltd dated 12 March 2024.
- The project brief produced by Kāinga Ora dated 5 August 2022.
- The report produced by BECA Ltd titled “06 - 10 Orr Street, Netherby, Ashburton - Geotechnical Design Report” 25 March 2024.
- The report produced by Kirk Roberts Consulting Engineers Ltd titled “Preliminary Site Investigation and Soil Management Report, 6-10 Orr Street, Netherby, Ashburton” dated 15 March 2023.
- The survey produced by Graham Surveying Ltd dated 21 February 2023.

which you have provided to us (“Existing Information”). We have not attempted to verify the accuracy or completeness of the Existing Information. If any of the information in the Existing Information is subsequently determined to be false, inaccurate, or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We understand and agree that our client will submit this report as part of an application for resource consent and that Ashburton District Council and/or Environment Canterbury as the consenting authorities will use this report for the purpose of assessing that application.


Tonkin & Taylor Ltd  
Environmental and Engineering Consultants

Report prepared by:



Katie Stephenson  
Environmental Consultant

Authorised for Tonkin & Taylor Ltd by:



Michael Mechaelis  
Project Director

Report technically reviewed by a SQEP as prescribed by the NESCS:



Mark Morley  
Environmental Geologist

## **Appendix A      Results**

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- **Table A1: Soil analytical results summary for disposal.**
- **Table 5.2: Soil analytical results summary (High Density Residential) (reproduced from PSI/DSI).**
- **Table 5.3: Soil analytical results summary (Residential 10% Produce) (reproduced from PSI/DSI).**
- **Eurofins Environment Testing certificates of analysis.**

Table A1: Soil analytical results summary for disposal: 6-10 Orr Street, Ashburton

				Asbestos <sup>1</sup>				Heavy Metals - Screen										Polycyclic aromatic hydrocarbons (PAH) <sup>2</sup>				Total Petroleum Hydrocarbons (TPH)			
				Asbestos Containing Material (ACM)	Asbestos Containing Material (ACM)	Asbestos (FA) / Fibrous Ins. Mat.	Asbestos (FA) / Fibrous Ins. Mat.	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	SP-TEO	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)anthracene	Benzo(e)pyrene	Benzo(a)pyrene	Benzo(a)pyrene	Benzo(a)pyrene		
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
Units				Presence/absence	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w			
Laboratory Limit of Reporting				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01			
Background (Canterbury) <sup>3</sup>				NAD	NAD	NAD	12.58	0.19	22.7	20.3	40.96	20.7	93.94	0.922 <sup>2</sup>	1.362 <sup>2</sup>	0.029 <sup>3</sup>	<LoR	<LoR	<LoR	<LoR	<LoR	<LoR			
Waste acceptance criteria - Leggett Road Facility <sup>4</sup>				-	5	0.1	12.58	0.19	22.7	20.3	40.96	20.7	93.94	0.922	NGV	NGV	NGV	<LoR	<LoR	<LoR	<LoR				
Waste Acceptance Criteria - Wheatheaf Managed Fill <sup>5</sup>				NAD	NAD	NAD	17	0.8	290	>10,000	160	400 <sup>6</sup>	7,400 <sup>6</sup>	6	NGV	NGV	NGV	NGV	NGV	NGV	NGV				
Waste Acceptance Criteria - Burwood Landfill <sup>7</sup>				NAD	NAD	NAD	80	400	2,700	>10,000	880	6,000	14,000	40	NGV	640	120	6,500	10,000	NGV	NGV				
Property Address	Sample ID	Sample depth (m bgl)	Material Type																						
6 Orr St	6HA1	0.1	Soil	NAD	-	-	6.1	0.10	23	16	47	16	90	-	-	-	-	-	-	-	-				
	6HA1	0.3	Soil	NAD	-	-	5.8	0.07	20	11	24	15	67	-	-	-	-	-	-	-	-				
	6HA2	0.1	Soil	NAD	-	-	6	0.09	24	15	41	17	91	-	-	-	-	-	-	-	-				
	6HA2	0.3	Soil	NAD	-	-	6.7	0.05	25	15	19	18	73	-	-	-	-	-	-	-	-				
	6HA2 FRAG	0.15	Building material	Chrysotile asbestos	NAD	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	6HA3	0.1	Soil	NAD	-	-	10	0.13	30	27	47	23	140	-	-	-	-	-	-	-	-				
	6HA3	0.3	Soil	NAD	-	-	14	0.07	37	35	31	30	120	-	-	-	-	-	-	-	-				
	6HA3	0.5	Soil	NAD	-	-	8	0.05	25	24	19	20	75	-	-	-	-	-	-	-	-				
	6HA3	0.7	Soil	NAD	-	-	7.9	0.04	23	23	20	19	74	-	-	-	-	-	-	-	-				
	6HA3	0.95	Soil	NAD	-	-	6.5	0.04	21	16	17	16	67	-	-	-	-	-	-	-	-				
	6HA4	0.1	Soil	NAD	-	-	11	0.18	29	27	67	21	140	-	-	-	-	-	-	-	-				
	6HA4	0.3	Soil	NAD	-	-	14	0.07	37	35	34	29	120	-	-	-	-	-	-	-	-				
	6HA4	0.5	Soil	NAD	-	-	8	0.04	22	24	19	18	69	-	-	-	-	-	-	-	-				
	6HA4	0.7	Soil	NAD	-	-	7.4	0.05	21	21	19	17	70	-	-	-	-	-	-	-	-				
	6HA4	1.0	Soil	NAD	-	-	3.8	0.03	16	8.8	11	12	47	-	-	-	-	-	-	-	-				
	6HA5	0.1	Soil	NAD	-	-	9.2	0.32	26	30	39	19	120	-	-	-	-	-	-	-	-				
	6HA5	0.3	Soil	NAD	-	-	11	0.12	31	28	28	24	100	-	-	-	-	-	-	-	-				
	6HA5	0.5	Soil	NAD	-	-	7.1	0.06	21	20	17	17	65	-	-	-	-	-	-	-	-				
	6HA5	0.7	Soil	NAD	-	-	7.7	0.05	21	21	18	17	67	-	-	-	-	-	-	-	-				
	6HA5	1.0	Soil	NAD	-	-	12	0.1	35	35	32	28	110	-	-	-	-	-	-	-	-				
	6HA6	0.1	Soil	NAD	-	-	9.9	0.43	27	25	410	19	470	-	-	-	-	-	-	-	-				
	6HA6	0.3	Soil	NAD	-	-	8.1	0.16	26	20	47	20	290	-	-	-	-	-	-	-	-				
	6HALO COMPOSITE	0.1	Topsoil	NAD	-	-	8.1	0.16	25	29	350	16	200	-	-	-	-	-	-	-	-				
	6HALO A	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	6HALO B	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	6HALO C	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	6HALO D	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
8 Orr St	8HA1	0.1	Soil	NAD	-	-	9.8	0.19	21	24	71	13	110	-	-	-	-	-	-	-	-				
	8HA1	0.3	Soil	NAD	-	-	4.8	0.08	17	11	20	13	60	-	-	-	-	-	-	-	-				
	8HA2	0.1	Soil	NAD	-	-	4.7	0.18	21	14	35	14	81	-	-	-	-	-	-	-	-				
	8HA2	0.3	Soil	NAD	-	-	4.4	0.06	20	9.0	16	14	68	-	-	-	-	-	-	-	-				
	8HA3	0.1	Soil	NAD	-	-	7.9	0.24	27	22	88	19	130	-	-	-	-	-	-	-	-				
	8HA3	0.3	Soil	NAD	-	-	6.6	0.04	24	16	23	17	80	-	-	-	-	-	-	-	-				
	8HA4	0.1	Soil	NAD	-	-	9.3	0.27	26	31	62	18	190	-	-	-	-	-	-	-	-				
	8HA4	0.3	Soil	NAD	-	-	8.8	0.09	28	24	23	22	120	-	-	-	-	-	-	-	-				
	8HA4	0.5	Soil	NAD	-	-	12	0.07	37	36	32	30	120	-	-	-	-	-	-	-	-				
	8HA4	0.7	Soil	NAD	-	-	11	0.07	33	30	29	26	110	-	-	-	-	-	-	-	-				
	8HA4	0.8	Soil	NAD	-	-	7.6	0.07	28	18	34	19	130	-	-	-	-	-	-	-	-				
	8HA5	0.1	Soil	NAD	-	-	6.1	0.42	41	59	390	24	340	-	-	-	-	-	-	-	-				
	8HA5	0.3	Soil	NAD	-	-	6.7	0.07	25	14	26	18	180	-	-	-	-	-	-	-	-				
	8HA5	0.65	Soil	NAD	-	-	5.7	0.05	25	15	18	19	71	-	-	-	-	-	-	-	-				
	8HA6	0.1	Soil	NAD	-	-	8.1	0.20	25	22	120	18	140	-	-	-	-	-	-	-	-				
	8HA6	0.3	Soil	NAD	-	-	7.3	0.05	26	17	22	19	86	-	-	-	-	-	-	-	-				
	8HA6	0.5	Soil	NAD	-	-	5.7	0.06	26	16	19	19	72	-	-	-	-	-	-	-	-				
	8HA6	0.65	Soil	NAD	-	-	6.2	0.04	26	13	19	19	74	-	-	-	-	-	-	-	-				
	8HALO COMPOSITE	0.1	Topsoil	NAD	-	-	11	0.35	27	65	660	19	350	-	-	-	-	-	-	-	-				
	8HALO A	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	8HALO B	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	8HALO C	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	8HALO D	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	10 Orr St	10HA1	0.1	Soil	NAD	-	-	8.4	0.21	21	25	79	12	140	-	-	-	-	-	-	-	-			
		10HA1	0.3	Soil	NAD	-	-	4.2	0.05	18	9	15	13	60	-	-	-	-	-	-	-	-			
		10HA2	0.1	Soil	NAD	-	-	5.2	0.21	21	20	39	15	82	-	-	-	-	-	-	-	-			
		10HA2	0.3	Soil	NAD	-	-	4	0.07	19	9.8	15	13	55	-	-	-	-	-	-	-	-			
10HA3		0.1	Soil	NAD	-	-	6.8	0.18	24	23	69	17	140	-	-	-	-	-	-	-	-				
10HA3		0.3	Soil	NAD	-	-	7.4	0.06	26	19	24	20	85	-	-	-	-	-	-	-	-				
10HA3		0.5	Soil	NAD	-	-	6.5	0.03	26	14	19	20	73	-	-	-	-	-	-	-	-				
10HA3		0.7	Soil	NAD	-	-	5.6	0.04	24	14	18	17	72	-	-	-	-	-	-	-	-				
10HA4		0.1	Soil	NAD	-	-	6	0.27	22	24	49	15	160	-	-	-	-	-	-	-	-				
10HA4		0.3	Soil	NAD	-	-	6.5	0.08	25	17	24	18	91	-	-	-	-	-	-	-	-				
10HA4		0.5	Soil	NAD	-	-	5.7	0.11	28	16	20	19	80	-	-	-	-	-	-	-	-				
10HA5		0.1	Soil	NAD	-	-	7.6	0.18	26	25	46	19	110	-	-	-	-	-	-	-	-				
10HA5		0.3	Soil	NAD	-	-	5.7	0.05	24	14	18	18	70	-	-	-	-	-	-	-	-				
10HA5		0.5	Soil	NAD	-	-	4.4	0.06	20	14	13	15	55	-	-	-	-	-	-	-	-				
10HA5		0.6	Soil	NAD	-	-	4	0.06	18	13	15	13	55	-	-	-	-	-	-	-	-				
10HA6		0.1	Soil	NAD	-	-	10	0.40	28	35	170	18	270	-	-	-	-	-	-	-	-				
10HA6		0.3	Soil	NAD	-	-	6.8	0.07	27	17	24	20	94	-	-	-	-	-	-	-	-				
10HA6		0.5	Soil	NAD	-	-	3.8	0.04	17	11	13	12	44	-	-	-	-	-	-	-	-				
10HA7	0.0	Soil	NAD	-	-	10	0.11	18	20	20	11	340	-	-	-	-	-	-	-	-					
10HALO COMPOSITE	0.1	Topsoil	NAD	-	-	30	0.28	34	56	220	17	290	-	-	-	-	-	-	-	-					
10HALO A	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
10HALO B	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
10HALO C	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
10HALO D	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Average all soils at 0.0 - 0.3 m bgl				12.2	0.24	26.3	30	158	18	185	-	-	-	-	-	-	-	-	-	-	-				
Average all soils, except 6HA3-6HA6 & 8HA4-8HA5 at 0.3m bgl				5.9	0.																				

Table 5.2: Soil analytical results summary (High Density Residential): 6-10 Orr Street, Ashburton

			Asbestos <sup>1</sup>					Heavy Metals - Screen							PAH <sup>4</sup>			Total Petroleum Hydrocarbons (TPH)				
			Asbestos Containing Material (ACM)	Asbestos Containing Material (AF/FA)	Asbestos (AF/FA) / Asbestos fines (AF)	K:sec	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Asp:TCO	Pyrene	Naphthalene	CP:CP	CP:CP	CP:CP	CP:CP (Total)			
			Presence/Absence	% w/w	% w/w	% w/w	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg			
Laboratory Limit of Reporting			0.01	0.01	0.001	0.1	0.01	0.1	0.1	0.1	0.1	0.1	5	0.03	0.03	0.1	5	10	20	35		
Background (Canterbury) <sup>2</sup>			NAD	NAD	NAD	12.58	0.19	22.7	20.3	40.96	20.7	93.94	0.922 <sup>3</sup>	1.362 <sup>3</sup>	0.029 <sup>3</sup>	<LoR	<LoR	<LoR	<LoR			
NESCS - Commercial / Industrial <sup>1</sup>			-	0.05	0.001	70	1.300	6.300	>10,000	3.300	6,000 <sup>4</sup>	400,000 <sup>4</sup>	35	NA <sup>5</sup>	210 <sup>5</sup>	500 <sup>m,7</sup>	1,700 <sup>x,7</sup>	NA <sup>6</sup>	NGV			
NESCS - High Density Residential <sup>1</sup>			-	0.04	0.001	45	230	1,500	>10,000	500	1,200 <sup>4</sup>	60,000 <sup>4</sup>	24	1,600 <sup>5</sup>	63 <sup>5</sup>	500 <sup>m,7</sup>	510 <sup>x,7</sup>	NA <sup>6</sup>	NGV			
Property Address	Sample ID	Sample depth (m bgl)	Material Type																			
6 Orr St	6HA1	0.1	Soil	NAD	-	-	6.1	0.10	23	16	47	16	90	-	-	-	-	-	-			
		0.3		-	-	-	5.8	0.07	20	11	24	15	67	-	-	-	-	-	-			
		0.1		NAD	-	-	6	0.09	24	15	41	17	91	-	-	-	-	-	-			
	6HA2	0.1	Soil	NAD	-	-	6.7	0.05	25	15	19	18	73	-	-	-	-	-	-			
		0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		0.15		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	6HA2 FRAG	0.15	Building material	Chrysotile asbestos	NAD	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-			
		0.1		NAD	-	-	10	0.13	30	27	47	23	140	-	-	-	-	-	-	-		
		0.3		-	-	-	14	0.07	37	35	31	30	120	-	-	-	-	-	-	-		
	6HA3	0.1	Soil	-	-	-	8	0.05	25	24	19	20	75	-	-	-	-	-	-	-		
		0.3		-	-	-	7.9	0.04	23	23	20	19	74	-	-	-	-	-	-	-		
		0.5		-	-	-	6.5	0.04	21	16	17	16	67	-	-	-	-	-	-	-		
	6HA4	0.1	Soil	NAD	-	-	11	0.18	29	27	67	21	140	-	-	-	-	-	-	-		
		0.3		-	-	-	14	0.07	37	35	34	29	120	-	-	-	-	-	-	-		
		0.5		-	-	-	8	0.04	22	24	19	18	69	-	-	-	-	-	-	-		
	6HA5	0.1	Soil	-	-	-	7.4	0.05	21	21	19	17	70	-	-	-	-	-	-	-		
		0.3		-	-	-	3.8	0.03	16	8.8	11	12	47	-	-	-	-	-	-	-		
		0.5		-	-	-	9.2	0.32	26	30	39	19	120	-	-	-	-	-	-	-		
	6HA6	0.1	Soil	NAD	-	-	11	0.12	31	28	28	24	100	-	-	-	-	-	-	-		
		0.3		-	-	-	7.1	0.06	21	20	17	17	65	-	-	-	-	-	-	-		
		0.5		-	-	-	7.7	0.05	21	21	18	17	67	-	-	-	-	-	-	-		
	6HALO COMPOSITE	0.1	Topsoil	-	-	-	12	0.1	35	35	32	28	110	-	-	-	-	-	-	-		
		0.3		-	-	-	9.9	0.43	27	25	410	19	470	-	-	-	-	-	-	-		
		0.5		-	-	-	8.1	0.16	26	20	47	20	290	-	-	-	-	-	-	-		
	8 Orr St	8HALO A	0.1	Topsoil	NAD	-	-	8.1	0.16	25	29	350	16	200	-	-	-	-	-	-	-	
			0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
8HALO B		0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
8HALO C		0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
8HALO D		0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
8HA1		0.1	Soil	NAD	-	-	9.8	0.19	21	24	71	13	110	-	-	-	-	-	-	-		
		0.3		-	-	-	4.8	0.08	17	11	20	13	60	-	-	-	-	-	-	-		
		0.1		-	-	-	4.7	0.18	21	14	35	14	81	-	-	-	-	-	-	-		
8HA2		0.1	Soil	NAD	-	-	4.4	0.06	20	9.0	16	14	68	-	-	-	-	-	-	-		
		0.3		-	-	-	7.9	0.24	27	22	88	19	130	-	-	-	-	-	-	-		
		0.1		-	-	-	6.6	0.04	24	16	23	17	80	-	-	-	-	-	-	-		
8HA3		0.1	Soil	NAD	-	-	9.3	0.27	26	31	62	18	190	-	-	-	-	-	-	-		
		0.3		-	-	-	8.8	0.09	28	24	23	22	120	-	-	-	-	-	-	-		
		0.5		-	-	-	12	0.07	37	36	32	30	120	-	-	-	-	-	-	-		
8HA4	0.1	Soil	-	-	-	11	0.07	33	30	29	26	110	-	-	-	-	-	-	-			
	0.3		-	-	-	7.6	0.07	28	18	34	19	130	-	-	-	-	-	-	-			
	0.5		-	-	-	6.1	0.42	41	59	390	24	340	-	-	-	-	-	-	-			
8HA5	0.1	Soil	NAD	-	-	6.7	0.07	25	14	26	18	180	-	-	-	-	-	-	-			
	0.3		-	-	-	5.7	0.05	25	15	18	19	71	-	-	-	-	-	-	-			
	0.1		-	-	-	8.1	0.20	25	22	120	18	140	-	-	-	-	-	-	-			
8HA6	0.1	Soil	NAD	-	-	7.3	0.05	26	17	22	19	86	-	-	-	-	-	-	-			
	0.3		-	-	-	5.7	0.06	26	16	19	19	72	-	-	-	-	-	-	-			
	0.5		-	-	-	6.2	0.04	26	13	19	19	74	-	-	-	-	-	-	-			
8HALO COMPOSITE	0.1	Topsoil	-	-	-	11	0.35	27	65	660	19	350	-	-	-	-	-	-	-			
	0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
10 Orr St	10HALO A	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.1		NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	10HALO B	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	10HALO C	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	10HALO D	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	10HA1	0.1	Soil	NAD	-	-	8.4	0.21	21	25	79	12	140	-	-	-	-	-	-	-		
		0.3		-	-	-	4.2	0.05	18	9	15	13	60	-	-	-	-	-	-	-		
		0.1		NAD	-	-	5.2	0.21	21	20	39	15	82	-	-	-	-	-	-	-		
	10HA2	0.1	Soil	-	-	-	4	0.07	19	9.8	15	13	55	-	-	-	-	-	-	-		
		0.3		-	-	-	6.8	0.18	24	23	69	17	140	<LoR	<LoR	<LoR	< 50	< 100	4,400	4,400		
		0.5		-	-	-	7.4	0.06	26	19	24	20	85	<LoR	<LoR	<LoR	< 5	< 10	< 20	< 35		
	10HA3	0.1	Soil	-	-	-	6.5	0.03	26	14	19	20	73	-	-	-	-	-	-	-		
		0.3		-	-	-	5.6	0.04	24	14	18	17	72	-	-	-	-	-	-	-		
		0.5		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	10HA6	0.1	Soil	NAD	-	-	10	0.40	28	35	170	18	270	-	-	-	-	-	-	-		
		0.3		-	-	-	6.8	0.07	27	17	24	20	94	-	-	-	-	-	-	-		
		0.5		-	-	-	3.8	0.04	17	11	13	12	44	-	-	-	-	-	-	-		
10HALO COMPOSITE	0.1	Topsoil	-	-	-	30	0.28	34	56	220	17	290	-	-	-	-	-	-	-			
	0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
10HALO A	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
10HALO B	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
10HALO C	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
10HALO D	0.1	Topsoil	NAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	0.3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			



Table 5.3: Soil analytical results summary (Residential 10% produce): 6-10 Orr Street, Ashburton

				Asbestos <sup>1</sup>			Heavy Metals - Screen						PAH *			Total Petroleum Hydrocarbons (TPH)				
				Asbestos Containing Material (ACM)	Asbestos Containing Material (ACM)	Fibrous asbestos (FA) / Asbestos fines (AF)	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	BaP TEQ	Pyrene	Naphthalene	C7-C9	C10-C14	C15-C36	C7-C36 (Total)
				Units	Presence/absence	% w/w	% w/w	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Laboratory Limit of Reporting				0.01	0.01	0.001	0.1	0.01	0.1	0.1	0.1	0.1	5	0.03	0.03	0.1	5	10	20	35
Background (Canterbury) <sup>2</sup>				NAD	NAD	NAD	12.58	0.19	22.7	20.3	40.96	20.7	93.94	0.922 <sup>6</sup>	1.362 <sup>6</sup>	0.029 <sup>6</sup>	<LoR	<LoR	<LoR	<LoR
NESCOs - Commercial / Industrial <sup>3</sup>				-	0.05	0.001	70	1,300	6,300	>10,000	3,300	6,000 <sup>4</sup>	400,000 <sup>4</sup>	35	NA <sup>5</sup>	210 <sup>5</sup>	500 <sup>m,7</sup>	1,700 <sup>x,7</sup>	NA <sup>7</sup>	NGV
NESCOs - Residential 10% produce <sup>3</sup>				-	-	-	20	3	460	>10,000	210	400 <sup>4</sup>	7,400 <sup>4</sup>	10	1,600 <sup>5</sup>	63 <sup>5</sup>	500 <sup>m,7</sup>	510 <sup>x,7</sup>	NA <sup>7</sup>	NGV
Property Address	Sample ID	Sample depth (m bgl)	Material Type																	
10 Orr Street	10HA4	0.1	Soil	NAD	-	-	6	0.27	22	24	49	15	160	-	-	-	-	-	-	-
		0.3		-	-	-	6.5	0.08	25	17	24	18	91	-	-	-	-	-	-	-
		0.5		-	-	-	5.7	0.11	28	16	20	19	80	-	-	-	-	-	-	-
	10HA5	0.1	Soil	NAD	-	-	7.6	0.18	26	25	46	19	110	-	-	-	-	-	-	-
		0.3		-	-	-	5.7	0.05	24	14	18	18	70	-	-	-	-	-	-	-
		0.5		-	-	-	4.4	0.06	20	14	13	15	55	-	-	-	-	-	-	-
		0.6		-	-	-	4	0.06	18	13	15	13	55	-	-	-	-	-	-	-
	10HA7	0.0	Soil	NAD	-	-	10	0.11	18	20	20	11	340	<LoR	<LoR	<LoR	< 500	< 1,000	76,000	76,000

**Key:**

NA = Indicates contaminant not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site.

NAD = No Asbestos Detected.

NGV = no guideline value.

&lt;LoR = below laboratory Limit of Reporting.

'-' denotes not analysed or not applicable.

m bgl = metres below ground level.

<b>BOLD</b>	exceeds published background concentrations at the site (used as a proxy for suitability of soils for disposal to cleanfill)
<b>Red text</b>	exceeds NES:CS SCS commercial/industrial criteria
<b>Green text</b>	exceeds NES:CS SCS residential 10% produce

**References:**

\* Full suite analysed, selected analytes shown. Refer Eurofins Environment Testing certificates of analysis for full results.

1. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, BRANZ 2017. Soil guideline values for ACM and AF/FA based on relevant land use.

2. Environment Canterbury GIS, Trace Elements Level 2. Background concentrations at the site, from "Background concentrations of selected trace elements in Canterbury soils" prepared for Environment Canterbury by Tonkin &amp; Taylor Ltd, July 2006.

3. MfE, June 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Commercial/Industrial land use criteria as a conservative proxy for construction worker health and safety, and high-density residential land use criteria.

4. In the absence of available NESCS criterion for nickel and zinc, the criterion has been adopted from Assessment of Site Contamination National Environment Protection Measures (ASC NEPM) Toolbox – <http://www.nepc.gov.au/nepms/assessment-site-contamination/toolbox>.

5. MfE 2011, Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Tier 1 soil acceptance criteria for TPH, pyrene and naphthalene commercial/industrial and residential land use. All pathways, SANDY SILT soil type, &lt;1 m depth of contamination.

6. ECan 2007, Background concentrations of polycyclic aromatic hydrocarbons in Christchurch urban soils.

7. MfE 2011, Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Tier 1 soil acceptance criteria for TPH. All pathways, SANDY SILT soil type conservatively adopted, &lt;1 m depth of contamination. The following notes denote the limiting pathway for each criterion: m-maintenance/excavation, x- PAH surrogate. NA indicates contaminant not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site.

**Kainga Ora – Homes and Communities**  
**107 Carlton Gore Road**  
**Newmarket, Auckland**  
**NZ 1023**



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

**Attention:** Katie Stephenson  
**Report** 1073892-AID  
**Project Name** ORR6-10  
**Project ID** 1018898.2000  
**Received Date** Feb 29, 2024  
**Date Reported** Mar 26, 2024

### Methodology:

Asbestos Fibre Identification

Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques.

*NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*

Unknown Mineral Fibres

Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity.

*NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*

Subsampling Soil Samples

The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed.

*NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*

Bonded asbestos-containing material (ACM)

The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination. The resultant material is then further examined in accordance with AS 4964 - 2004.

*NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*

Limit of Reporting

The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w).

The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence IANZ Accreditation does not cover the performance of this service (non-IANZ results shown with an asterisk).

*NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos". This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

**Project Name**            **ORR6-10**  
**Project ID**                **1018898.2000**  
**Date Sampled**           **Feb 28, 2024**  
**Report**                     **1073892-AID**

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
6 HA1 0.1	24-Ma0000228	Feb 28, 2024	Approximate Sample 107g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
6 HA2 0.1	24-Ma0000230	Feb 28, 2024	Approximate Sample 122g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
6 HA3 0.1	24-Ma0000232	Feb 28, 2024	Approximate Sample 104g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
6 HA4 0.1	24-Ma0000234	Feb 28, 2024	Approximate Sample 94g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
6 HA5 0.1	24-Ma0000236	Feb 28, 2024	Approximate Sample 65g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
6 HA6 0.1	24-Ma0000238	Feb 28, 2024	Approximate Sample 68g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
6 HALO A	24-Ma0000240	Feb 28, 2024	Approximate Sample 99g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
6 HALO B	24-Ma0000241	Feb 28, 2024	Approximate Sample 85g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
6 HALO C	24-Ma0000242	Feb 28, 2024	Approximate Sample 75g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
6 HALO D	24-Ma0000243	Feb 28, 2024	Approximate Sample 88g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
8 HA1 0.1	24-Ma0000245	Feb 28, 2024	Approximate Sample 81g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
8 HA2 0.1	24-Ma0000247	Feb 28, 2024	Approximate Sample 74g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
8 HA3 0.1	24-Ma0000249	Feb 28, 2024	Approximate Sample 92g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
8 HA4 0.1	24-Ma0000251	Feb 28, 2024	Approximate Sample 93g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
8 HA5 0.1	24-Ma0000253	Feb 28, 2024	Approximate Sample 96g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
8 HA6 0.1	24-Ma0000255	Feb 28, 2024	Approximate Sample 56g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
8 HALO A	24-Ma0000257	Feb 28, 2024	Approximate Sample 120g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
8 HALO B	24-Ma0000258	Feb 28, 2024	Approximate Sample 99g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
8 HALO C	24-Ma0000259	Feb 28, 2024	Approximate Sample 46g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
8 HALO D	24-Ma0000260	Feb 28, 2024	Approximate Sample 82g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
10 HA1 0.1	24-Ma0000262	Feb 28, 2024	Approximate Sample 88g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
10 HA2 0.1	24-Ma0000264	Feb 28, 2024	Approximate Sample 91g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
10 HA3 0.1	24-Ma0000266	Feb 28, 2024	Approximate Sample 71g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
10 HA4 0.1	24-Ma0000268	Feb 28, 2024	Approximate Sample 63g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
10 HA5 0.1	24-Ma0000270	Feb 28, 2024	Approximate Sample 82g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
10 HA6 0.1	24-Ma0000272	Feb 28, 2024	Approximate Sample 66g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
10 HALO A	24-Ma0000274	Feb 28, 2024	Approximate Sample 106g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
10 HALO B	24-Ma0000275	Feb 28, 2024	Approximate Sample 84g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
10 HALO C	24-Ma0000276	Feb 28, 2024	Approximate Sample 62g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
10 HALO D	24-Ma0000277	Feb 28, 2024	Approximate Sample 133g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
6 HA2 FRAG	24-Ma0000301	Feb 28, 2024	Approximate Sample 1g / 40 x 30 x 10mm Sample consisted of: Fibre cement	Chrysotile asbestos detected. Organic fibre detected.
6 HA2 0.15	24-Ma0000339	Feb 28, 2024	Approximate Sample 97g Sample consisted of: Fine grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.

**Sample History**

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Christchurch	Mar 13, 2024	Indefinite
Asbestos - LTM-ASB-8020	Christchurch	Mar 13, 2024	Indefinite



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Auckland	Auckland (Asb)	Christchurch	Tauranga
35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth
6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289	46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370

**Company Name:** Kainga Ora – Homes and Communities - SI  
**Address:** 107 Carlton Gore Road  
Newmarket, Auckland  
NZ 1023

**Project Name:** ORR6-10  
**Project ID:** 1018898.2000

**Order No.:** PO 6181830  
**Report #:** 1073892  
**Phone:** (021) 537 696  
**Fax:**

**Received:** Feb 29, 2024 5:30 PM  
**Due:** Mar 22, 2024  
**Priority:** 15 Day  
**Contact Name:** Katie Stephenson

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	Asbestos Absence / Presence	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Metals M7 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
Tauranga Laboratory - IANZ# 1402												
External Laboratory												
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
1	6 HA1 0.1	Feb 28, 2024		Soil	Z24-Ma0000228	X			X		X	
2	6 HA1 0.3	Feb 28, 2024		Soil	Z24-Ma0000229				X		X	
3	6 HA2 0.1	Feb 28, 2024		Soil	Z24-Ma0000230	X			X		X	
4	6 HA2 0.3	Feb 28, 2024		Soil	Z24-Ma0000231				X		X	
5	6 HA3 0.1	Feb 28, 2024		Soil	Z24-Ma0000232	X			X		X	
6	6 HA3 0.3	Feb 28, 2024		Soil	Z24-Ma0000233				X		X	
7	6 HA4 0.1	Feb 28, 2024		Soil	Z24-Ma0000234	X			X		X	
8	6 HA4 0.3	Feb 28, 2024		Soil	Z24-Ma0000235				X		X	
9	6 HA5 0.1	Feb 28, 2024		Soil	Z24-Ma0000236	X			X		X	
10	6 HA5 0.3	Feb 28, 2024		Soil	Z24-Ma0000237				X		X	



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Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
11	6 HA6 0.1	Feb 28, 2024		Soil	Z24-Ma0000238	X			X		X	
12	6 HA6 0.3	Feb 28, 2024		Soil	Z24-Ma0000239				X		X	
13	6 HALO A	Feb 28, 2024		Soil	Z24-Ma0000240	X						
14	6 HALO B	Feb 28, 2024		Soil	Z24-Ma0000241	X						
15	6 HALO C	Feb 28, 2024		Soil	Z24-Ma0000242	X						
16	6 HALO D	Feb 28, 2024		Soil	Z24-Ma0000243	X						
17	6 HALO COMPOSITE	Feb 28, 2024		Soil	Z24-Ma0000244				X		X	
18	8 HA1 0.1	Feb 28, 2024		Soil	Z24-Ma0000245	X			X		X	
19	8 HA1 0.3	Feb 28, 2024		Soil	Z24-Ma0000246				X		X	
20	8 HA2 0.1	Feb 28, 2024		Soil	Z24-Ma0000247	X			X		X	
21	8 HA2 0.3	Feb 28, 2024		Soil	Z24-Ma0000248				X		X	
22	8 HA3 0.1	Feb 28, 2024		Soil	Z24-Ma0000249	X			X		X	
23	8 HA3 0.3	Feb 28, 2024		Soil	Z24-Ma0000250				X		X	





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Sample Detail						Asbestos - AS4964	Asbestos Absence / Presence	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Metals M7 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
24	8 HA4 0.1	Feb 28, 2024		Soil	Z24-Ma0000251	X			X		X	
25	8 HA4 0.3	Feb 28, 2024		Soil	Z24-Ma0000252				X		X	
26	8 HA5 0.1	Feb 28, 2024		Soil	Z24-Ma0000253	X			X		X	
27	8 HA5 0.3	Feb 28, 2024		Soil	Z24-Ma0000254				X		X	
28	8 HA6 0.1	Feb 28, 2024		Soil	Z24-Ma0000255	X			X		X	
29	8 HA6 0.3	Feb 28, 2024		Soil	Z24-Ma0000256				X		X	
30	8 HALO A	Feb 28, 2024		Soil	Z24-Ma0000257	X						
31	8 HALO B	Feb 28, 2024		Soil	Z24-Ma0000258	X						
32	8 HALO C	Feb 28, 2024		Soil	Z24-Ma0000259	X						
33	8 HALO D	Feb 28, 2024		Soil	Z24-Ma0000260	X						
34	8 HALO COMPOSITE	Feb 28, 2024		Soil	Z24-Ma0000261				X		X	
35	10 HA1 0.1	Feb 28, 2024		Soil	Z24-Ma0000262	X			X		X	
36	10 HA1 0.3	Feb 28, 2024		Soil	Z24-Ma0000263				X		X	



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Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth
6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289	46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370

**Company Name:** Kainga Ora – Homes and Communities - SI  
**Address:** 107 Carlton Gore Road  
Newmarket, Auckland  
NZ 1023

**Project Name:** ORR6-10  
**Project ID:** 1018898.2000

**Order No.:** PO 6181830  
**Report #:** 1073892  
**Phone:** (021) 537 696  
**Fax:**

**Received:** Feb 29, 2024 5:30 PM  
**Due:** Mar 22, 2024  
**Priority:** 15 Day  
**Contact Name:** Katie Stephenson

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	Asbestos Absence / Presence	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Metals M7 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
37	10 HA2 0.1	Feb 28, 2024		Soil	Z24-Ma0000264	X			X		X	
38	10 HA2 0.3	Feb 28, 2024		Soil	Z24-Ma0000265				X		X	
39	10 HA3 0.1	Feb 28, 2024		Soil	Z24-Ma0000266	X			X	X	X	X
40	10 HA3 0.3	Feb 28, 2024		Soil	Z24-Ma0000267				X	X	X	X
41	10 HA4 0.1	Feb 28, 2024		Soil	Z24-Ma0000268	X			X		X	
42	10 HA4 0.25	Feb 28, 2024		Soil	Z24-Ma0000269				X		X	
43	10 HA5 0.1	Feb 28, 2024		Soil	Z24-Ma0000270	X			X		X	
44	10 HA5 0.3	Feb 28, 2024		Soil	Z24-Ma0000271				X		X	
45	10 HA6 0.1	Feb 28, 2024		Soil	Z24-Ma0000272	X			X		X	
46	10 HA6 0.3	Feb 28, 2024		Soil	Z24-Ma0000273				X		X	
47	10 HALO A	Feb 28, 2024		Soil	Z24-Ma0000274	X						
48	10 HALO B	Feb 28, 2024		Soil	Z24-Ma0000275	X						
49	10 HALO C	Feb 28, 2024		Soil	Z24-Ma0000276	X						
50	10 HALO D	Feb 28, 2024		Soil	Z24-Ma0000277	X						



Auckland	Auckland (Asb)	Christchurch	Tauranga
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Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
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Perth
46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370

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Sample Detail						Asbestos - AS4964	Asbestos Absence / Presence	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Metals M7 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
51	10 HALO COMPOSITE	Feb 28, 2024		Soil	Z24-Ma0000278				X		X	
52	6 HA3 0.5	Feb 28, 2024		Soil	Z24-Ma0000279				X		X	
53	6 HA3 0.7	Feb 28, 2024		Soil	Z24-Ma0000280				X		X	
54	6 HA3 0.95	Feb 28, 2024		Soil	Z24-Ma0000281				X		X	
55	6 HA4 0.5	Feb 28, 2024		Soil	Z24-Ma0000282				X		X	
56	6 HA4 0.7	Feb 28, 2024		Soil	Z24-Ma0000283				X		X	
57	6 HA4 1.0	Feb 28, 2024		Soil	Z24-Ma0000284				X		X	
58	6 HA5 0.5	Feb 28, 2024		Soil	Z24-Ma0000285				X		X	
59	6 HA5 0.7	Feb 28, 2024		Soil	Z24-Ma0000286				X		X	
60	6 HA5 1.0	Feb 28, 2024		Soil	Z24-Ma0000287				X		X	
61	8 HA1 0.5	Feb 28, 2024		Soil	Z24-Ma0000288			X				
62	8 HA4 0.5	Feb 28, 2024		Soil	Z24-Ma0000289				X		X	
63	8 HA4 0.7	Feb 28, 2024		Soil	Z24-Ma0000290				X		X	



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Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth
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Sample Detail						Asbestos - AS4964	Asbestos Absence / Presence	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Metals M7 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
64	8 HA4 0.8	Feb 28, 2024		Soil	Z24-Ma0000291				X		X	
65	8 HA5 0.45	Feb 28, 2024		Soil	Z24-Ma0000292				X		X	
66	8 HA6 0.5	Feb 28, 2024		Soil	Z24-Ma0000293				X		X	
67	8 HA6 0.65	Feb 28, 2024		Soil	Z24-Ma0000294				X		X	
68	10 HA3 0.5	Feb 28, 2024		Soil	Z24-Ma0000295				X		X	
69	10 HA3 0.7	Feb 28, 2024		Soil	Z24-Ma0000296				X		X	
70	10 HA4 0.5	Feb 28, 2024		Soil	Z24-Ma0000297				X		X	
71	10 HA5 0.5	Feb 28, 2024		Soil	Z24-Ma0000298				X		X	
72	10 HA5 0.6	Feb 28, 2024		Soil	Z24-Ma0000299				X		X	
73	10 HA6 0.5	Feb 28, 2024		Soil	Z24-Ma0000300				X		X	
74	6 HA2 FRAG	Feb 28, 2024		Building Materials	Z24-Ma0000301		X					
75	10 HA7 0.0	Feb 28, 2024		Soil	Z24-Ma0000326				X	X	X	X
76	6 HA2 0.15	Feb 28, 2024		Soil	Z24-Ma0000339	X						



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Eurofins Environment Testing NZ Ltd

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Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth
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Sample Detail				Asbestos - AS4964	Asbestos Absence / Presence	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Metals M7 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327						X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308										
Christchurch Laboratory - IANZ# 1290				X	X					
Test Counts				31	1	1	61	3	61	3

## Internal Quality Control Review and Glossary General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. Information identified on this report with the colour **blue** indicates data provided by customer that may have an impact on the results.
5. This report replaces any interim results previously issued.

## Holding Times

Please refer to the most recent version of the 'Sample Preservation and Container Guide' for holding times (QS3001).

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported. Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

## Units

% w/w:	Percentage weight-for-weight basis, e.g. of asbestos in asbestos-containing finds in soil samples ( <b>% w/w</b> )
F/fld	Airborne fibre filter loading as Fibres ( <b>N</b> ) per Fields counted ( <b>n</b> )
F/mL	Airborne fibre reported concentration as Fibres per millilitre of air drawn over the sampler membrane ( <b>C</b> )
g, kg	Mass, e.g. of whole sample ( <b>M</b> ) or asbestos-containing find within the sample ( <b>m</b> )
g/kg	Concentration in grams per kilogram
L, mL	Volume, e.g. of air as measured in AFM ( <b>V = r x t</b> )
L/min	Airborne fibre sampling Flowrate as litres per minute of air drawn over the sampler membrane ( <b>r</b> )
min	Time ( <b>t</b> ), e.g. of air sample collection period

## Calculations

Airborne Fibre Concentration:  $C = \left(\frac{A}{a}\right) \times \left(\frac{N}{n}\right) \times \left(\frac{1}{r}\right) \times \left(\frac{1}{t}\right) = K \times \left(\frac{N}{n}\right) \times \left(\frac{1}{r}\right)$

Asbestos Content (as asbestos):  $\% w/w = \frac{(m \times P_A)}{M}$

Weighted Average (of asbestos):  $\%_{WA} = \sum \frac{(m \times P_A) \times x}{x}$

## Terms

<b>%asbestos</b>	Estimated percentage of asbestos in a given matrix may be derived from knowledge or experience of the material, informed by HSG264 <i>Appendix 2</i> , else assumed to be 15% in accordance with WA DOH <i>Appendix 2 (P<sub>A</sub>)</i> . This estimate is not NATA-accredited.
<b>ACM</b>	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded (non-friable) condition. For the purposes of the NEPM and WA DOH, ACM corresponds to material larger than 7 mm x 7 mm.
<b>AF</b>	Asbestos Fines. Asbestos contamination within a soil sample, as defined by WA DOH. Includes loose fibre bundles and small pieces of friable and non-friable material such as asbestos cement fragments mixed with soil. Considered under the NEPM as equivalent to "non-bonded / friable".
<b>AFM</b>	Airborne Fibre Monitoring, e.g., by the MFM.
<b>Amosite</b>	Amosite Asbestos Detected. Amosite may also refer to Fibrous Grunerite or Brown Asbestos. Identified in accordance with AS 4964-2004.
<b>AS</b>	Australian Standard.
<b>Asbestos Content (as asbestos)</b>	Total %w/w asbestos content in asbestos-containing finds in a soil sample ( <b>% w/w</b> ).
<b>Chrysotile</b>	Chrysotile Asbestos Detected. Chrysotile may also refer to Fibrous Serpentine or White Asbestos. Identified in accordance with AS 4964-2004.
<b>COC</b>	Chain of Custody.
<b>Crocidolite</b>	Crocidolite Asbestos Detected. Crocidolite may also refer to Fibrous Riebeckite or Blue Asbestos. Identified in accordance with AS 4964-2004.
<b>Dry</b>	Sample is dried by heating prior to analysis.
<b>DS</b>	Dispersion Staining. Technique required for Unequivocal Identification of asbestos fibres by PLM.
<b>FA</b>	Fibrous Asbestos. Asbestos containing material that is wholly or in part friable, including materials with higher asbestos content with a propensity to become friable with handling, and any material that was previously non-friable and in a severely degraded condition. For the purposes of the NEPM and WA DOH, FA generally corresponds to material larger than 7 mm x 7 mm, although FA may be more difficult to visibly distinguish and may be assessed as AF.
<b>Fibre Count</b>	Total of all fibres (whether asbestos or not) meeting the counting criteria set out in the NOHSC:3003
<b>Fibre ID</b>	Fibre Identification. Unequivocal identification of asbestos fibres according to AS 4964-2004. Includes Chrysotile, Amosite (Grunerite) or Crocidolite asbestos.
<b>Friable</b>	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory's remit to assess degree of friability.
<b>HSG248</b>	UK HSE HSG248, <i>Asbestos: The Analysts Guide</i> , 2nd Edition (2021).
<b>HSG264</b>	UK HSE HSG264, <i>Asbestos: The Survey Guide</i> (2012).
<b>ISO (also ISO/IEC)</b>	International Organization for Standardization / International Electrotechnical Commission.
<b>K Factor</b>	Microscope constant ( <b>K</b> ) as derived from the effective filter area of the given AFM membrane used for collecting the sample ( <b>A</b> ) and the projected eyepiece graticule area of the specific microscope used for the analysis ( <b>a</b> ).
<b>LOR</b>	Limit of Reporting.
<b>MFM (also NOHSC:3003)</b>	Membrane Filter Method. As described by the Australian Government National Occupational Health and Safety Commission, <i>Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres</i> , 2nd Edition [NOHSC:3003(2005)].
<b>NEPM (also ASC NEPM)</b>	National Environment Protection (Assessment of Site Contamination) Measure, (2013, as amended).
<b>Organic</b>	Organic Fibres Detected. Organic may refer to Natural or Man-Made Polymeric Fibres. Identified in accordance with AS 4964-2004.
<b>PCM</b>	Phase Contrast Microscopy. As used for Fibre Counting according to the MFM.
<b>PLM</b>	Polarised Light Microscopy. As used for Fibre Identification and Trace Analysis according to AS 4964-2004.
<b>Sampling</b>	Unless otherwise stated Eurofins are not responsible for sampling equipment or the sampling process.
<b>SMF</b>	Synthetic Mineral Fibre Detected. SMF may also refer to Man Made Vitreous Fibres. Identified in accordance with AS 4964-2004.
<b>SRA</b>	Sample Receipt Advice.
<b>Trace Analysis</b>	Analytical procedure used to detect the presence of respirable fibres (particularly asbestos) in a given sample matrix.
<b>UK HSE HSG</b>	United Kingdom, Health and Safety Executive, Health and Safety Guidance, publication.
<b>UMF</b>	Unidentified Mineral Fibre Detected. Fibrous minerals that are detected but have not been unequivocally identified by PLM with DS according to the AS 4964-2004. May include (but not limited to) Actinolite, Anthophyllite or Tremolite asbestos.
<b>WA DOH</b>	Reference document for the NEPM. Government of Western Australia, <i>Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia</i> (updated 2021), including Appendix Four: <i>Laboratory analysis</i>
<b>Weighted Average</b>	Combined average %w/w asbestos content of all asbestos-containing finds in the given aliquot or total soil sample ( <b>%<sub>WA</sub></b> ).

## Comments

### Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

### Asbestos Counter/Identifier:

Adelle Black                      Senior Analyst-Asbestos

### Authorised by:

Sophie Bush                      Senior Analyst-Asbestos



**Adelle Black**

**Senior Analyst-Asbestos (Key Technical Personnel)**

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

\* Indicates ISO/IEC 17025:2017 accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Kainga Ora – Homes and Communities  
107 Carlton Gore Road  
Newmarket, Auckland  
NZ 1023



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Attention: **Katie Stephenson**

Report **1073892-S-V2**

Project name **ORR6-10**

Project ID **1018898.2000**

Received Date **Feb 29, 2024**

Client Sample ID			6 HA1 0.1	6 HA1 0.3	6 HA2 0.1	6 HA2 0.3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			Z24-Ma0000228	Z24-Ma0000229	Z24-Ma0000230	Z24-Ma0000231
Date Sampled			Feb 28, 2024	Feb 28, 2024	Feb 28, 2024	Feb 28, 2024
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	6.1	5.8	6.0	6.7
Cadmium	0.01	mg/kg	0.10	0.07	0.09	0.05
Chromium	0.1	mg/kg	23	20	24	25
Copper	0.1	mg/kg	16	11	15	15
Lead	0.1	mg/kg	47	24	41	19
Nickel	0.1	mg/kg	16	15	17	18
Zinc	5	mg/kg	90	67	91	73
<b>Sample Properties</b>						
% Moisture	1	%	7.3	3.0	13	4.2

Client Sample ID			6 HA3 0.1	6 HA3 0.3	6 HA4 0.1	6 HA4 0.3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			Z24-Ma0000232	Z24-Ma0000233	Z24-Ma0000234	Z24-Ma0000235
Date Sampled			Feb 28, 2024	Feb 28, 2024	Feb 28, 2024	Feb 28, 2024
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	10	14	11	14
Cadmium	0.01	mg/kg	0.13	0.07	0.18	0.07
Chromium	0.1	mg/kg	30	37	29	37
Copper	0.1	mg/kg	27	35	27	35
Lead	0.1	mg/kg	47	31	67	34
Nickel	0.1	mg/kg	23	30	21	29
Zinc	5	mg/kg	140	120	140	120
<b>Sample Properties</b>						
% Moisture	1	%	21	12	17	13



<b>Client Sample ID</b>			<b>6 HA5 0.1</b>	<b>6 HA5 0.3</b>	<b>6 HA6 0.1</b>	<b>6 HA6 0.3</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000236</b>	<b>Z24-Ma0000237</b>	<b>Z24-Ma0000238</b>	<b>Z24-Ma0000239</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	9.2	11	9.9	8.1
Cadmium	0.01	mg/kg	0.32	0.12	0.43	0.16
Chromium	0.1	mg/kg	26	31	27	26
Copper	0.1	mg/kg	30	28	25	20
Lead	0.1	mg/kg	39	28	410	47
Nickel	0.1	mg/kg	19	24	19	20
Zinc	5	mg/kg	120	100	470	290
<b>Sample Properties</b>						
% Moisture	1	%	19	10	18	13

<b>Client Sample ID</b>			<b>6 HALO COMPOSITE</b>	<b>8 HA1 0.1</b>	<b>8 HA1 0.3</b>	<b>8 HA2 0.1</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000244</b>	<b>Z24-Ma0000245</b>	<b>Z24-Ma0000246</b>	<b>Z24-Ma0000247</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	8.1	9.8	4.8	4.7
Cadmium	0.01	mg/kg	0.16	0.19	0.08	0.18
Chromium	0.1	mg/kg	25	21	17	21
Copper	0.1	mg/kg	29	24	11	14
Lead	0.1	mg/kg	350	71	20	35
Nickel	0.1	mg/kg	16	13	13	14
Zinc	5	mg/kg	200	110	60	81
<b>Sample Properties</b>						
% Moisture	1	%	12	12	3.3	15

<b>Client Sample ID</b>			<b>8 HA2 0.3</b>	<b>8 HA3 0.1</b>	<b>8 HA3 0.3</b>	<b>8 HA4 0.1</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000248</b>	<b>Z24-Ma0000249</b>	<b>Z24-Ma0000250</b>	<b>Z24-Ma0000251</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	4.4	7.9	6.6	9.3
Cadmium	0.01	mg/kg	0.06	0.24	0.04	0.27
Chromium	0.1	mg/kg	20	27	24	26
Copper	0.1	mg/kg	9.0	22	16	31
Lead	0.1	mg/kg	16	88	23	62
Nickel	0.1	mg/kg	14	19	17	18
Zinc	5	mg/kg	68	130	80	190
<b>Sample Properties</b>						
% Moisture	1	%	< 1	9.3	7.2	20

<b>Client Sample ID</b>			<b>8 HA4 0.3</b>	<b>8 HA5 0.1</b>	<b>8 HA5 0.3</b>	<b>8 HA6 0.1</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000252</b>	<b>Z24-Ma0000253</b>	<b>Z24-Ma0000254</b>	<b>Z24-Ma0000255</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	8.8	61	6.7	8.1
Cadmium	0.01	mg/kg	0.09	0.42	0.07	0.20
Chromium	0.1	mg/kg	28	41	25	25
Copper	0.1	mg/kg	24	59	14	22
Lead	0.1	mg/kg	23	390	26	120
Nickel	0.1	mg/kg	22	24	18	18
Zinc	5	mg/kg	120	340	180	140
<b>Sample Properties</b>						
% Moisture	1	%	12	16	9.2	14

<b>Client Sample ID</b>			<b>8 HA6 0.3</b>	<b>8 HALO COMPOSITE</b>	<b>10 HA1 0.1</b>	<b>10 HA1 0.3</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000256</b>	<b>Z24-Ma0000261</b>	<b>Z24-Ma0000262</b>	<b>Z24-Ma0000263</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	7.3	11	8.4	4.2
Cadmium	0.01	mg/kg	0.05	0.35	0.21	0.05
Chromium	0.1	mg/kg	26	27	21	18
Copper	0.1	mg/kg	17	65	25	9.0
Lead	0.1	mg/kg	22	660	79	15
Nickel	0.1	mg/kg	19	19	12	13
Zinc	5	mg/kg	86	350	140	60
<b>Sample Properties</b>						
% Moisture	1	%	7.1	18	20	2.8

<b>Client Sample ID</b>			<b>10 HA2 0.1</b>	<b>10 HA2 0.3</b>	<b>10 HA3 0.1</b>	<b>10 HA3 0.3</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000264</b>	<b>Z24-Ma0000265</b>	<b>Z24-Ma0000266</b>	<b>Z24-Ma0000267</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	5.2	4.0	5.1	5.3
Cadmium	0.01	mg/kg	0.21	0.07	0.12	0.05
Chromium	0.1	mg/kg	21	19	18	18
Copper	0.1	mg/kg	20	9.8	17	14
Lead	0.1	mg/kg	39	15	47	17
Nickel	0.1	mg/kg	15	13	13	14
Zinc	5	mg/kg	82	55	110	61
<b>Sample Properties</b>						
% Moisture	1	%	11	4.5	24	16

<b>Client Sample ID</b>			<b>10 HA2 0.1</b>	<b>10 HA2 0.3</b>	<b>10 HA3 0.1</b>	<b>10 HA3 0.3</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000264</b>	<b>Z24-Ma0000265</b>	<b>Z24-Ma0000266</b>	<b>Z24-Ma0000267</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Total Petroleum Hydrocarbons (NZ MfE 1999)</b>						
Comments					G01	
TPH-SG C7-C9	5	mg/kg	-	-	< 50	< 5
TPH-SG C10-C14	10	mg/kg	-	-	< 100	< 10
TPH-SG C15-C36	20	mg/kg	-	-	4400	< 20
TPH-SG C7-C36 (Total)	35	mg/kg	-	-	4400	< 35
<b>Polycyclic Aromatic Hydrocarbons (NZ MfE)</b>						
Comments					G01	
Acenaphthene	0.03	mg/kg	-	-	< 3	< 0.03
Acenaphthylene	0.03	mg/kg	-	-	< 3	< 0.03
Anthracene	0.03	mg/kg	-	-	< 3	< 0.03
Benz(a)anthracene	0.03	mg/kg	-	-	< 3	< 0.03
Benzo(a)pyrene	0.03	mg/kg	-	-	< 3	< 0.03
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	-	-	< 3	< 0.03
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	-	-	3.6	0.04
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	-	-	7.5	0.08
Benzo(b&j)fluoranthene <sup>N07</sup>	0.03	mg/kg	-	-	< 3	< 0.03
Benzo(g,h,i)perylene	0.03	mg/kg	-	-	< 3	< 0.03
Benzo(k)fluoranthene	0.03	mg/kg	-	-	< 3	< 0.03
Chrysene	0.03	mg/kg	-	-	< 3	< 0.03
Dibenz(a,h)anthracene	0.03	mg/kg	-	-	< 3	< 0.03
Fluoranthene	0.03	mg/kg	-	-	< 3	< 0.03
Fluorene	0.03	mg/kg	-	-	< 3	< 0.03
Indeno(1,2,3-cd)pyrene	0.03	mg/kg	-	-	< 3	< 0.03
Naphthalene	0.1	mg/kg	-	-	< 3	< 0.1
Phenanthrene	0.03	mg/kg	-	-	< 3	< 0.03
Pyrene	0.03	mg/kg	-	-	< 3	< 0.03
Total PAH*	0.1	mg/kg	-	-	< 3	< 0.1
p-Terphenyl-d14 (surr.)	1	%	-	-	126	113
2-Fluorobiphenyl (surr.)	1	%	-	-	105	98

<b>Client Sample ID</b>			<b>10 HA4 0.1</b>	<b>10 HA4 0.25</b>	<b>10 HA5 0.1</b>	<b>10 HA5 0.3</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000268</b>	<b>Z24-Ma0000269</b>	<b>Z24-Ma0000270</b>	<b>Z24-Ma0000271</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	6.0	6.5	7.6	5.7
Cadmium	0.01	mg/kg	0.27	0.08	0.18	0.05
Chromium	0.1	mg/kg	22	25	26	24
Copper	0.1	mg/kg	24	17	25	14
Lead	0.1	mg/kg	49	24	46	18
Nickel	0.1	mg/kg	15	18	19	18
Zinc	5	mg/kg	160	91	110	70
<b>Sample Properties</b>						
% Moisture	1	%	19	10	10	9.5

<b>Client Sample ID</b>			<b>10 HA6 0.1</b>	<b>10 HA6 0.3</b>	<b>10 HALO COMPOSITE</b>	<b>6 HA3 0.5</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000272</b>	<b>Z24-Ma0000273</b>	<b>Z24-Ma0000278</b>	<b>Z24-Ma0000279</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	10	6.8	30	8.0
Cadmium	0.01	mg/kg	0.40	0.07	0.28	0.05
Chromium	0.1	mg/kg	28	27	34	25
Copper	0.1	mg/kg	35	17	56	24
Lead	0.1	mg/kg	170	24	220	19
Nickel	0.1	mg/kg	18	20	17	20
Zinc	5	mg/kg	270	94	290	75
<b>Sample Properties</b>						
% Moisture	1	%	23	15	19	12

<b>Client Sample ID</b>			<b>6 HA3 0.7</b>	<b>6 HA3 0.95</b>	<b>6 HA4 0.5</b>	<b>6 HA4 0.7</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000280</b>	<b>Z24-Ma0000281</b>	<b>Z24-Ma0000282</b>	<b>Z24-Ma0000283</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	7.9	6.5	8.0	7.4
Cadmium	0.01	mg/kg	0.04	0.04	0.04	0.05
Chromium	0.1	mg/kg	23	21	22	21
Copper	0.1	mg/kg	23	16	24	21
Lead	0.1	mg/kg	20	17	19	19
Nickel	0.1	mg/kg	19	16	18	17
Zinc	5	mg/kg	74	67	69	70
<b>Sample Properties</b>						
% Moisture	1	%	15	15	12	12

<b>Client Sample ID</b>			<b>6 HA4 1.0</b>	<b>6 HA5 0.5</b>	<b>6 HA5 0.7</b>	<b>6 HA5 1.0</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000284</b>	<b>Z24-Ma0000285</b>	<b>Z24-Ma0000286</b>	<b>Z24-Ma0000287</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	3.8	7.1	7.7	13
Cadmium	0.01	mg/kg	0.03	0.06	0.05	0.10
Chromium	0.1	mg/kg	16	21	21	36
Copper	0.1	mg/kg	8.8	20	21	36
Lead	0.1	mg/kg	11	17	18	33
Nickel	0.1	mg/kg	12	17	17	28
Zinc	5	mg/kg	47	65	67	120
<b>Sample Properties</b>						
% Moisture	1	%	11	10	10	15

<b>Client Sample ID</b>			<b>8 HA4 0.5</b>	<b>8 HA4 0.7</b>	<b>8 HA4 0.8</b>	<b>8 HA5 0.45</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000289</b>	<b>Z24-Ma0000290</b>	<b>Z24-Ma0000291</b>	<b>Z24-Ma0000292</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	14	10	9.2	4.9
Cadmium	0.01	mg/kg	0.07	0.07	0.07	0.05
Chromium	0.1	mg/kg	40	30	28	18
Copper	0.1	mg/kg	39	30	25	12
Lead	0.1	mg/kg	34	27	25	22
Nickel	0.1	mg/kg	32	25	22	13
Zinc	5	mg/kg	130	99	93	84
<b>Sample Properties</b>						
% Moisture	1	%	14	15	14	7.2

<b>Client Sample ID</b>			<b>8 HA6 0.5</b>	<b>8 HA6 0.65</b>	<b>10 HA3 0.5</b>	<b>10 HA3 0.7</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000293</b>	<b>Z24-Ma0000294</b>	<b>Z24-Ma0000295</b>	<b>Z24-Ma0000296</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	4.0	4.3	4.6	5.6
Cadmium	0.01	mg/kg	0.06	0.04	0.03	0.04
Chromium	0.1	mg/kg	17	19	19	24
Copper	0.1	mg/kg	10	12	10	14
Lead	0.1	mg/kg	12	14	14	18
Nickel	0.1	mg/kg	13	14	15	17
Zinc	5	mg/kg	49	55	57	72
<b>Sample Properties</b>						
% Moisture	1	%	5.9	5.2	12	12

<b>Client Sample ID</b>			<b>10 HA4 0.5</b>	<b>10 HA5 0.5</b>	<b>10 HA5 0.6</b>	<b>10 HA6 0.5</b>
<b>Sample Matrix</b>			<b>Soil</b>	<b>Soil</b>	<b>Soil</b>	<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000297</b>	<b>Z24-Ma0000298</b>	<b>Z24-Ma0000299</b>	<b>Z24-Ma0000300</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>	<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit				
<b>Metals M7 (NZ MfE)</b>						
Arsenic	0.1	mg/kg	5.7	4.4	4.0	3.8
Cadmium	0.01	mg/kg	0.11	0.06	0.06	0.04
Chromium	0.1	mg/kg	28	20	18	17
Copper	0.1	mg/kg	16	14	13	11
Lead	0.1	mg/kg	20	13	15	13
Nickel	0.1	mg/kg	19	15	13	12
Zinc	5	mg/kg	80	55	55	44
<b>Sample Properties</b>						
% Moisture	1	%	8.1	6.9	5.3	12

<b>Client Sample ID</b>			<b>10 HA7 0.0</b>
<b>Sample Matrix</b>			<b>Soil</b>
<b>Eurofins Sample No.</b>			<b>Z24-Ma0000326</b>
<b>Date Sampled</b>			<b>Feb 28, 2024</b>
Test/Reference	LOR	Unit	
<b>Metals M7 (NZ MfE)</b>			
Arsenic	0.1	mg/kg	10
Cadmium	0.01	mg/kg	0.11
Chromium	0.1	mg/kg	18
Copper	0.1	mg/kg	20
Lead	0.1	mg/kg	20
Nickel	0.1	mg/kg	11
Zinc	5	mg/kg	340
<b>Sample Properties</b>			
% Moisture	1	%	12
<b>Total Petroleum Hydrocarbons (NZ MfE 1999)</b>			
Comments			G01
TPH-SG C7-C9	5	mg/kg	< 500
TPH-SG C10-C14	10	mg/kg	< 1000
TPH-SG C15-C36	20	mg/kg	76000
TPH-SG C7-C36 (Total)	35	mg/kg	76000
<b>Polycyclic Aromatic Hydrocarbons (NZ MfE)</b>			
Comments			G01
Acenaphthene	0.03	mg/kg	< 3
Acenaphthylene	0.03	mg/kg	< 3
Anthracene	0.03	mg/kg	< 3
Benz(a)anthracene	0.03	mg/kg	< 3
Benzo(a)pyrene	0.03	mg/kg	< 3
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	< 3
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	3.6
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	7.5
Benzo(b&j)fluoranthene <sup>N07</sup>	0.03	mg/kg	< 3
Benzo(g,h,i)perylene	0.03	mg/kg	< 3
Benzo(k)fluoranthene	0.03	mg/kg	< 3
Chrysene	0.03	mg/kg	< 3
Dibenz(a,h)anthracene	0.03	mg/kg	< 3
Fluoranthene	0.03	mg/kg	< 3
Fluorene	0.03	mg/kg	< 3
Indeno(1,2,3-cd)pyrene	0.03	mg/kg	< 3
Naphthalene	0.1	mg/kg	< 3
Phenanthrene	0.03	mg/kg	< 3
Pyrene	0.03	mg/kg	< 3
Total PAH*	0.1	mg/kg	< 3
p-Terphenyl-d14 (surr.)	1	%	INT
2-Fluorobiphenyl (surr.)	1	%	101

**Sample History**

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Metals M7 (NZ MfE) - Method: LTM-MET-3040 Metals in Waters Soils Sediments by ICP-MS	Auckland	Apr 03, 2024	6 Months
Total Petroleum Hydrocarbons (NZ MfE 1999) - Method: LTM-ORG-2010 TRH and BTEX in Soil and Water by GC FID and PT GCMS	Auckland	Mar 15, 2024	14 Days
Polycyclic Aromatic Hydrocarbons (NZ MfE) - Method: LTM-ORG-2130 PAH and Phenols in Soil and Water by GC MSMS	Auckland	Mar 15, 2024	14 Days
% Moisture - Method: LTM-GEN-7080 Moisture Content in Soil by Gravimetry	Auckland	Mar 15, 2024	14 Days



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<b>Melbourne</b> 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	<b>Geelong</b> 19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	<b>Sydney</b> 179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	<b>Canberra</b> Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	<b>Brisbane</b> 1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	<b>Newcastle</b> 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289	<b>Perth</b> 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370
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<b>Company Name:</b>	Kainga Ora – Homes and Communities - SI	<b>Order No.:</b>	PO 6181830	<b>Received:</b>	Feb 29, 2024 5:30 PM
<b>Address:</b>	107 Carlton Gore Road Newmarket, Auckland NZ 1023	<b>Report #:</b>	1073892	<b>Due:</b>	Mar 22, 2024
		<b>Phone:</b>	(021) 537 696	<b>Priority:</b>	15 Day
		<b>Fax:</b>		<b>Contact Name:</b>	Katie Stephenson
<b>Project Name:</b>	ORR6-10				
<b>Project ID:</b>	1018898.2000				

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	Asbestos Absence / Presence	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Metals M7 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
Tauranga Laboratory - IANZ# 1402												
External Laboratory												
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
1	6 HA1 0.1	Feb 28, 2024		Soil	Z24-Ma0000228	X			X		X	
2	6 HA1 0.3	Feb 28, 2024		Soil	Z24-Ma0000229				X		X	
3	6 HA2 0.1	Feb 28, 2024		Soil	Z24-Ma0000230	X			X		X	
4	6 HA2 0.3	Feb 28, 2024		Soil	Z24-Ma0000231				X		X	
5	6 HA3 0.1	Feb 28, 2024		Soil	Z24-Ma0000232	X			X		X	
6	6 HA3 0.3	Feb 28, 2024		Soil	Z24-Ma0000233				X		X	
7	6 HA4 0.1	Feb 28, 2024		Soil	Z24-Ma0000234	X			X		X	
8	6 HA4 0.3	Feb 28, 2024		Soil	Z24-Ma0000235				X		X	
9	6 HA5 0.1	Feb 28, 2024		Soil	Z24-Ma0000236	X			X		X	
10	6 HA5 0.3	Feb 28, 2024		Soil	Z24-Ma0000237				X		X	





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Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth
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**Company Name:** Kainga Ora – Homes and Communities - SI  
**Address:** 107 Carlton Gore Road  
Newmarket, Auckland  
NZ 1023

**Project Name:** ORR6-10  
**Project ID:** 1018898.2000

**Order No.:** PO 6181830  
**Report #:** 1073892  
**Phone:** (021) 537 696  
**Fax:**

**Received:** Feb 29, 2024 5:30 PM  
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**Priority:** 15 Day  
**Contact Name:** Katie Stephenson

Eurofins Analytical Services Manager : Katyana Gausel

Sample Detail						Asbestos - AS4964	Asbestos Absence / Presence	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Metals M7 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
11	6 HA6 0.1	Feb 28, 2024		Soil	Z24-Ma0000238	X			X		X	
12	6 HA6 0.3	Feb 28, 2024		Soil	Z24-Ma0000239				X		X	
13	6 HALO A	Feb 28, 2024		Soil	Z24-Ma0000240	X						
14	6 HALO B	Feb 28, 2024		Soil	Z24-Ma0000241	X						
15	6 HALO C	Feb 28, 2024		Soil	Z24-Ma0000242	X						
16	6 HALO D	Feb 28, 2024		Soil	Z24-Ma0000243	X						
17	6 HALO COMPOSITE	Feb 28, 2024		Soil	Z24-Ma0000244				X		X	
18	8 HA1 0.1	Feb 28, 2024		Soil	Z24-Ma0000245	X			X		X	
19	8 HA1 0.3	Feb 28, 2024		Soil	Z24-Ma0000246				X		X	
20	8 HA2 0.1	Feb 28, 2024		Soil	Z24-Ma0000247	X			X		X	
21	8 HA2 0.3	Feb 28, 2024		Soil	Z24-Ma0000248				X		X	
22	8 HA3 0.1	Feb 28, 2024		Soil	Z24-Ma0000249	X			X		X	
23	8 HA3 0.3	Feb 28, 2024		Soil	Z24-Ma0000250				X		X	



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Newmarket, Auckland  
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ORR6-10

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Katie Stephenson

Eurofins Analytical Services Manager : Katyana Gausel

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Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
24	8 HA4 0.1	Feb 28, 2024		Soil	Z24-Ma0000251	X			X		X	
25	8 HA4 0.3	Feb 28, 2024		Soil	Z24-Ma0000252				X		X	
26	8 HA5 0.1	Feb 28, 2024		Soil	Z24-Ma0000253	X			X		X	
27	8 HA5 0.3	Feb 28, 2024		Soil	Z24-Ma0000254				X		X	
28	8 HA6 0.1	Feb 28, 2024		Soil	Z24-Ma0000255	X			X		X	
29	8 HA6 0.3	Feb 28, 2024		Soil	Z24-Ma0000256				X		X	
30	8 HALO A	Feb 28, 2024		Soil	Z24-Ma0000257	X						
31	8 HALO B	Feb 28, 2024		Soil	Z24-Ma0000258	X						
32	8 HALO C	Feb 28, 2024		Soil	Z24-Ma0000259	X						
33	8 HALO D	Feb 28, 2024		Soil	Z24-Ma0000260	X						
34	8 HALO COMPOSITE	Feb 28, 2024		Soil	Z24-Ma0000261				X		X	
35	10 HA1 0.1	Feb 28, 2024		Soil	Z24-Ma0000262	X			X		X	
36	10 HA1 0.3	Feb 28, 2024		Soil	Z24-Ma0000263				X		X	



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Perth
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Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
37	10 HA2 0.1	Feb 28, 2024		Soil	Z24-Ma0000264	X			X		X	
38	10 HA2 0.3	Feb 28, 2024		Soil	Z24-Ma0000265				X		X	
39	10 HA3 0.1	Feb 28, 2024		Soil	Z24-Ma0000266	X			X	X	X	X
40	10 HA3 0.3	Feb 28, 2024		Soil	Z24-Ma0000267				X	X	X	X
41	10 HA4 0.1	Feb 28, 2024		Soil	Z24-Ma0000268	X			X		X	
42	10 HA4 0.25	Feb 28, 2024		Soil	Z24-Ma0000269				X		X	
43	10 HA5 0.1	Feb 28, 2024		Soil	Z24-Ma0000270	X			X		X	
44	10 HA5 0.3	Feb 28, 2024		Soil	Z24-Ma0000271				X		X	
45	10 HA6 0.1	Feb 28, 2024		Soil	Z24-Ma0000272	X			X		X	
46	10 HA6 0.3	Feb 28, 2024		Soil	Z24-Ma0000273				X		X	
47	10 HALO A	Feb 28, 2024		Soil	Z24-Ma0000274	X						
48	10 HALO B	Feb 28, 2024		Soil	Z24-Ma0000275	X						
49	10 HALO C	Feb 28, 2024		Soil	Z24-Ma0000276	X						
50	10 HALO D	Feb 28, 2024		Soil	Z24-Ma0000277	X						



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Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth
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Sample Detail						Asbestos - AS4964	Asbestos Absence / Presence	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Metals M7 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
51	10 HALO COMPOSITE	Feb 28, 2024		Soil	Z24-Ma0000278				X		X	
52	6 HA3 0.5	Feb 28, 2024		Soil	Z24-Ma0000279				X		X	
53	6 HA3 0.7	Feb 28, 2024		Soil	Z24-Ma0000280				X		X	
54	6 HA3 0.95	Feb 28, 2024		Soil	Z24-Ma0000281				X		X	
55	6 HA4 0.5	Feb 28, 2024		Soil	Z24-Ma0000282				X		X	
56	6 HA4 0.7	Feb 28, 2024		Soil	Z24-Ma0000283				X		X	
57	6 HA4 1.0	Feb 28, 2024		Soil	Z24-Ma0000284				X		X	
58	6 HA5 0.5	Feb 28, 2024		Soil	Z24-Ma0000285				X		X	
59	6 HA5 0.7	Feb 28, 2024		Soil	Z24-Ma0000286				X		X	
60	6 HA5 1.0	Feb 28, 2024		Soil	Z24-Ma0000287				X		X	
61	8 HA1 0.5	Feb 28, 2024		Soil	Z24-Ma0000288			X				
62	8 HA4 0.5	Feb 28, 2024		Soil	Z24-Ma0000289				X		X	
63	8 HA4 0.7	Feb 28, 2024		Soil	Z24-Ma0000290				X		X	



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6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289	46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370

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Auckland Laboratory - IANZ# 1327								X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308												
Christchurch Laboratory - IANZ# 1290						X	X					
64	8 HA4 0.8	Feb 28, 2024		Soil	Z24-Ma0000291				X		X	
65	8 HA5 0.45	Feb 28, 2024		Soil	Z24-Ma0000292				X		X	
66	8 HA6 0.5	Feb 28, 2024		Soil	Z24-Ma0000293				X		X	
67	8 HA6 0.65	Feb 28, 2024		Soil	Z24-Ma0000294				X		X	
68	10 HA3 0.5	Feb 28, 2024		Soil	Z24-Ma0000295				X		X	
69	10 HA3 0.7	Feb 28, 2024		Soil	Z24-Ma0000296				X		X	
70	10 HA4 0.5	Feb 28, 2024		Soil	Z24-Ma0000297				X		X	
71	10 HA5 0.5	Feb 28, 2024		Soil	Z24-Ma0000298				X		X	
72	10 HA5 0.6	Feb 28, 2024		Soil	Z24-Ma0000299				X		X	
73	10 HA6 0.5	Feb 28, 2024		Soil	Z24-Ma0000300				X		X	
74	6 HA2 FRAG	Feb 28, 2024		Building Materials	Z24-Ma0000301		X					
75	10 HA7 0.0	Feb 28, 2024		Soil	Z24-Ma0000326				X	X	X	X
76	6 HA2 0.15	Feb 28, 2024		Soil	Z24-Ma0000339	X						



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Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

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Sample Detail				Asbestos - AS4964	Asbestos Absence / Presence	HOLD	Moisture Set	Total Petroleum Hydrocarbons (NZ MfE 1999)	Metals M7 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327						X	X	X	X	X
Auckland (asbestos) Laboratory - IANZ# 1308										
Christchurch Laboratory - IANZ# 1290				X	X					
Test Counts				31	1	1	61	3	61	3

## Internal Quality Control Review and Glossary

### General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. Unless otherwise stated, all soil/sediment/solid results are reported on a dry weight basis.
3. Unless otherwise stated, all biota/food results are reported on a wet weight basis on the edible portion.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds where annotated.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

### Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the sampling date; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

### Units

<b>mg/kg:</b> milligrams per kilogram	<b>mg/L:</b> milligrams per litre	<b>ppm:</b> parts per million
<b>µg/L:</b> micrograms per litre	<b>ppb:</b> parts per billion	<b>%:</b> Percentage
<b>org/100 mL:</b> Organisms per 100 millilitres	<b>NTU:</b> Nephelometric Turbidity Units	<b>MPN/100 mL:</b> Most Probable Number of organisms per 100 millilitres
<b>CFU:</b> Colony Forming Unit	<b>Colour:</b> Pt-Co Units (CU)	

### Terms

<b>APHA</b>	American Public Health Association
<b>CEC</b>	Cation Exchange Capacity
<b>COC</b>	Chain of Custody
<b>CP</b>	Client Parent - QC was performed on samples pertaining to this report
<b>CRM</b>	Certified Reference Material (ISO17034) - reported as percent recovery.
<b>Dry</b>	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
<b>Duplicate</b>	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
<b>LOR</b>	Limit of Reporting.
<b>LCS</b>	Laboratory Control Sample - reported as percent recovery.
<b>Method Blank</b>	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
<b>NCP</b>	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
<b>RPD</b>	Relative Percent Difference between two Duplicate pieces of analysis.
<b>SPIKE</b>	Addition of the analyte to the sample and reported as percentage recovery.
<b>SRA</b>	Sample Receipt Advice
<b>Surr - Surrogate</b>	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
<b>TBTO</b>	Tributyltin oxide ( <i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
<b>TCLP</b>	Toxicity Characteristic Leaching Procedure
<b>TEQ</b>	Toxic Equivalency Quotient or Total Equivalence
<b>QSM</b>	US Department of Defense Quality Systems Manual Version 6.0
<b>US EPA</b>	United States Environmental Protection Agency
<b>WA DWER</b>	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

### QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 50 – 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

### QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

## Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
<b>Method Blank</b>							
<b>Metals M7 (NZ MfE)</b>							
Arsenic	mg/kg	< 0.1			0.1	Pass	
Cadmium	mg/kg	< 0.01			0.01	Pass	
Chromium	mg/kg	< 0.1			0.1	Pass	
Copper	mg/kg	< 0.1			0.1	Pass	
Lead	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 0.1			0.1	Pass	
Zinc	mg/kg	< 5			5	Pass	
<b>Method Blank</b>							
<b>Total Petroleum Hydrocarbons (NZ MfE 1999)</b>							
TPH-SG C7-C9	mg/kg	< 5			5	Pass	
TPH-SG C10-C14	mg/kg	< 10			10	Pass	
TPH-SG C15-C36	mg/kg	< 20			20	Pass	
TPH-SG C7-C36 (Total)	mg/kg	< 35			35	Pass	
<b>Method Blank</b>							
<b>Polycyclic Aromatic Hydrocarbons (NZ MfE)</b>							
Acenaphthene	mg/kg	< 0.03			0.03	Pass	
Acenaphthylene	mg/kg	< 0.03			0.03	Pass	
Anthracene	mg/kg	< 0.03			0.03	Pass	
Benzo(a)anthracene	mg/kg	< 0.03			0.03	Pass	
Benzo(a)pyrene	mg/kg	< 0.03			0.03	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Benzo(g,h,i)perylene	mg/kg	< 0.03			0.03	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Chrysene	mg/kg	< 0.03			0.03	Pass	
Dibenz(a,h)anthracene	mg/kg	< 0.03			0.03	Pass	
Fluoranthene	mg/kg	< 0.03			0.03	Pass	
Fluorene	mg/kg	< 0.03			0.03	Pass	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.03			0.03	Pass	
Naphthalene	mg/kg	< 0.1			0.1	Pass	
Phenanthrene	mg/kg	< 0.03			0.03	Pass	
Pyrene	mg/kg	< 0.03			0.03	Pass	
<b>Method Blank</b>							
<b>Metals M7 (NZ MfE)</b>							
Arsenic	mg/kg	< 0.1			0.1	Pass	
Cadmium	mg/kg	< 0.01			0.01	Pass	
Chromium	mg/kg	< 0.1			0.1	Pass	
Copper	mg/kg	< 0.1			0.1	Pass	
Lead	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 0.1			0.1	Pass	
Zinc	mg/kg	< 5			5	Pass	
<b>Method Blank</b>							
<b>Metals M7 (NZ MfE)</b>							
Arsenic	mg/kg	< 0.1			0.1	Pass	
Cadmium	mg/kg	0.02			0.01	Fail	
Chromium	mg/kg	< 0.1			0.1	Pass	
Copper	mg/kg	< 0.1			0.1	Pass	
Lead	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 0.1			0.1	Pass	
Zinc	mg/kg	< 5			5	Pass	
<b>Method Blank</b>							



Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
<b>Metals M7 (NZ MfE)</b>							
Arsenic	mg/kg	< 0.1			0.1	Pass	
Cadmium	mg/kg	0.03			0.01	Fail	
Chromium	mg/kg	< 0.1			0.1	Pass	
Copper	mg/kg	< 0.1			0.1	Pass	
Lead	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 0.1			0.1	Pass	
Zinc	mg/kg	< 5			5	Pass	
<b>Method Blank</b>							
<b>Total Petroleum Hydrocarbons (NZ MfE 1999)</b>							
TPH-SG C7-C9	mg/kg	< 5			5	Pass	
TPH-SG C10-C14	mg/kg	< 10			10	Pass	
TPH-SG C15-C36	mg/kg	< 20			20	Pass	
TPH-SG C7-C36 (Total)	mg/kg	< 35			35	Pass	
<b>LCS - % Recovery</b>							
<b>Metals M7 (NZ MfE)</b>							
Arsenic	%	108			80-120	Pass	
Cadmium	%	103			80-120	Pass	
Chromium	%	102			80-120	Pass	
Copper	%	99			80-120	Pass	
Lead	%	101			80-120	Pass	
Nickel	%	99			80-120	Pass	
Zinc	%	106			80-120	Pass	
<b>LCS - % Recovery</b>							
<b>Total Petroleum Hydrocarbons (NZ MfE 1999)</b>							
TPH-SG C7-C36 (Total)	%	78			70-130	Pass	
<b>LCS - % Recovery</b>							
<b>Polycyclic Aromatic Hydrocarbons (NZ MfE)</b>							
Benzo(b&j)fluoranthene	%	111			70-130	Pass	
<b>LCS - % Recovery</b>							
<b>Metals M7 (NZ MfE)</b>							
Arsenic	%	116			80-120	Pass	
Cadmium	%	119			80-120	Pass	
Chromium	%	117			80-120	Pass	
Copper	%	116			80-120	Pass	
Lead	%	113			80-120	Pass	
Nickel	%	116			80-120	Pass	
Zinc	%	119			80-120	Pass	
<b>LCS - % Recovery</b>							
<b>Metals M7 (NZ MfE)</b>							
Arsenic	%	110			80-120	Pass	
Cadmium	%	111			80-120	Pass	
Chromium	%	109			80-120	Pass	
Copper	%	110			80-120	Pass	
Lead	%	106			80-120	Pass	
Nickel	%	109			80-120	Pass	
Zinc	%	107			80-120	Pass	
<b>LCS - % Recovery</b>							
<b>Metals M7 (NZ MfE)</b>							
Arsenic	%	108			80-120	Pass	
Cadmium	%	107			80-120	Pass	
Chromium	%	109			80-120	Pass	
Copper	%	109			80-120	Pass	
Lead	%	104			80-120	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Nickel			%	108			80-120	Pass	
Zinc			%	111			80-120	Pass	
<b>LCS - % Recovery</b>									
<b>Total Petroleum Hydrocarbons (NZ MfE 1999)</b>									
TPH-SG C7-C36 (Total)			%	76			70-130	Pass	
<b>LCS - % Recovery</b>									
<b>Polycyclic Aromatic Hydrocarbons (NZ MfE)</b>									
Acenaphthene			%	84			70-130	Pass	
Acenaphthylene			%	108			70-130	Pass	
Anthracene			%	93			70-130	Pass	
Benz(a)anthracene			%	95			70-130	Pass	
Benzo(a)pyrene			%	97			70-130	Pass	
Benzo(g,h,i)perylene			%	85			70-130	Pass	
Benzo(k)fluoranthene			%	88			70-130	Pass	
Chrysene			%	105			70-130	Pass	
Dibenz(a,h)anthracene			%	82			70-130	Pass	
Fluoranthene			%	93			70-130	Pass	
Fluorene			%	87			70-130	Pass	
Indeno(1,2,3-cd)pyrene			%	83			70-130	Pass	
Naphthalene			%	88			70-130	Pass	
Phenanthrene			%	83			70-130	Pass	
Pyrene			%	91			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
<b>Spike - % Recovery</b>									
<b>Metals M7 (NZ MfE)</b>				Result 1					
Arsenic	Z24-Ma0000237	CP	%	102			75-125	Pass	
Cadmium	Z24-Ma0000237	CP	%	102			75-125	Pass	
Chromium	Z24-Ma0000237	CP	%	104			75-125	Pass	
Copper	Z24-Ma0000237	CP	%	100			75-125	Pass	
Lead	Z24-Ma0000237	CP	%	100			75-125	Pass	
Nickel	Z24-Ma0000237	CP	%	99			75-125	Pass	
Zinc	Z24-Ma0000237	CP	%	108			75-125	Pass	
<b>Spike - % Recovery</b>									
<b>Metals M7 (NZ MfE)</b>				Result 1					
Arsenic	Z24-Ma0000251	CP	%	97			75-125	Pass	
Cadmium	Z24-Ma0000251	CP	%	96			75-125	Pass	
Chromium	Z24-Ma0000251	CP	%	94			75-125	Pass	
Copper	Z24-Ma0000251	CP	%	91			75-125	Pass	
Lead	Z24-Ma0000251	CP	%	94			75-125	Pass	
Nickel	Z24-Ma0000251	CP	%	91			75-125	Pass	
Zinc	Z24-Ma0000251	CP	%	96			75-125	Pass	
<b>Spike - % Recovery</b>									
<b>Metals M7 (NZ MfE)</b>				Result 1					
Arsenic	Z24-Ma0000265	CP	%	95			75-125	Pass	
Cadmium	Z24-Ma0000265	CP	%	95			75-125	Pass	
Chromium	Z24-Ma0000265	CP	%	96			75-125	Pass	
Copper	Z24-Ma0000265	CP	%	95			75-125	Pass	
Lead	Z24-Ma0000265	CP	%	97			75-125	Pass	
Nickel	Z24-Ma0000265	CP	%	95			75-125	Pass	
Zinc	Z24-Ma0000265	CP	%	106			75-125	Pass	
<b>Spike - % Recovery</b>									
<b>Total Petroleum Hydrocarbons (NZ MfE 1999)</b>				Result 1					
TPH-SG C7-C36 (Total)	K24-Ma0001969	NCP	%	113			70-130	Pass	
<b>Spike - % Recovery</b>									

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
<b>Polycyclic Aromatic Hydrocarbons (NZ MfE)</b>				Result 1					
Acenaphthene	K24-Ma0036009	NCP	%	80			70-130	Pass	
Acenaphthylene	K24-Ma0032689	NCP	%	83			70-130	Pass	
Anthracene	K24-Ma0032689	NCP	%	76			70-130	Pass	
Benz(a)anthracene	K24-Ma0032689	NCP	%	78			70-130	Pass	
Benzo(a)pyrene	K24-Ma0015106	NCP	%	93			70-130	Pass	
Benzo(b&j)fluoranthene	K24-Ma0015106	NCP	%	97			70-130	Pass	
Benzo(g,h,i)perylene	K24-Ma0032689	NCP	%	72			70-130	Pass	
Benzo(k)fluoranthene	K24-Ma0032689	NCP	%	82			70-130	Pass	
Chrysene	K24-Ma0032689	NCP	%	96			70-130	Pass	
Dibenz(a,h)anthracene	K24-Ma0032689	NCP	%	72			70-130	Pass	
Fluoranthene	K24-Ma0015106	NCP	%	91			70-130	Pass	
Fluorene	K24-Ma0036009	NCP	%	85			70-130	Pass	
Indeno(1,2,3-cd)pyrene	K24-Ma0032689	NCP	%	70			70-130	Pass	
Naphthalene	K24-Ma0032689	NCP	%	89			70-130	Pass	
Phenanthrene	K24-Ma0036009	NCP	%	90			70-130	Pass	
Pyrene	K24-Ma0025625	NCP	%	76			70-130	Pass	
<b>Spike - % Recovery</b>									
<b>Metals M7 (NZ MfE)</b>				Result 1					
Arsenic	Z24-Ma0000288	CP	%	108			75-125	Pass	
Cadmium	Z24-Ma0000288	CP	%	111			75-125	Pass	
Chromium	Z24-Ma0000288	CP	%	105			75-125	Pass	
Copper	Z24-Ma0000288	CP	%	106			75-125	Pass	
Lead	Z24-Ma0000288	CP	%	104			75-125	Pass	
Nickel	Z24-Ma0000288	CP	%	105			75-125	Pass	
Zinc	Z24-Ma0000288	CP	%	95			75-125	Pass	
<b>Spike - % Recovery</b>									
<b>Metals M7 (NZ MfE)</b>				Result 1					
Arsenic	Z24-Ma0000289	CP	%	119			75-125	Pass	
Chromium	Z24-Ma0000289	CP	%	119			75-125	Pass	
Copper	Z24-Ma0000289	CP	%	119			75-125	Pass	
Lead	Z24-Ma0000289	CP	%	115			75-125	Pass	
Nickel	Z24-Ma0000289	CP	%	119			75-125	Pass	
Zinc	Z24-Ma0000289	CP	%	120			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
<b>Duplicate</b>									
<b>Metals M7 (NZ MfE)</b>				Result 1	Result 2	RPD			
Arsenic	Z24-Ma0000236	CP	mg/kg	9.2	10.0	8.0	30%	Pass	
Cadmium	Z24-Ma0000236	CP	mg/kg	0.32	0.33	3.6	30%	Pass	
Chromium	Z24-Ma0000236	CP	mg/kg	26	29	10.0	30%	Pass	
Copper	Z24-Ma0000236	CP	mg/kg	30	33	8.3	30%	Pass	
Lead	Z24-Ma0000236	CP	mg/kg	39	43	8.6	30%	Pass	
Nickel	Z24-Ma0000236	CP	mg/kg	19	21	9.5	30%	Pass	
Zinc	Z24-Ma0000236	CP	mg/kg	120	130	10	30%	Pass	
<b>Duplicate</b>									
<b>Sample Properties</b>				Result 1	Result 2	RPD			
% Moisture	Z24-Ma0000236	CP	%	19	19	<1	30%	Pass	
<b>Duplicate</b>									
<b>Metals M7 (NZ MfE)</b>				Result 1	Result 2	RPD			
Arsenic	Z24-Ma0000250	CP	mg/kg	6.6	6.5	1.3	30%	Pass	
Cadmium	Z24-Ma0000250	CP	mg/kg	0.04	0.04	12	30%	Pass	
Chromium	Z24-Ma0000250	CP	mg/kg	24	24	1.4	30%	Pass	
Copper	Z24-Ma0000250	CP	mg/kg	16	16	<1	30%	Pass	
Lead	Z24-Ma0000250	CP	mg/kg	23	22	2.4	30%	Pass	

Duplicate								
Metals M7 (NZ MfE)				Result 1	Result 2	RPD		
Nickel	Z24-Ma0000250	CP	mg/kg	17	17	1.6	30%	Pass
Zinc	Z24-Ma0000250	CP	mg/kg	80	80	1.0	30%	Pass
Duplicate								
Sample Properties				Result 1	Result 2	RPD		
% Moisture	Z24-Ma0000250	CP	%	7.2	7.2	<1	30%	Pass
Duplicate								
Metals M7 (NZ MfE)				Result 1	Result 2	RPD		
Arsenic	Z24-Ma0000264	CP	mg/kg	5.2	4.5	14	30%	Pass
Cadmium	Z24-Ma0000264	CP	mg/kg	0.21	0.19	7.4	30%	Pass
Chromium	Z24-Ma0000264	CP	mg/kg	21	20	9.2	30%	Pass
Copper	Z24-Ma0000264	CP	mg/kg	20	18	11	30%	Pass
Lead	Z24-Ma0000264	CP	mg/kg	39	34	13	30%	Pass
Nickel	Z24-Ma0000264	CP	mg/kg	15	13	10	30%	Pass
Zinc	Z24-Ma0000264	CP	mg/kg	82	75	9.9	30%	Pass
Duplicate								
Sample Properties				Result 1	Result 2	RPD		
% Moisture	Z24-Ma0000264	CP	%	11	11	4.6	30%	Pass
Duplicate								
Metals M7 (NZ MfE)				Result 1	Result 2	RPD		
Arsenic	Z24-Ma0000266	CP	mg/kg	5.1	4.2	20	30%	Pass
Cadmium	Z24-Ma0000266	CP	mg/kg	0.12	0.11	7.3	30%	Pass
Chromium	Z24-Ma0000266	CP	mg/kg	18	15	20	30%	Pass
Copper	Z24-Ma0000266	CP	mg/kg	17	14	18	30%	Pass
Lead	Z24-Ma0000266	CP	mg/kg	47	40	15	30%	Pass
Nickel	Z24-Ma0000266	CP	mg/kg	13	11	15	30%	Pass
Zinc	Z24-Ma0000266	CP	mg/kg	110	94	13	30%	Pass
Duplicate								
Total Petroleum Hydrocarbons (NZ MfE 1999)				Result 1	Result 2	RPD		
TPH-SG C7-C9	K24-Ma0014971	NCP	mg/kg	< 5	< 5	<1	30%	Pass
TPH-SG C10-C14	K24-Ma0014971	NCP	mg/kg	< 10	< 10	<1	30%	Pass
TPH-SG C15-C36	K24-Fe0074096	NCP	mg/kg	900	1200	28	30%	Pass
TPH-SG C7-C36 (Total)	K24-Fe0074096	NCP	mg/kg	900	1200	28	30%	Pass
Duplicate								
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1	Result 2	RPD		
Acenaphthene	K24-Ma0032541	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass
Acenaphthylene	K24-Ma0032541	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass
Anthracene	K24-Ma0032541	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass
Benz(a)anthracene	K24-Ma0032541	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass
Benzo(a)pyrene	K24-Ma0032541	NCP	mg/kg	0.04	< 0.03	2.8	30%	Pass
Benzo(b&j)fluoranthene	K24-Ma0032541	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass
Benzo(g,h,i)perylene	K24-Ma0032541	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass
Benzo(k)fluoranthene	K24-Ma0032541	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass
Chrysene	K24-Ma0032541	NCP	mg/kg	0.05	0.04	6.7	30%	Pass
Dibenz(a,h)anthracene	K24-Ma0032541	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass
Fluoranthene	K24-Ma0032541	NCP	mg/kg	0.06	< 0.03	4.1	30%	Pass
Fluorene	K24-Ma0032541	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass
Indeno(1,2,3-cd)pyrene	K24-Ma0032541	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass
Naphthalene	K24-Ma0032541	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Phenanthrene	K24-Ma0032541	NCP	mg/kg	< 0.03	< 0.03	<1	30%	Pass
Pyrene	K24-Ma0032541	NCP	mg/kg	0.08	< 0.03	5.0	30%	Pass

Duplicate								
Metals M7 (NZ MfE)				Result 1	Result 2	RPD		
Arsenic	Z24-Ma0000278	CP	mg/kg	30	30	1.7	30%	Pass
Cadmium	Z24-Ma0000278	CP	mg/kg	0.28	0.27	3.5	30%	Pass
Chromium	Z24-Ma0000278	CP	mg/kg	34	32	4.7	30%	Pass
Copper	Z24-Ma0000278	CP	mg/kg	56	52	6.4	30%	Pass
Lead	Z24-Ma0000278	CP	mg/kg	220	260	18	30%	Pass
Nickel	Z24-Ma0000278	CP	mg/kg	17	16	3.6	30%	Pass
Zinc	Z24-Ma0000278	CP	mg/kg	290	300	<1	30%	Pass
Duplicate								
Sample Properties				Result 1	Result 2	RPD		
% Moisture	Z24-Ma0000278	CP	%	19	18	5.7	30%	Pass
Duplicate								
Metals M7 (NZ MfE)				Result 1	Result 2	RPD		
Arsenic	Z24-Ma0000287	CP	mg/kg	13	13	1.4	30%	Pass
Cadmium	Z24-Ma0000287	CP	mg/kg	0.10	0.08	20	30%	Pass
Chromium	Z24-Ma0000287	CP	mg/kg	36	37	2.7	30%	Pass
Copper	Z24-Ma0000287	CP	mg/kg	36	37	2.1	30%	Pass
Lead	Z24-Ma0000287	CP	mg/kg	33	33	1.0	30%	Pass
Nickel	Z24-Ma0000287	CP	mg/kg	28	29	2.9	30%	Pass
Zinc	Z24-Ma0000287	CP	mg/kg	120	120	2.7	30%	Pass
Duplicate								
Sample Properties				Result 1	Result 2	RPD		
% Moisture	Z24-Ma0000287	CP	%	15	14	2.4	30%	Pass
Duplicate								
Metals M7 (NZ MfE)				Result 1	Result 2	RPD		
Arsenic	Z24-Ma0000297	CP	mg/kg	5.7	5.8	<1	30%	Pass
Cadmium	Z24-Ma0000297	CP	mg/kg	0.11	0.10	11	30%	Pass
Chromium	Z24-Ma0000297	CP	mg/kg	28	26	7.9	30%	Pass
Copper	Z24-Ma0000297	CP	mg/kg	16	15	5.0	30%	Pass
Lead	Z24-Ma0000297	CP	mg/kg	20	20	<1	30%	Pass
Nickel	Z24-Ma0000297	CP	mg/kg	19	18	3.8	30%	Pass
Zinc	Z24-Ma0000297	CP	mg/kg	80	77	3.4	30%	Pass
Duplicate								
Metals M7 (NZ MfE)				Result 1	Result 2	RPD		
Arsenic	Z24-Ma0000298	CP	mg/kg	4.4	3.8	14	30%	Pass
Cadmium	Z24-Ma0000298	CP	mg/kg	0.06	0.05	16	30%	Pass
Chromium	Z24-Ma0000298	CP	mg/kg	20	17	14	30%	Pass
Copper	Z24-Ma0000298	CP	mg/kg	14	11	18	30%	Pass
Lead	Z24-Ma0000298	CP	mg/kg	13	12	11	30%	Pass
Nickel	Z24-Ma0000298	CP	mg/kg	15	13	15	30%	Pass
Zinc	Z24-Ma0000298	CP	mg/kg	55	47	15	30%	Pass

## Comments

This report has been revised (V2) following repeat analysis. Metals results for sample 24-Ma0000297 have now been replaced by the repeat results.

## Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

## Qualifier Codes/Comments

Code	Description
G01	The LORs have been raised due to matrix interference
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

## Authorised by:

Katjana Gausel	Analytical Services Manager
Raymond Siu	Senior Analyst-Metal
Raymond Siu	Senior Analyst-Organic
Sophie Bush	Senior Analyst-Asbestos



**Raymond Siu**  
**Senior Instrument Chemist (Key Technical Personnel)**

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

\* Indicates IANZ accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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## **Appendix B      Figures**

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- **Figure 1: Ground Contamination Investigation Plan.**
- **Figure 2: Soil disposal 0.0 – 0.3 m bgl.**
- **Figure 3: Soil disposal >0.3 m bgl.**















## **Appendix C      Site Earthwork Completion Checklist**

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## Site Earthwork Completion Checklist- 6-10 Orr Street, Ashburton

Project foreman to complete the following checklist and provide evidence to the project SQEP within two weeks of completion of soil disturbance works.

If multiple phases of soil disturbance are undertaken by different contractors (e.g., demolition contractor and earthworks/ building contractor), each contractor must complete the following checklist, sign and date (overleaf) and provide to the Project SQEP.

Task	Comments	Initials	Date completed
Confirm the WI was reviewed before, and implemented during soil disturbance work.			
Confirm the Kāinga Ora CSMP was reviewed before and implemented during soil disturbance work.			
Provide photographic evidence to the project SQEP clearly showing all excavations (including depths/extents) as per Section 3.			
Provide evidence (e.g., disposal docket) for material removed from the site.			
Provide disposal facility acceptance letters for material exported from this site.			
Confirm that material imported to the site was certified cleanfill and/or quarry sourced.			
<p>Confirm no unexpected contamination discoveries were encountered during soil disturbance works.</p> <p>If unexpected discoveries were encountered, provide evidence of the material encountered and any remedial work undertaken.</p> <p>NOTE: if unexpected contamination was identified the project SQEP should have been notified <b>immediately</b> and the Kāinga Ora 'contaminated soil discovery guideline' followed.</p>			
Provide any records of ground contamination-related complaints or incidents during soil disturbance.			

I, Site Foreman/Manager (full name) .....

of (Contractor)..... confirm that:

- The soil disturbance and earthwork undertaken at 6-10 Orr Street, Ashburton has been carried out in accordance with the WI, Kāinga Ora CSMP, and relevant stated guidelines.
- Soils taken offsite were disposed of appropriately to approved facilities as shown through relevant disposal documentation.
- The above tasks have been completed and signed off by the Site Foreman/Manager, and a copy of this checklist sent to the project SQEP on completion.

Professional title: .....

Signed: .....

Dated: .....

## **Appendix D      Approximate Soil Disposal Volumes**

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6-10 Orr Street, Ashburton: approximate and estimated disposal volumes.

Additional quantities may require disposal to managed fill/landfill if prior approval for disposal to cleanfill is not obtained, and/or if unexpected contamination is encountered.  
Assumes that soils below current building footprints will not require disposal as asbestos waste.

	Area of the site	Approx. area (m <sup>2</sup> )	Depth of excavation (m bgl)	Volume estimate (m <sup>3</sup> )	Volume estimate (m <sup>3</sup> ) ± 20%	Disposal site (subject to operator approval)
<b>Stage 1</b> Demolition of structures, excavation of dwelling footprints and halos to 0.3 m bgl	6 Orr St dwelling footprint	93	0.0 - 0.3	28	20 - 35	Based on the disposal option within the dwelling halo, disposal to Burwood Landfill is assumed, <u>following post demolition asbestos clearance by a Competent Person.</u>
	6 Orr St dwelling halo	110	0.0 - 0.3	33	25 - 40	Burwood Landfill
	8 Orr St dwelling footprint	121	0.0 - 0.3	36	30 - 45	Based on the disposal option within the dwelling halo, disposal to Burwood Landfill is assumed, <u>following post demolition asbestos clearance by a Competent Person.</u>
	8 Orr St dwelling halo	106	0.0 - 0.3	32	25 - 40	Burwood Landfill
	10 Orr St dwelling footprint	95	0.0 - 0.3	29	25 - 35	Based on the disposal option within the dwelling halo, disposal to Burwood Landfill is assumed, <u>following post demolition asbestos clearance by a Competent Person.</u>
	10 Orr St dwelling halo	116	0.0 - 0.3	35	30 - 40	Burwood Landfill
	6 HA6 (shed)	57	0.0 - 0.3	17	15 - 20	Burwood Landfill
	8 HA5 (shed)	32	0.0 - 0.3	10	5 - 15	
	10 HA6 (shed)	34	0.0 - 0.3	10	5 - 15	
<b>Stage 2A</b> Remove soils impacted by asbestos or TPH	6 HA2	37	0.0 - 0.3	11	10 - 15	Landfill - asbestos
	Oil stained surface soil at 10 HA3 & 10 HA7	9.5	0.0 - 0.05	1	<2	Landfill
<b>Stage 2B</b> Site scrape to 0.4 m bgl	8 HA2	46	0.0 - 0.3	14	10 - 15	Cleanfill
	Rest of site (i.e., 6HA1, 6HA3-6HA5, 8HA1, 8HA3-8HA4, 8HA6, 10HA1-10HA5, 10HA7)	1,637	0.0 - 0.3	491	395 - 590	Wheatsheaf Managed Fill
	6 Orr Street dwelling halo & footprint	203	0.3 - 0.4	20	15 - 25	Burwood Landfill
	8 Orr Street dwelling halo & footprint	227	0.3 - 0.4	23	20 - 25	
	10 Orr Street dwelling halo & footprint	211	0.3 - 0.4	21	15 - 25	
	8HA4-8HA5, 6HA3-6HA6	739	0.3 - 0.4	74	60 - 90	Wheatsheaf Managed Fill
	Rest of site (i.e., 6HA1-6HA2, 8HA1-8HA3, 8HA6, 10HA1-10HA7)	1,139	0.3 - 0.4	114	90 - 135	Cleanfill (on average, if soils are excavated and transported in bulk)

Notes:

All measurements are approximate only. Soil volumes are an in-ground estimate with no bulking factor applied.  
Site scrape depth and soil volume estimates are based on information provided by the HDS Christchurch geotechnical engineers.  
Areas, volumes and excavation depths are subject to changes in the design process, which are TBC at the completion of this report.  
Earthwork and any soil disposal for civil drainage/infrastructure not included.  
Earthwork and any soil disposal for civil grading and retaining walls not included.  
Accidental discoveries of ACM/other contamination may result in changes to the above soil disposal options and disposal sites/volumes.

## **Appendix E      Kāinga Ora Contaminated Soil Discovery Guideline**

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# Contaminated Soil Discovery Guideline



December 2021



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## **1 INTRODUCTION**

Contaminated land can be defined as, 'any land that has been adversely affected through the impact of human activity that has resulted in a significant alteration to the chemical, inorganic or organic characteristics of the naturally occurring soil material of the land'.

Such a definition leaves a broad spectrum of potential physico-chemical characteristics which may apply. It is not the purpose of these guidelines to attempt to define all of the possible activities, characteristics, processes, or chemical compounds which may have an adverse impact upon naturally occurring soil material.

However, in the current field of contaminated soil investigation, disturbance, remediation and validation, and within the context of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES) there are situations that may be uncovered, or may present themselves in other ways, where the impact of man-made activities are both hazardous, in terms of human risk, and significant, in terms of environmental risk.

It should be noted that not all hazardous and significant contamination sources can be discerned by the eye, the ear or the nose and that any suspected occurrence of soil contamination should be scientifically investigated through the most appropriate means available.

It is hoped that this document can provide some additional guidance, examples, and discussion points around the investigation and assessment of particularly 'gross' or visually, olfactory and auditory significant contamination events, sources or plumes. It should not be taken that this document can replace suitable qualifications and experience, but rather can be used as general guide to the field practical methods used to immediately assess, prepare, and undertake the safe handling and immediate containment or excavation of contaminated soil materials.

## **2 PURPOSE**

The practices and procedures in this report are intended to provide a field-practical process for the identification, assessment and management of grossly contaminated soil that may be encountered during earth breaking activities or other sub surface soil disturbance. These processes are intended to provide guidance on health, safety and environmental risks and risk management associated with earth breaking activities when gross evidence of contamination is encountered.

The practices and procedures outlined provide for first layer risk control and are one of many stages in the applicable health, safety and environmental risk management process. It is not intended to replace site specific health and safety plans, nor can it provide for every possible eventuality encountered in the field and cannot be reasonably expected to replace significant relevant on-the-job experience.

The Health and Safety Guidelines on the Clean-up of Contaminated Sites developed by Occupational Safety and Health Services (OSH) provides reference to appropriate H&S measures that can be adopted for contaminated sites and this is a key reference document when dealing with contaminated materials. These guidelines do not intend to replace the guidance provided in that document and, if in doubt, it is the more preferable guidance document on provisions for Health and Safety when operating on contaminated soil sites.

### **3 INADVERTENT DISCOVERY OF CONTAMINATION**

It is assumed that a site which has already been identified as 'contaminated' has been assessed with respect of the inorganic or organic characteristics which exceed the applicable criteria or threshold values as defined by the relevant legislation, rules, or plans. Identified contaminated sites will therefore already have appropriate protocols in place for the ongoing assessment, investigation, remediation and validation of the areas that have been defined as contaminated and have plans and procedures in place to protect both human health and the environment.

It still remains possible however, that unknown, unidentified or even identified but underestimated, contamination may exist on such a site, or on a supposed 'non-contaminated' site. Such unknown contamination may be encountered as underground lenses (conglomerates of contamination in a localised zone), layers (widespread zone of contamination occurring along a stratified zone), hotspots (individual occurrences in a single location not otherwise connected), columns (vertical bands of contamination) or a plume (a zone of contamination moving along or through an aquifer / underground flow path and usually associated with seasonal or permanent groundwater flow).

In the event that 'unknown contamination' is encountered then it is advisable to have available some form of reference documentation that can provide insight to the frontline staff on the immediate signs, symptoms and actions that should be identified, assessed or considered while further advice is sought.

In all events encountering unknown soil contamination, a suitably qualified and experienced practitioner (SQEP) should be contacted for further advice, assessment and investigation.

### **4 GENERAL PROCEDURES**

Below is a summarized guide of applicable steps which should be considered if any grossly contaminated material is encountered. The contaminated soil discovery guideline factsheets at the back of the report provide further details on the explicit health, safety and environmental risks associated with particular contamination scenarios, and the procedures to follow, however, in all instances the following general procedures summarized within the headings below should be considered. The steps highlighted below should not be considered exhaustive nor considered solely in step-by-step fashion, it may be necessary to conduct one or more actions at the same time or in differing order as a result of changing circumstances 'on the ground'.

#### **4.1 STOP**

- Stop working immediately and exclude others from working in the immediate area.
- Switch off machinery, generators etc., and establish a safe zone around the area dependent upon the assumed risk.
  - For example, a gas release from an old landfill can be considered potentially toxic and/ or explosive and a zone of approximately 10m may be considered appropriate depending upon the scale of the event.

- A series of dark red, brown or black stains in a pit with no odorous or free liquid discharges is unlikely to be immediately hazardous and the safe zone may extend to only the excavation edges.
- Prevent ingress or egress of stormwater, rainwater or wash water and stop all further activity immediately associated with the area.
- At this stage the extent, type and risk to health as a result of contamination is unknown - proceed with care and caution.

#### **4.2 ADVISE THE SITE MANAGER**

The site manager (or designated person) is the person principally in charge of health and safety on the site. They should also be familiar with these guidelines. The following steps are generally completed by the site manager or completed on the manager's delegation.

#### **4.3 CONTAIN**

If the contamination is leaving the site, or has the potential to leave the work site, then it should be contained. At this stage, the exact nature and risk of the contamination may not be known, so appropriate care and caution should be exercised. Some or all of the following methods may be used to contain the contamination:

- Sediment fences and straw bales;
- drain covers and sandbags;
- absorbent booms, spill mats, 'kitty litter' etc. can all be utilized to protect the environment from further release; and
- If containment is not possible, immediately contact:
  - ***Local Council Pollution Hotline.***

#### **4.4 ASSESS THE RISK**

Not all contaminants, or all instances of contamination, will require special provisions or procedures. Similarly, an instance of contamination may be falsely or incorrectly reported. Not all stains are contamination, or all apparent plumes of oil on a liquid surface, are man-made occurrences.

- Refer to the factsheets at the back of these guidelines.
- Make a note of any or all of the following. It may be necessary to document and record some or all of the findings, for forwarding to the SQEP/Consultant, as odours may dissipate and water may dry up or soak back into the soil:
  - Appearance - staining, trickling, flowing, bubbling (gas escape), thick, sticking to tools and equipment, sliding off tools etc.
  - Odour - sweet, sour, petrol-like, tar-like, sharp etc.
  - Colour or colours

- Miscibility i.e. does it or does it not mix with water. Oil / solvents etc. do not mix with water and creates a coloured sheen on the water surface.
- If gross contamination is confirmed (or strongly suspected) then the appropriate measures should be put in place, dependent upon the risks concerned as defined in the factsheets. A half buried rusted drum of waste batteries will require different safety procedures to the discovery of a buried pile of asbestos cement board, for example.

#### **4.5 CONTACT THE SQEP/CONSULTANT**

Contact the on-call contaminated land advisor - provide digital photographs if safely possible to do so. Talk to the SQEP/Consultant. They may advise additional steps to follow; they may be required to come to site.

#### **4.6 RESTRICT ACCESS**

Following the assessment of the risk, the safety zone can now be better defined.

- With reference to the factsheets, restrict access to the safe zone to only those members of the team that need to be there. It may be necessary in the case of potentially explosive vapour release, to cordon off a significant sized area and prevent working, or vehicular access, within that area.
- Consider the potential flow paths of vapours along trenches, down slopes, through drains etc.
- Access can be restricted through purely visual means, e.g. warning signs, via fencing or by staff management (security guard for example) or a mixture of all three based upon the site manager's assessment and the extent of the contamination.

#### **4.7 ESTABLISH A WORKING TEAM AND PROVIDE WITH APPROPRIATE PPE**

Before continuing, establish a team of competent trained individuals who can deal with the matter and ensure that they have, and are correctly wearing, the appropriate PPE for the situation at hand as defined in the factsheets. Consider the following when establishing the team:

- Experience - have they handled such a situation before?
- Competence - are they familiar with the tools, equipment, PPE and procedures that will be employed?
- Comfort - not all staff are comfortable with unknown situations. Will they be comfortable in this situation?

#### **4.8 EXCAVATE**

At some point, the contamination is likely to be removed. This may not be the case in every instance and the regulations allow for other actions such as in-situ remediation, stabilisation, encapsulation etc. and the SQEP/Consultant will advise on the specific methodologies required. In certain circumstances a more detailed remedial plan may have to be compiled which will document specific goals, validations and disposal actions. The SQEP/Consultant will advise on the requirements of the regulations. In most cases of localised acute instances of gross contamination, they can be safely

managed immediately in the interests of protecting human health and the environment. In this case, some or all of the following processes should be followed:

- Excavation/ Isolation - solid contaminants, soil, drums, refuse etc. can be excavated, by machine or by hand, directly into a covered truck or sealed skip, preventing further potential spread and isolating the contaminants for assessment and disposal;
- Vacuum extraction - contaminated water may be sucked up into a vacuum tanker, provided that there is no risk of reaction or explosion, where it can be isolated for assessment and disposal. DO NOT MIX water/ liquid from more than one event in a vacuum truck;
- Separation - large separate items, such as asbestos sheet fragments, can be collected by hand, separated from the soil matrix and placed in double skinned plastic bags for appropriate disposal; and
- Absorbance - contaminated water, hydrocarbons and chemicals can all be absorbed through the use of contaminated pads, pillows and booms which can then be placed in sealed skips or bags and isolated for appropriate disposal.

#### **4.9 DOCUMENT**

Keep written documents, including digital photographs, of all measures used to contain or cleanup the contamination. This might include some or all of the following:

- Assessment measures used e.g. laboratory analysis, in-situ analysis (e.g. XRF), smell, behaviour in water (miscibility etc.), pH indicator test etc.;
- Staff involved in clean-up and experience;
- Methods used, problems encountered, discussions with SQEP;
- Complaints by third parties (e.g. odours, colour changes to local waterways etc.);
- Excavation or separation methods used, names of contractors etc.;
- Volumes extracted;
- Conditions of cartage, e.g. skip bin, covered truck, closed wheelie bins etc.
- Location of final disposal and disposal documentation e.g. tip dockets, weighbridge receipts etc.

#### **4.10 DISPOSE**

In order to ensure that all material is disposed of correctly, ensure the safe and licensed disposal of the material in accordance with the requirements outlined by the SQEP/Cosultant. In the majority of cases, examples of gross contamination are likely to require disposal at a licensed landfill facility e.g. Redvale Landfill or Hampton Downs Landfill. Other licensed facilities may exist that can handle potentially contaminated material, that may also be able to provide assistance.

- Contaminated liquids will not be received at landfill for disposal and must go to a licensed liquid disposal facility. Sewerage contaminated liquids can probably go directly to the nearest local sewer treatment facility, but chemical contaminated liquid will be required to go to an appropriate liquid treatment plant.

- Drums of unknown or unidentified waste may have to go to a solid / liquid hazardous waste handling plant.
- Contaminated PPE will also require appropriate disposal.
- In all instances, the receiving facility will be unlikely to receive and handle the material without some form of analysis or assessment of the composition of the waste.
- Keep all transport and disposal dockets for the final report.

#### **4.11 REPORT**

Communications and documentation will be kept during the procedures, but a final report should be provided to the project manager detailing all of the steps, communications and records as required.

This report provides assurance to the regulatory authority that all the necessary steps have been followed and the matter has been adequately and professionally dealt with.



## 5 FACTSHEETS

### 5.1 PETROLEUM HYDROCARBONS



#### ACTIVITY

- Petroleum service station
- Vehicle workshop
- Gasworks sites

#### POTENTIAL CONTAMINATION

- Total Petroleum Hydrocarbons (TPHs)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Benzene, Toluene, Ethylxylene, and Xylenes (BTEX)
- Heavy Metals

#### DESCRIPTION

Petroleum-contaminated soils have a brown / black discolouration and an 'oily' consistency. Petroleum products, such as diesel and petrol, are insoluble in water and can form oil slicks in excavated areas such as trenches. Petroleum products in soil can be detected by the characteristic odour of petrol and diesel. BTEX produces a much 'sweeter' odour similar to that of paint-thinners.

#### HUMAN HEALTH AND ENVIRONMENTAL RISKS

Adverse reactions to strong hydrocarbon odours are possible, e.g. headaches, blurred vision, nausea. Contaminants can be absorbed into body via inhalation of dust, contact with skin, or ingestion. Leaked fuels can migrate into groundwater, potentially contaminating drinking water.

#### PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical/ oil resistant steel-capped boots; (2) disposable coveralls; (3) chemical-resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face respirator.

#### HANDLING AND DISPOSAL

Pooled hydrocarbon spills can be removed using suitable absorbent materials or collected by a suitably rated vacuum tanker. Spills can also be transferred to a sealed container by an appropriately rated vacuum pump or similar. Hydrocarbon contaminated soil can be placed in a sealed leak proof skip bin or truck for disposal at a facility authorised to receive material of that kind.

## 5.2 HEAVY METALS



### ACTIVITY

- Metal workshop
- Metallisation works
- Electroplating industries
- Timber treatment facilities

### POTENTIAL CONTAMINATION

- Heavy Metals

### DESCRIPTION

Gross contamination of heavy metals in soils can cause bands of discolouration within the soil profile. Pools of discoloured water (yellow, blue, red, orange) in excavated areas, such as trenches, are indicative heavy metal contamination. Solvents used for metal preparation, like BTEX, can form 'sheen' on the surface of water and produce a 'sweet' odour similar to that of paint-thinners.

### HUMAN HEALTH AND ENVIRONMENTAL RISKS

Contaminants can be absorbed into body via inhalation of dust, contact with skin, or ingestion. Heavy metals have the ability to leach further into soil and eventually into groundwater, potentially contaminating drinking water. A consideration should be given to the potential of pH alteration as metal finishing plants often employ acidic solutions for metal preparation.

### PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical / oil resistant steel-capped boots; (2) disposable coveralls; (3) chemical resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face mask or respirator.

### HANDLING AND DISPOSAL

Heavy metal-contaminated soil can be placed in a truck and covered with tarpaulin for disposal at a facility authorised to receive material of that kind.

### 5.3 DRY CLEANERS



#### ACTIVITY

- Dry-cleaners

#### POTENTIAL CONTAMINATION

- Volatile hydrocarbons (trichloroethylene, tetrachloroethylene, carbon tetrachloride)

#### DESCRIPTION

It is difficult to distinguish soil contamination by solvents used for dry-cleaning. However, the solvents can form a bilayer with water they are less dense than water. The odours associated with dry-cleaning agents are very distinctive and can be described as 'sickly sweet', causing dizziness and nausea.

#### HUMAN HEALTH AND ENVIRONMENTAL RISKS

Contaminants can be absorbed into body via inhalation of vapours, contact with skin, or ingestion. Depending on atmospheric conditions, dry-cleaning agents may readily evaporate. Extended exposure to dry-cleaning agents can affect the central nervous system. Gross contamination of dry-cleaning agents in soil can migrate past the water table, making remediation complex.

#### PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical / oil resistant steel-capped boots; (2) disposable coveralls; (3) chemical-resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face respirator.

#### HANDLING AND DISPOSAL

Pooled hydrocarbon spills can be removed using suitable absorbent materials or collected by a suitably rated vacuum tanker. Spills can also be transferred to a sealed container by a suitably rated vacuum pump or similar. Solvent contaminated soil, including drums or containers, can be placed in a sealed leak proof skip bin for disposal at a facility authorised to receive material of that kind.

## 5.4 TANNERY/ LEATHER PROCESSING



### ACTIVITY

- Leather manufacture/ treating facility

### POTENTIAL CONTAMINATION

- Heavy Metals (particularly chromium) Solvents
- Pesticides Bleaching agents

### DESCRIPTION

Gross contamination of chromium in soils, caused in the tanning stage of treating leather, can cause orange and blue bands of discolouration within the soil profile. Pools of discoloured water (orange, blue, green) in excavated areas, such as trenches, are indicative chromium and metal contamination.

### HUMAN HEALTH AND ENVIRONMENTAL RISKS

Contaminants can be absorbed into body via inhalation of vapours and dust, contact with skin, or ingestion. Wastewater produced from the tanning process can have excessive levels of chromium and sulphides which can cause gross soil contamination if inadequately handled.

### PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical / oil resistant steel-capped boots; (2) disposable coveralls; (3) chemical-resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face mask or respirator.

### HANDLING AND DISPOSAL

Pooled liquid spills can be removed by using tailor-designed absorbent materials and via tanker or pump. Contaminated soil can be placed in a sealed skip bin or covered truck for disposal at a facility authorised to receive material of that kind.

## 5.5 ASBESTOS



### ACTIVITY

- Improper disposal of asbestos-containing building materials

### POTENTIAL CONTAMINATION

- Asbestos (fibres)

### DESCRIPTION

Asbestos in soil is most likely due to burial of building materials. Asbestos fibres are usually entrained in a substrate material, making identification difficult. Broken cement, floor tiles, roof shingles, insulation, heat shields, and textured ceiling tiles manufactured between the 1950s and 1980s are likely to contain asbestos.

### HUMAN HEALTH AND ENVIRONMENTAL RISKS

Asbestos can be absorbed into the lungs via inhalation of fibres. A significant acute or chronic exposure can lead to mesothelioma, asbestosis and lung cancer. Buried asbestos is relatively stable; however, disturbing asbestos during excavations could lead to the production of harmful fibres.

### PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) disposable coveralls; (2) washable PVC gloves; (4) safety glasses; (5) suitably graded full face or half face P3 respirator.

### HANDLING AND DISPOSAL

KEEP DAMP to suppress fibre generation. Large fragments may be collected by hand and place in double skinned plastic bags. Asbestos-contaminated soil can be placed in a sealed skip bin for disposal at a facility authorised to receive material of that kind. Soil of this kind can also be transported via sealed doubled bags or a sealed skip bin.



## 5.6 REFUSE



### ACTIVITY

- Inorganic/ Organic refuse disposal

### POTENTIAL CONTAMINATION

- Variable, dependant on the type of refuse. Contaminants could arise from liquid waste, putrid organic waste, and any material that would normally be sent to a licensed landfill.

### DESCRIPTION

Refuse in soil is most likely due to burial of waste materials that should have normally been sent to landfill. Waste could include, but not limited to, paint cans, oil / hydrocarbon containers, and putrid household waste. The odour of buried refuse is likely to be extremely pungent.

### HUMAN HEALTH AND ENVIRONMENTAL RISKS

Due to the variability of types of refuse and waste, it is difficult to distinguish human health and environmental risks. Individual assessment of the risks will be required.

### PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical-resistant steel-capped boots; (2) disposable coveralls; (3) chemical-resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face mask or respirator.

### HANDLING AND DISPOSAL

Handling and disposal of refuse will be dependent upon the waste material identified.

## 5.7 PESTICIDES



### ACTIVITY

- Horticultural activity Pesticide manufacture

### POTENTIAL CONTAMINATION

- Pesticides, including DDT, dieldrin, and other organochloride pesticides (OCPs)

### DESCRIPTION

Persistent use and storage of pesticides associated with horticultural activities are the main contributors to pesticide-related contamination in soil. Illegal burial of pesticide drums and containers may be encountered on production and agricultural sites. Pesticides are often found as fine, white powders.

### HUMAN HEALTH AND ENVIRONMENTAL RISKS

Pesticide contaminants can be absorbed into body via inhalation of dust, contact with skin, or ingestion. Extended exposure to organochloride pesticides can disrupt the endocrine system as well as affecting DNA. DDT and its breakdown products, DDD and DDE, are highly persistent and do not breakdown easily in soil. DDT and its isomers have the ability to magnify through the food chain (bioaccumulate).

### PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical-resistant steel-capped boots; (2) disposable coveralls; (3) chemical-resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face mask or respirator..

### HANDLING AND DISPOSAL

If bulk pesticide storage containers are found, the site manager must be advised. Pesticide-contaminated soil can be placed in a truck and covered with tarpaulin for disposal at a facility authorised to receive material of that kind.

## 5.8 SEWAGE



### ACTIVITY

- Underground sewage tanks/ pipelines

### POTENTIAL CONTAMINATION

- Raw sewage
- Bacteria / pathogens (Escherichia coli, Vibrio cholerae, etc.)

### DESCRIPTION

Sewage in soil is most likely due to leaking underground septic tanks and/ or sewer pipelines. The odour of sewage is likely to be extremely pungent.

### HUMAN HEALTH AND ENVIRONMENTAL RISKS

Pathogens in sewage-contaminated soil can be absorbed into body via contact with skin or ingestion. Exposure to raw sewage can infect a person with an array of harmful pathogens, such as E. coli, which originate from faecal matter in wastewater. Gross contamination of raw sewage can lead to eutrophication of lakes, rivers, and other receiving bodies of water.

### PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical-resistant steel-capped boots; (2) disposable / liquid repellent coveralls; (3) chemical-resistant / waterproof gloves; (4) safety glasses; (5) suitably full face mask or face shield.

### HANDLING AND DISPOSAL

If raw sewage is encountered, the site manager must be advised. Sewage-contaminated soil can be placed in a truck and covered with tarpaulin for disposal at a facility authorised to receive material of that kind.



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