

Site Validation Report

Neighbourhood: Aorere	Stage: 2	Superlot: AO-016
<p>Introduction (Objective and scope):</p> <p>This Site Validation Report (SVR) has been prepared for the Piritahi site located across 23, 25 and 27 Winthrop Way and 66, 68 and 70 Mayflower Close (AO-016). The site, which covers a total area of approximately 3000 m², will be part of a larger residential housing re-development. The purpose of this report is to verify that identified impacted soil has been removed from the subject site. This SVR summarises the remedial ground works programme, the validation process, and documents the condition of the site post the earthworks undertaken to remove the impacted soil.</p> <p>Pre-remediation site contamination</p> <p>The pre-remediation site contamination conditions are detailed in the Piritahi, Site Specific Remedial Action Plan¹ (SSRAP) AO-016. In summary, the following soils requiring remediation were identified:</p> <ul style="list-style-type: none">Copper above the AUP² permitted activity criteria. <p>The remedial areas and associated soil sample results (investigation / pre-validation) are presented in Figures 1 and 2 and are summarised in Table 1.</p>		<p>Site remediation method:</p> <p>To remediate land by removing identified site contamination exceeding the remedial goal for disposal to an approved disposal facility consented to accept that level of contamination.</p> <p>Remedial goal: impacted not a risk. Remaining soil concentrations at/or below:</p> <ul style="list-style-type: none">NESCS³ residential (10% produce) soil contaminant standard (SCS) and AUP PA criteria for metals; andBRANZ⁴ residential soil guideline value for asbestos in soil.
<p>Applicable consent conditions</p> <p>This report has been prepared in accordance with Section 8 of the Site wide Soil Management Plan⁵ (SSMP) and to meet the requirements outlined in Condition 66 of BUN60354164⁶ (the consents).</p> <p>For this project, validation comprised confirmation that works were undertaken in accordance with the SSMP (Condition 21 of the consents), visual and laboratory confirmation via soil sampling overseen by a suitably qualified and experienced practitioner (SQEP⁷) (Condition 22 of the consents) of remaining materials, and documentation that the excavated materials were managed and disposed to an appropriate disposal facility (Condition 28 of the consents).</p>		
<p>Other reference documents:</p> <ul style="list-style-type: none">Piritahi Land Remediation Investigation Report for Superlot AO-016⁸		
<p>Applicability</p> <p>This report has been prepared by the Piritahi Alliance. It is acknowledged that this report will be relied upon by Auckland Council for the purpose of undertaking its regulatory functions in relation to the work of the Piritahi Alliance. However, this report may not be relied upon in other contexts or for any other purpose, or by any other person, without the prior written agreement of the Piritahi Alliance.</p> <p>Recommendations and opinions contained in this report are based on our visual inspection and sampling of material within the remedial works area. The nature and continuity of the contamination away from the inspection and sampling locations is inferred but it must be appreciated that actual conditions may vary from the assumed model.</p>		

¹ Piritahi 2022. Site Specific Remediation and Management Plan, Aorere, AO-016, Prepared for Kāinga Ora by the Piritahi Alliance, dated 2 March 2022.

² Auckland Unitary Plan (AUP) Standard E30.6.1.4.

³ Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).

⁴ Building Research Association New Zealand New Zealand “Guidelines for Assessing and Managing Asbestos in Soil”, 2017 (BRANZ).

⁵ Piritahi 2021. Site-Wide Soil Management Plan, Version 4, Aorere Development, Prepared for Kāinga Ora by the Piritahi Alliance, dated September 2021.

⁶ Comprising land use consent LUC60354165 and discharge consent DIS60354166.

⁷ Suitably qualified and experienced practitioner (SQEP) – as defined in the Ministry for the Environment “Users’ Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health”, 2012.

⁸ Piritahi 2022. Land Remediation Investigation Report, Superlot AO-016, Prepared for Kāinga Ora by the Piritahi Alliance, dated February 2022.

Validation results (refer validation plan):

The validation work performed follows the general reporting and investigation methodology presented in the:

- Ministry for the Environment (MfE) Contaminated Land Management Guidelines No. 1. Reporting on Contaminated Sites in New Zealand (Revised 2021);
- MfE Contaminated Land Management Guidelines No. 5. Site Investigation and Analysis of Soils (Revised 2021); and
- BRANZ Guidelines for Assessing and Managing Asbestos in Soil (2017)

This SVR was completed under the direction of a SQEP.

The requirements of the SSMP and SSRAP were being followed and applicable resource consent conditions listed above were being met during site inspections completed by a Land Remediation staff member (SQEP).

A visual inspection of the cut surface was undertaken confirming that remedial depths were achieved. As this site was pre-validated, no validation soil samples were necessary or collected. The pre-validation results originally presented in the SSRAP but have also been included in this report for handover purposes. Samples were analysed for metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc) and asbestos by an International Accreditation New Zealand (IANZ) accredited laboratory using industry-standard methods. Laboratory transcripts are provided Appendix A and tabulated below.

In summary, the remediation was successful as validation soil samples reported concentrations below the remedial goal.

Final site condition:

- Identified impacted soil has been successfully removed from the site and the validation inspection indicate that the remediation goal was achieved.
- Based on the final validation inspection, no additional monitoring or management (beyond standard earthwork controls) is deemed to be required for the ongoing development and use of the site.

Figure 2: Off-site soil disposal plan and asbestos controls



Hampton Downs Landfill disposal criteria.

Pre-Validation results table

20/12/2022

Table 1: Soil analytical results - metal and asbestos

					Asbestos ¹			Heavy Metals - Screen						
					Asbestos Containing Material (ACM) (Presence / absence and type)	Asbestos Containing Material (ACM) (% w/w)	Fibrous asbestos (FA) / Asbestos fines (AF) (% w/w)	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
					-	%w/w	%w/w	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
NES Soil - High Density Residential ²					NA	0.04%	0.001%	45	230	1,500	>10,000	500	1,200 ⁴	60,000 ⁴
Auckland Unitary Plan Permitted activity criteria ³					NA	NA	NA	100	7.5	400	325	250	320 ⁵	1160 ⁵
Auckland Background Concentrations (volcanic range) ⁵					NAD	<LoR	<LoR	0.4 - 12	<0.1 - 0.65	3 - 125	20 - 90	<5 - 65	4 - 320	54 - 1,160
Property Address	Sample ID	Sample depth (m bgl)	Material Type	Sampled Date										
AO-016	S01	0.00m	Topsoil	20/12/2021	Asbestos NOT detected.	-	-	9	0.53	40	24	70	21	81
AO-016	S02	0.00m	Topsoil	20/12/2021	Asbestos NOT detected.	-	-	38	1.02	50	52	71	25	250
AO-016	S03	0.00m	Topsoil	20/12/2021	Asbestos NOT detected.	-	-	24	2.5	57	104	108	34	420
AO-016	S03 - 0.3	0.30m	Natural	20/12/2021	-	-	-	12	0.34	53	23	32	21	76
AO-016	S04	0.00m	Topsoil	22/12/2021	Asbestos NOT detected.	-	-	8	0.46	48	450	56	21	164
AO-016	S04-0.3	0.30m	Natural	22/12/2021	-	-	-	5	0.13	54	52	16.8	25	73
AO-016	S05	0.00m	Topsoil	22/12/2021	Asbestos NOT detected.	-	-	6	0.22	43	32	29	17	85
AO-016	S06	0.00m	Topsoil	22/12/2021	Asbestos NOT detected.	-	-	5	0.2	36	17	23	18	100
AO-016	S07	0.00m	Topsoil	21/12/2021	Asbestos NOT detected.	-	-	4	< 0.10	43	18	27	30	57
AO-016	S08	0.00m	Topsoil	21/12/2021	Asbestos NOT detected.	-	-	8	0.3	37	45	38	16	110
AO-016	S09	0.00m	Topsoil	21/12/2021	Asbestos NOT detected.	-	-	5	0.24	43	26	117	18	98
AO-016	S10	0.00m	Topsoil	21/12/2021	Asbestos NOT detected.	-	-	5	0.3	43	19	45	23	101
AO-016	S011	0.00m	Topsoil	20/12/2021	Asbestos NOT detected.	-	-	6	0.24	37	19	22	19	67
AO-016	S012	0.00m	Topsoil	20/12/2021	Chrysotile (White Asbestos) detected.	< 0.001	< 0.001	10	0.21	37	19	31	17	149
AO-016	S013	0.00m	Topsoil	20/12/2021	Asbestos NOT detected.	-	-	10	0.33	43	25	33	21	87
AO-016	S014	0.00m	Topsoil	20/12/2021	Asbestos NOT detected.	-	-	8	0.18	35	13	24	15	51
AO-016	S15	0.00m	Topsoil	21/12/2021	Asbestos NOT detected.	-	-	6	0.23	41	23	48	17	73
AO-016	S16	0.00m	Topsoil	21/12/2021	Asbestos NOT detected.	-	-	11	0.39	46	46	66	33	280
AO-016	S17	0.00m	Topsoil	21/12/2021	Asbestos NOT detected.	-	-	8	1.78	40	4300	172	26	240
AO-016	S17 0.3	0.30m	Natural	21/12/2021	-	-	-	-	-	-	14	-	-	-
AO-016	S17 0.5	0.50m	Natural	21/12/2021	-	-	-	-	-	-	34	-	-	-
AO-016	S18	0.00m	Topsoil	21/12/2021	Asbestos NOT detected.	-	-	7	2.7	40	55	40	20	390
AO-016	S19	0.00m	Topsoil	21/12/2021	Asbestos NOT detected.	-	-	10	0.5	42	46	38	24	159
AO-016	S20	0.00m	Topsoil	21/12/2021	Asbestos NOT detected.	-	-	4	0.23	37	15	36	16	48

Comments

Results are in milligrams per kilogram (mg/kg) unless specified.

1 = BRANZ soil guideline value for asbestos based on relevant land use

2 = MfE, June 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health.

3 = Auckland Unitary Plan Operative in part E30 Contaminated Land. Permitted Activity Soil Criteria Table E30.6.1.4.1

4 = in the absence of available NES Soil 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 = Auckland Regional Council, Technical Publication 153, October 2001. Background Concentrations of inorganic elements in soils from the Auckland Region: volcanic soils

NA = Not Applicable.

NAD - No asbestos detected.

<LoR - below laboratory reporting limits.

BOLD : exceeded NES:CS SCS and AUP PA soil acceptance criteria**BOLD :** exceeded one or more NES:CS SCS**BOLD :** exceeded AUP PA soil acceptance criteria**GREY Values :** area has been remediated, thus values are historic

above background concentrations

- : not tested for

m bgl: metre below ground level

Photos

20/12/2022



View from sample location V16 on adjacent reserve



Site view November 2022

Date	Docket	Disposal Facility	Vehicle ID	Disposal Type	Weight (tonnes)
12/04/2022	WB00195352	Hampton Downs	GML396	Metals Contaminated – Type 2	11.76
12/04/2022	WB00195358	Hampton Downs	JMG981	Metals Contaminated – Type 2	11.00
12/04/2022	WB00195439	Hampton Downs	NAS912	Metals Contaminated – Type 2	8.44
12/04/2022	WB00195484	Hampton Downs	FWD17	Metals Contaminated – Type 2	10.16
12/04/2022	WB00195868	Hampton Downs	GML396	Metals Contaminated – Type 2	10.36
12/04/2022	WB00195965	Hampton Downs	NAS912	Metals Contaminated – Type 2	12.40
12/04/2022	WB00196022	Hampton Downs	JMG981	Metals Contaminated – Type 2	12.40
12/04/2022	WB00196067	Hampton Downs	FWD17	Metals Contaminated – Type 2	10.22
12/04/2022	WB00196505	Hampton Downs	JMG981	Metals Contaminated – Type 2	10.22
12/04/2022	WB00196518	Hampton Downs	GML396	Metals Contaminated – Type 2	8.18
12/04/2022	WB00196527	Hampton Downs	NAS912	Metals Contaminated – Type 2	8.98
12/04/2022	WB00196889	Hampton Downs	FWD17	Metals Contaminated – Type 2	11.62
12/04/2022	WB00197022	Hampton Downs	JMG981	Metals Contaminated – Type 2	12.38
12/04/2022	WB00197028	Hampton Downs	NAS912	Metals Contaminated – Type 2	9.78
12/04/2022	WB00197084	Hampton Downs	GML396	Metals Contaminated – Type 2	12.66

No	Description of discovery	Date	Outcome
	N/A		

Date	Version	Prepared by	Reviewed by	Authorised by
9 December 2022	1	A. Ardourel	C. Westerbur	S. Schiess



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LUC60354165
Approved Resource Consent Plan
20/12/2022

Certificate of Analysis

20/12/2022

Page 1 of 2

Client:	Piritahi Alliance	Lab No:	2806471	SPv2
Contact:	Cliff Westerbur C/- Piritahi Alliance Level 8, 139 Quay Street Auckland Central Auckland 1010	Date Received:	20-Dec-2021	
		Date Reported:	14-Jan-2022	(Amended)
		Quote No:	94501	
		Order No:	K0014720	
		Client Reference:	AO-016	
		Submitted By:	Nick McCormick	

Sample Type: Soil						
Sample Name:		S01 - 0.0 20-Dec-2021	S02 - 0.0 20-Dec-2021	S03 - 0.0 20-Dec-2021	S03 - 0.3 20-Dec-2021	
Lab Number:		2806471.1	2806471.7	2806471.9	2806471.11	
Individual Tests						
Dry Matter	g/100g as rcvd	71	80	69	-	-
Moisture*	g/100g as rcvd	29	20	31	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	9	38	24	12	-
Total Recoverable Cadmium	mg/kg dry wt	0.53	1.02	2.5	0.34	-
Total Recoverable Chromium	mg/kg dry wt	40	50	57	53	-
Total Recoverable Copper	mg/kg dry wt	24	52	104	23	-
Total Recoverable Lead	mg/kg dry wt	70	71	108	32	-
Total Recoverable Nickel	mg/kg dry wt	21	25	34	21	-
Total Recoverable Zinc	mg/kg dry wt	81	250	420	76	-
Asbestos in Soil						
As Received Weight	g	221.2	267.0	292.6	-	-
Dry Weight	g	156.7	214.7	210.7	-	-
<2mm Subsample Weight	g dry wt	50.2	55.6	52.8	-	-
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	-	-
Description of Asbestos Form		-	-	-	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces report '2806471-SPv1' issued on 06-Jan-2022 at 11:19 am.
Reason for amendment: Further testing has been added, at the request of the client.

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 7, 9, 11
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 7, 9
Moisture*	Calculated from (100 - Dry Matter %). DM performed at 103°C for 18hr.	0.10 g/100g as rcvd	1, 7, 9



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Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 mg/kg dry wt	1, 7, 9
Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 7, 9
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 7, 9
<2mm Subsample Weight	Sample dried at 100 to 105°C, weight of <2mm sample fraction taken for asbestos identification if less than entire fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	1, 7, 9
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 7, 9
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 7, 9

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

Testing was completed between 22-Dec-2021 and 14-Jan-2022. For completion dates of individual analyses please contact the laboratory.

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

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Client Services Manager - Environmental



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20/12/2022

Certificate of Analysis

20/12/2022

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Client:	Piritahi Alliance	Lab No:	2810023	SPv2
Contact:	Cliff Westerbur C/- Piritahi Alliance Level 8, 139 Quay Street Auckland Central Auckland 1010	Date Received:	22-Dec-2021	
		Date Reported:	14-Jan-2022	(Amended)
		Quote No:	94501	
		Order No:	K0014720	
		Client Reference:	1007708.2086 / A0-016	
		Add. Client Ref:	Sampled: 22/12/21	
		Submitted By:	Nebojsa Jancic	

Sample Type: Soil						
Sample Name:		S04-0.0 22-Dec-2021	S04-0.3 22-Dec-2021	S05-0.0 22-Dec-2021	S06-0.0 22-Dec-2021	
Lab Number:		2810023.1	2810023.3	2810023.7	2810023.9	
Individual Tests						
Dry Matter	g/100g as rcvd	81	-	83	70	-
Moisture*	g/100g as rcvd	19.4	-	17.1	30	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	8	5	6	5	-
Total Recoverable Cadmium	mg/kg dry wt	0.46	0.13	0.22	0.20	-
Total Recoverable Chromium	mg/kg dry wt	48	54	43	36	-
Total Recoverable Copper	mg/kg dry wt	450	52	32	17	-
Total Recoverable Lead	mg/kg dry wt	56	16.8	29	23	-
Total Recoverable Nickel	mg/kg dry wt	21	25	17	18	-
Total Recoverable Zinc	mg/kg dry wt	164	73	85	100	-
Asbestos in Soil						
As Received Weight	g	236.4	-	250.7	229.2	-
Dry Weight	g	192.5	-	201.3	163.6	-
<2mm Subsample Weight	g dry wt	53.6	-	57.6	55.4	-
Asbestos Presence / Absence		Asbestos NOT detected.	-	Asbestos NOT detected.	Asbestos NOT detected.	-
Description of Asbestos Form		-	-	-	-	-

Analyst's Comments	
Amended Report: This certificate of analysis replaces report '2810023-SPv1' issued on 10-Jan-2022 at 10:01 am. Reason for amendment: At the client's request, testing has been added.	


Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 3, 7, 9
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry), gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 7, 9
Moisture*	Calculated from (100 - Dry Matter %). DM performed at 103°C for 18hr.	0.10 g/100g as rcvd	1, 7, 9



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Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 mg/kg dry wt	1, 7, 9
Asbestos in Soil		<div style="border: 2px solid red; padding: 5px; text-align: center;"> LUC60354165 Approved Resource Consent Plan 20/12/2022 </div>	
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 7, 9
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 7, 9
<2mm Subsample Weight	Sample dried at 100 to 105°C, weight of <2mm sample fraction taken for asbestos identification if less than entire fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	1, 7, 9
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 7, 9
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 7, 9

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

Testing was completed between 24-Dec-2021 and 14-Jan-2022. For completion dates of individual analyses please contact the laboratory.

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

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Client:	Piritahi Alliance	Lab No:	2808977	SPv4
Contact:	Cliff Westerbur C/- Piritahi Alliance Level 8, 139 Quay Street Auckland Central Auckland 1010	Date Received:	21-Dec-2021	
		Date Reported:	04-Apr-2022	(Amended)
		Quote No:	94501	
		Order No:	K0014720	
		Client Reference:	AO-016	
		Submitted By:	Nick McCormick	

Sample Type: Soil						
Sample Name:		S07 0.0	S08 0.0	S09 0.0	S10 0.0	S15 0.0
		21-Dec-2021	21-Dec-2021	21-Dec-2021	21-Dec-2021	21-Dec-2021
Lab Number:		2808977.1	2808977.7	2808977.9	2808977.15	2808977.21
Individual Tests						
Dry Matter	g/100g as rcvd	71	84	69	73	74
Moisture*	g/100g as rcvd	29	16.0	31	27	26
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	8	5	5	6
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.30	0.24	0.3	0.23
Total Recoverable Chromium	mg/kg dry wt	43	37	43	43	41
Total Recoverable Copper	mg/kg dry wt	18	45	26	19	23
Total Recoverable Lead	mg/kg dry wt	27	38	117	45	48
Total Recoverable Nickel	mg/kg dry wt	30	16	18	23	17
Total Recoverable Zinc	mg/kg dry wt	57	110	98	101	73
Asbestos in Soil						
As Received Weight	g	260.9	249.2	251.8	243.6	240.8
Dry Weight	g	200.7	220.4	183.6	184.7	184.4
<2mm Subsample Weight	g dry wt	53.9	52.6	59.2	50.6	50.1
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-

Sample Name:		S16 0.0	S17 0.0	S17 0.3	S17 0.5	S18 0.0
		21-Dec-2021	21-Dec-2021	21-Dec-2021	21-Dec-2021	21-Dec-2021
Lab Number:		2808977.27	2808977.29	2808977.31	2808977.33	2808977.35
Individual Tests						
Dry Matter	g/100g as rcvd	81	67	-	-	73
TCLP Weight of Sample Taken	g	-	100	-	-	-
TCLP Initial Sample pH	pH Units	-	6.4	-	-	-
TCLP Acid Adjusted Sample pH	pH Units	-	1.5	-	-	-
TCLP Extractant Type*		-	NaOH/Acetic acid at pH 4.93 +/- 0.05	-	-	-
TCLP Extraction Fluid pH	pH Units	-	4.9	-	-	-
TCLP Post Extraction Sample pH	pH Units	-	4.9	-	-	-
Moisture*	g/100g as rcvd	19.1	33	-	-	27
Total Recoverable Copper	mg/kg dry wt	-	-	14	34	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	11	8	-	-	7
Total Recoverable Cadmium	mg/kg dry wt	0.39	1.78	-	-	2.7
Total Recoverable Chromium	mg/kg dry wt	46	40	-	-	40
Total Recoverable Copper	mg/kg dry wt	46	4,300	-	-	55
Total Recoverable Lead	mg/kg dry wt	66	172	-	-	40
Total Recoverable Nickel	mg/kg dry wt	33	26	-	-	20



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Sample Type: Soil

Sample Name:	S16 0.0	S17 0.0	S17 0.3	S18 0.0
	21-Dec-2021	21-Dec-2021	21-Dec-2021	21-Dec-2021
Lab Number:	2808977.27	2808977.29	2808977.31	2808977.33
Heavy Metals, Screen Level				
Total Recoverable Zinc	mg/kg dry wt	280	240	390
Asbestos in Soil				
As Received Weight	g	220.4	262.8	267.0
Dry Weight	g	178.4	183.3	203.0
<2mm Subsample Weight	g dry wt	59.0	51.8	58.3
Asbestos Presence / Absence	Asbestos NOT detected.	Asbestos NOT detected.	-	Asbestos NOT detected.
Description of Asbestos Form	-	-	-	-

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Sample Name:	S19 0.0	S20 0.0		
	21-Dec-2021	21-Dec-2021		
Lab Number:	2808977.41	2808977.43		
Individual Tests				
Dry Matter	g/100g as rcvd	80	74	-
Moisture*	g/100g as rcvd	19.9	26	-
Heavy Metals, Screen Level				
Total Recoverable Arsenic	mg/kg dry wt	10	4	-
Total Recoverable Cadmium	mg/kg dry wt	0.50	0.23	-
Total Recoverable Chromium	mg/kg dry wt	42	37	-
Total Recoverable Copper	mg/kg dry wt	46	15	-
Total Recoverable Lead	mg/kg dry wt	38	36	-
Total Recoverable Nickel	mg/kg dry wt	24	16	-
Total Recoverable Zinc	mg/kg dry wt	159	48	-
Asbestos in Soil				
As Received Weight	g	221.2	231.9	-
Dry Weight	g	188.9	175.7	-
<2mm Subsample Weight	g dry wt	53.8	55.3	-
Asbestos Presence / Absence	Asbestos NOT detected.	Asbestos NOT detected.	-	-
Description of Asbestos Form	-	-	-	-

Sample Type: Aqueous

Sample Name:	S17 0.0 [TCLP extract]			
Lab Number:	2808977.49			
Individual Tests				
Total Copper	g/m ³	0.51	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces report '2808977-SPv3' issued on 20-Jan-2022 at 3:00 pm.
Reason for amendment: At the client's request, a TCLP has been added.

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 7, 9, 15, 21, 27, 29, 31, 33, 35, 41, 43
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation May contain a residual moisture content of 2-5%.	-	31, 33
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 7, 9, 15, 21, 27, 29, 35, 41, 43

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	103°C	1, 7, 9, 15, 21, 27, 29, 35, 41, 43
Moisture*	Calculated from (100 - Dry Matter %). DM performed at 103°C for 18hr.	0.10 g/100g as rcvd	1, 7, 9, 15, 21, 27, 29, 35, 41, 43
Total Recoverable Copper	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	31, 33
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 7, 9, 15, 21, 27, 29, 35, 41, 43
TCLP Profile*	Extraction at 30 +/- 2 rpm for 18 +/- 2 hours, (Ratio 1g sample : 20g extraction fluid). US EPA 1311.	-	29

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Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 7, 9, 15, 21, 27, 29, 35, 41, 43
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 7, 9, 15, 21, 27, 29, 35, 41, 43
<2mm Subsample Weight	Sample dried at 100 to 105°C, weight of <2mm sample fraction taken for asbestos identification if less than entire fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	1, 7, 9, 15, 21, 27, 29, 35, 41, 43
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 7, 9, 15, 21, 27, 29, 35, 41, 43
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 7, 9, 15, 21, 27, 29, 35, 41, 43

TCLP Profile			
TCLP Weight of Sample Taken	Gravimetric. US EPA 1311.	0.1 g	29
TCLP Initial Sample pH	pH meter. US EPA 1311.	0.1 pH Units	29
TCLP Acid Adjusted Sample pH	pH meter. US EPA 1311.	0.1 pH Units	29
TCLP Extractant Type*	US EPA 1311.	-	29
TCLP Extraction Fluid pH	pH meter. US EPA 1311.	0.1 pH Units	29
TCLP Post Extraction Sample pH	pH meter. US EPA 1311.	0.1 pH Units	29

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Total Digestion of Extracted Samples*	Nitric acid digestion. APHA 3030 E (modified) 23 rd ed. 2017.	-	49
Total Copper	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B 23 rd ed. 2017.	0.011 g/m ³	49

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

Testing was completed between 24-Dec-2021 and 04-Apr-2022. For completion dates of individual analyses please contact the laboratory.

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

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Client Services Manager - Environmental



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Client:	Piritahi Alliance	Lab No:	2807288	SPV2
Contact:	Cliff Westerbur C/- Piritahi Alliance Level 8, 139 Quay Street Auckland Central Auckland 1010	Date Received:	20-Dec-2021	
		Date Reported:	14-Jan-2022	(Amended)
		Quote No:	94501	
		Order No:	K0014720	
		Client Reference:	1007708.2086 - AO-016	
		Submitted By:	Nebojsa Jancic	

Sample Type: Soil						
Sample Name:	S011 - 0.0 20-Dec-2021	S012 - 0.0 20-Dec-2021	S012 - 0.0 [NZG] 20-Dec-2021	S013 - 0.0 20-Dec-2021	S014 - 0.0 20-Dec-2021	
Lab Number:	2807288.1	2807288.7	2807288.8	2807288.9	2807288.15	
Individual Tests						
Dry Matter	g/100g as rcvd	75	78	-	76	74
Moisture*	g/100g as rcvd	25	22	-	24	26
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	6	10	-	10	8
Total Recoverable Cadmium	mg/kg dry wt	0.24	0.21	-	0.33	0.18
Total Recoverable Chromium	mg/kg dry wt	37	37	-	43	35
Total Recoverable Copper	mg/kg dry wt	19	19	-	25	13
Total Recoverable Lead	mg/kg dry wt	22	31	-	33	24
Total Recoverable Nickel	mg/kg dry wt	19	17	-	21	15
Total Recoverable Zinc	mg/kg dry wt	67	149	-	87	51
Asbestos in Soil						
As Received Weight	g	257.8	262.2	-	259.4	227.0
Dry Weight	g	202.6	207.0	-	204.0	167.3
<2mm Subsample Weight	g dry wt	53.7	58.8	-	53.7	53.6
Asbestos Presence / Absence	Asbestos NOT detected.	Chrysotile (White Asbestos) detected.	-	Asbestos NOT detected.	Asbestos NOT detected.	
Description of Asbestos Form	-	Loose fibres (minor)	-	-	-	-
New Zealand Guidelines Semi Quantitative Asbestos in Soil*						
As Received Weight	g	-	-	570.2	-	-
Dry Weight	g	-	-	484.9	-	-
Moisture	%	-	-	15	-	-
Sample Fraction >10mm	g dry wt	-	-	4.0	-	-
Sample Fraction <10mm to >2mm	g dry wt	-	-	51.0	-	-
Sample Fraction <2mm	g dry wt	-	-	425.6	-	-
<2mm Subsample Weight	g dry wt	-	-	54.3	-	-
Asbestos Presence / Absence	-	-	Chrysotile (White Asbestos) detected.	-	-	-
Description of Asbestos Form	-	-	Loose fibres	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g dry wt	-	-	< 0.00001	-	-
Asbestos in ACM as % of Total Sample*	% w/w	-	-	< 0.001	-	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	-	-	< 0.00001	-	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	-	-	< 0.001	-	-



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Sample Type: Soil

Sample Name:	S011 - 0.0 20-Dec-2021	S012 - 0.0 20-Dec-2021	S012 - 0.0 [NZG] 20-Dec-2021	S012 - 0.0 [NZG] 20-Dec-2021	S012 - 0.0 [NZG] 20-Dec-2021	S012 - 0.0 [NZG] 20-Dec-2021
Lab Number:	2807288.1	2807288.7	2807288.9	2807288.9	2807288.9	2807288.9
New Zealand Guidelines Semi Quantitative Asbestos in Soil*						
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	-	-	0.00001	-	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	-	-	< 0.001	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	-	-	< 0.001	-	-

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Analyst's Comments

Amended Report: This certificate of analysis replaces report '2807288-SPv1' issued on 06-Jan-2022 at 11:19 am.
Reason for amendment: Additional testing has been added, at the request of the client.

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 7, 9, 15
Weight of Asbestos as Asbestos Fines in <10mm >2mm Fraction*	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	8
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1, 7, 9, 15
Moisture*	Calculated from (100 - Dry Matter %). DM performed at 103°C for 18hr.	0.10 g/100g as rcvd	1, 7, 9, 15
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 7, 9, 15
Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 7-9, 15
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 7-9, 15
<2mm Subsample Weight	Sample dried at 100 to 105°C, weight of <2mm sample fraction taken for asbestos identification if less than entire fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	1, 7, 9, 15
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 7-9, 15
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 7-9, 15
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	8
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	8
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	8
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	8

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	8
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	8
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	8
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	8
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	8
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	8
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	8

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

Testing was completed between 23-Dec-2021 and 14-Jan-2022. For completion dates of individual analyses please contact the laboratory.

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

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