

Soil Validation Report

Faringdon South West Rolleston Canterbury

> Submitted to: Hughes Developments Limited 8 Millbank Lane Fendalton Christchurch 8011



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ENGEO Document Control:



1 Introduction

ENGEO Ltd was requested by Hughes Developments Limited to prepare a soil validation report for the small scale impacted soil removal undertaken at Faringdon South West in Rolleston.

This report was prepared in general accordance with the Ministry for the Environment (MfE) Contaminated Land Management Guidelines No.1: Reporting on Contaminated Sites in New Zealand.

This validation report is for several sites situated between East Maddisons Road, Goulds Road and Selwyn Road in Rolleston. Please refer to Figure 1 appended for the site plan which shows all sites to be included into the Faringdon South West subdivision.

1.1 Objectives of Site Validation Report

This validation report is required to be sent to Ministry for the Environment to seek acknowledgement that contaminants of concern relating to the site are below the relevant land use standards (commercial / industrial). Following acknowledgement from MfE that the contamination has been successfully remediated to the appropriate level, it is anticipated that the subdivision development can proceed in the areas of concern.

Please note that this report is for the validation of the targeted remediation areas only and does not seek to provide a full characterisation of soil across the whole site. ENGEO (2020 and 2021) previously completed a preliminary and detailed intrusive investigation for the remainder of the site and it is recommended that these DSI reports are read in conjunction with this report.

2 Site Description

2.1 Site Location

Site information is summarised in Table 1 below.



Item	Description
	493 East Maddisons Road
	503 East Maddisons Road
	523 East Maddisons Road
	533 East Maddisons Road
Location	583 East Maddisons Road
Location	830 Selwyn Road
	844 Selwyn Road
	858 Selwyn Road
	870 Selwyn Road
	870 Goulds Road
	LOT 1 DP 74660 BLK III LEESTON SD
	LOT 4 DP 326339 BLK II LEESTON SD
	LOT 2 DP 326339
	LOT 3 DP 326339 BLK II LEESTON SD
Legal Description	LOT 1 DP 69688 BLK III LEESTON SD
	LOT 2 DP 343803 BLK III LEESTON SD
	LOT 1 DP 343803
	LOT 2 DP 75821 LOT 2 DP 355996 BLK III BLK VII LEESTON SD
	LOT 3 DP 355996 BLK III LEESTON SD
	LOT 4 DP 355996 BLK III LEESTON SD
Current Land Use	Agricultural and residential land use
Proposed Land Use	Residential 10% land use
Site Area	Approximately 54.44 ha
Territorial Authority	Selwyn District Council

Table 1: Site Information

3 Previous Investigations

Three Detailed Site Investigation (DSI) reports have previously been completed by ENGEO following the identification of potentially contaminating activities in preliminary site investigations also completed by ENGEO. The below reports listed are those completed relating to the Faringdon South West subdivision.

- Preliminary Site Investigation 583 East Maddisons Road dated 1 December 2017.
- Preliminary Site Investigation 523 East Maddisons Road dated 22 May 2018.



- Preliminary Site Investigation 533 East Maddisons Road & 870 Goulds Road dated 27 September 2018.
- Detailed Site Investigation 503 East Maddisons Road dated 14 December 2018.
- Preliminary Site Investigation 830 Selwyn Road dated 13 December 2018.
- Preliminary Site Investigation 479 East Maddisons Road dated 16 May 2019
- Preliminary Site Investigation 844 Selwyn Road dated 19 July 2019.
- Detailed Site Investigation 858 Selwyn Road dated 1 September 2020.
- Preliminary Site Investigation 870 Selwyn Road dated 22 January 2021.
- Detailed Site Investigation Faringdon South West dated 8 April 2021.

The majority of the sites were considered highly unlikely to have had an activity included on the HAIL undertaken on them. Targeted investigations were undertaken were localised potential impacts were identified. Soil analysis above the guideline criteria for residential land use 10% produce were identified within eight areas across the sites. These areas and HAIL categories are listed in Table 2 below.

Address	Area and HAIL Category	Work required
479 East Maddisons Road	Area 1 – Burn drum G5	Heavy metals reported above NES residential land use criteria. Removal and disposal off-site required.
503 East Maddisons Road	Area 2 – Burn pile G5	Heavy metals reported above NES residential land use criteria. Removal and disposal off-site required.
523 East Maddisons Road	Area 3 – Burn piles G5	Heavy metals reported above NES residential land use criteria. Removal and disposal off-site required.
583 East Maddisons Road	Area 4 – Rubbish pit G5	Heavy metals reported above NES residential land use criteria. Removal and disposal off-site required.
858 Selwyn Road	Area 5 – Burn pile G5	Heavy metals reported above NES residential land use criteria. Removal and disposal off-site required.
858 Selwyn Road	Area 6 – Sheep foot bath A8	Heavy metals reported above NES residential land use criteria. Removal and disposal off-site required.
870 Goulds Road	Area 7	Heavy metals reported below NES residential land use criteria. No remediation required.
870 Selwyn Road	Area 8 – Former coal storage area	Former coal storage area identified. Underlying soils below concrete slab were assessed by ENGEO. No

Table 2: Areas of Remedial Work Required



Address	Area and HAIL Category	Work required
	E5	staining or olfactory indicators of potential impact present within the natural soils uncovered.
583 East Maddisons Road	Area 9 – Burn drums	No investigation undertaken as identified during remedial works for other areas. Recommended removal of material to Kate Valley.
870 Selwyn road	Area 10 – Underground tank	Area identified during site clearance work. Underground concrete tank identified within a garage building. Tank was approximately 2,000 L and was slightly stained. The contents of the tank was unknown and considered to potentially be a mix tank for water and pesticides prior to application due to the lack of staining and smell which would likely be associated with its use for hydrocarbon storage.

4 Remediation

4.1 Remedial Method

The chosen remedial method was excavation and disposal off-site and was completed in all eight of the individual remediation areas. The remedial works were staged in accordance with the on-site redevelopment plan. The soil validation sampling was completed following the removal of the soil.

4.2 Validation Sampling

Upon completion of the soil excavation, ENGEO undertook validation sampling at each site. The ENGEO representative completed the following during the soil sampling:

- Inspection of each sample for visual and olfactory indicators of contamination.
- Collection of soil samples from the walls and base of the excavations. The samples were compressed directly into laboratory supplied containers using a new pair of nitrile gloves for each sample. Prior to sampling, the equipment (hand trowel) was decontaminated using a triple wash procedure with potable water, Decon 90 solution and deionised water.
- Submission of soil samples to R J Hill Laboratories in Hamilton, under standard ENGEO chain of custody.

Quality Assurance and Quality Control

The quality assurance / quality control (QA/QC) procedures employed during the works included:

- Standard sample registers and chain of custody records have been kept for all samples.
- The use of Hills which are International Accreditation New Zealand (IANZ) laboratories, to conduct all analysis. To maintain their accreditation, Hills laboratories undertake rigorous cross checking and routine duplicate sample testing to ensure the accuracy of their results.
- During the site investigation, every attempt was made to ensure that cross contamination did not occur through the use of the procedures outlined within this document.



5 Soil Validation Visits

Remediation was required in eight areas:

- Area 1 Burn drum 479 East Maddisons Road
- Area 2 Burn pile 503 East Maddisons Road
- Area 3 Burn piles 523 East Maddisons Road
- Area 4 Rubbish pit 583 East Maddisons Road
- Area 5 Burn pile 858 Selwyn Road
- Area 6 Sheep foot bath 858 Selwyn Road
- Area 8 Former coal storage 870 Selwyn Road
- Area 9 Burn drums 583 East Maddisons Road
- Area 10 Underground tank 870 Selwyn Road

Validation sampling was undertaken on 26 March 2021. Please refer to the Figures below for photographs and descriptions of each area during the validation visits.

The depths of the remediation excavations varied dependent on the location, with the majority being 0.3-0.5 m in depth with the exception of Area 6 sheep foot bath being excavated to approximately 2.0 m in depth.

Sampling of the concrete tank and surrounding soils was undertaken on 22 October 2021.

Area 1

Soil in the remedial grid was free from visual or olfactory indicators of staining or contamination. The area was excavated in a 2 x 2 m grid down to 0.5 m in depth.

Figure 1: Area 1 Remedial Grid Photographs



Photo 1: Area 1 remedial excavation



Photo 2: Area 1 remedial excavation down to 0.5 m



Soil in the remedial grid was free from visual or olfactory indicators of staining or contamination. The area was excavated in a 6 x 6 m grid down to a maximum 0.75 m in depth. An area towards the middle of the grid returned high concentrations of arsenic when screened with an XRF, therefore additional material was excavated from the middle section of the grid to 0.75 m depth.



Photo 3: Area 2 remedial excavation



Photo 4: Area 2 remedial excavation



Soils in the remedial area were free from visual or olfactory indicators of staining or contamination. The two grids within Area 3 were both $2 \times 2 \text{ m}$ excavations down to 0.5 m in depth.

Figure 3: Area 1 Remedial Grid Photographs



Photo 5: Area 3a remedial excavation



Photo 6: Area 3a remedial excavation down to 0.5 m



Photo 7: Area 3b remedial excavation



Photo 8: Area 3b remedial excavation down to 0.5 m



Soil in the remedial grid was free from visual or olfactory indicators of staining or contamination. The area was excavated in a 10×6 m grid down to 0.5 m in depth.

Figure 4: Area 4 Remedial Grid Photographs



Photo 9: Area 4 remedial excavation



Photo 10: Area 4 remedial excavation down to 0.5 m

Area 5

Soil in the remedial grid was free from visual or olfactory indicators of staining or contamination. The area was excavated in a 6 x 6 m grid down to 0.5 m in depth.





Photo 11: Area 5 remedial excavation



Photo 12: Area 5 remedial excavation down to 0.5 m



Soil in the remedial grid was free from visual or olfactory indicators of staining or contamination. During the remedial excavation, the soils were screened with the XRF and the soil material below the former sheep foot bath returned high concentrations of copper down to approximately 1.75 m in depth. The remainder of the area was excavated down to 0.3 m in depth. The total area of excavation was approximately 4×12 m in size.



Figure 6: Area 6 Remedial Grid Photographs

Photo 13: Area 6 remedial excavation looking east



Photo 14: Area 6 remedial excavation looking west



Photo 15: Area 6 remedial excavation looking east into deeper excavation



Photo 16: Area 6 remedial excavation looking west



The concrete slab was lifted under supervision of ENGEO to determine if the underlying soils were impacted by the former coal storage. No visual staining was identified in the underlying soils and no olfactory indicators of contamination were present.

Figure 7: Area 8 Remedial Grid Photographs



Photo 17: Area 8 below former concrete coal storage area

Photo 18: Area 8 below former concrete coal storage area



Soil in the remedial grid was free from visual or olfactory indicators of staining or contamination. The area was excavated in a 3 x 3 m grid down to 0.3 m in depth.

Figure 8: Area 9 Remedial Grid Photographs

Photo 19: Area 9 remedial excavation



Photo 20: Area 9 remedial excavation down to 0.3 m

Area 10

Soil in the tank excavation area was free from visual indicators of staining or olfactory impacts. The tank pit was approximately 2.5 m in depth and 4 x 4 m wide.

Figure 9: Area 10 Remedial Grid Photographs



Photo 21: Area 10 tank excavation



Photo 22: Area 10 tank excavation

5.1 Areas not Investigated / Remediated

No additional areas of concern were identified during the remedial works. At the time of writing, ENGEO understands that the remaining dwellings on-site are to remain on-site during the redevelopment works.

Area 7 was sampled and analysed with results reported in the ENGEO Faringdon South West report (ENGEO, 2021) with no exceedances against the NES residential land use criteria. Therefore, remedial works in Area 7 were not required.



6 Contractor Documentation

The following documentation was provided by WasteCo who were involved with the remedial works, including the cartage of contaminated soil off-site to Kate Valley Landfill. All waste dockets are provided in Appendix 1. A summary is provided in Table 3 below.

Table 3: Waste Disposal Information – Kate Valley

Date	Waste Docket No.	Manifest No.	Weight, tonnes
26/03/2021	988396	46003	11.4
26/03/2021	988397	46003	12.32
31/03/2021	988725	46008	8.56
31/03/2021	988726	46008	11.32
1/04/2021	988940	46010	8.8
1/04/2021	988878	46009	9.96
1/04/2021	887269	46010	9.22
1/04/2021	887269	46009	12.12
1/04/2021	988933	46001	9.12
1/04/2021	988934	46001	17.04
6/04/2021	989110	46012	9.58
6/04/2021	989111	46012	13.18
6/04/2021	989178	46014	8.64
6/04/2021	989179	46014	16.44
6/04/2021	989207	46013	12.08
6/04/2021	989206	46013	8.44
	Total		178.22

7 Remediation Criteria

The specific criteria referenced in this report have been selected in accordance with the NES and the MfE Contaminated Land Management Guidelines No.2: Hierarchy and Application in New Zealand of Environmental Guideline Values.



Contaminant concentrations in soil were compared to human health criteria for residential land use 10 % produce as this is the likely proposed land use of the site following redevelopment.

8 Soil Validation Results

Area 1

No exceedances of the guideline criteria were identified in the validation samples. All samples also reported heavy metals below the site specific regional background levels. Please refer to Table 4 for the validation sample analysis summary.

Area 2

No exceedances of the guideline criteria were identified in the validation samples. Three samples reported concentrations of heavy metals above the site specific regional background levels. Please refer to Table 5 for the validation sample analysis summary.

Area 3

No exceedances of the guideline criteria were identified in the validation samples. Three samples reported concentrations of zinc above the site specific regional background levels. Please refer to Table 6 and Table 7 for the validation sample analysis summary.

Area 4

No exceedances of the guideline criteria were identified in the validation samples. All samples also reported heavy metals below the site specific regional background levels. Please refer to Table 8 for the validation sample analysis summary.

Area 5

No exceedances of the guideline criteria were identified in the validation samples. Four samples reported concentrations of heavy metals above the site specific regional background levels. Please refer to Table 9 for the validation sample analysis summary.

Area 6

No exceedances of the guideline criteria were identified in the validation samples. Five samples reported concentrations of heavy metals above the site specific regional background levels. Please refer to Table 10 for the validation sample analysis summary.

Area 8

No samples were collected from Area 8 as there was no visual or olfactory evidence of impact present in natural soils below the former coal storage area.

Area 9

No exceedances of the guideline criteria were identified in the validation samples. All samples also reported heavy metals below the site specific regional background levels. Please refer to Table 11 for the validation sample analysis summary.



The two soil samples taken reported no exceedances against the residential 10% produce consumption guideline criteria. The soil samples also reported heavy metals below the site specific regional background values. Organochlorine pesticides and Organonitro & phosphorus pesticides were reported below the laboratory limit of detection. Therefore, no remediation of the soils was required.

The crushed concrete sample reported no exceedances against the guideline criteria. The concrete sample also reported heavy metals below the site specific regional background values. Controlled disposal of the concrete was not required. The concrete was placed into the on-site borrow pit. Please refer to Table 12 for the validation sample analysis summary.



Sample Name	A1VS1	A1VS2	A1VS3	A1VS4	A1VS5	Human health criteria –	Human health			
Soil Type	SAND	SAND	SAND	SAND	SAND		iman criteria - alth teria – Commercial sidential / industrial outdoor worker (unpaved) ^a	Regional background - Trace Elements (Level 2) ^b		
Location	Base	N Wall	E Wall	S Wall	W Wall	Residential Land Use				
Sample Depth, m	0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5					
Heavy Metals in soil, mg/kg										
Arsenic	5	3	3	3	3	20	70	6.35		
Cadmium ^c	<0.10	<0.10	<0.10	<0.10	<0.10	3	1,300	0.14		
Chromium ^d	19	13	14	14	13	460	6,300	19.89		
Copper	4	3	4	4	4	>10,000	>10,000	11.68		
Lead	16	15	15.2	15.3	15.2	210	3,300	19.75		
Nickel	9	9	9	10	10	400 ^c	6,000°	13.91		
Zinc	59	50	54	56	53	7,400°	400,000°	59.58		

Table 4: Area 1 Validation Sample Analysis

Bold text indicates that the concentration exceeds the Residential land use criterion.

^b ECan (2007) Background Concentrations of Selected Trace Elements in Canterbury Soils. Exceedances are shaded.

° Assumes soil pH of 5.



Sample Name	A2VS1	A2VS2	A2VS3	A2VS4	A2VS5	A2VS6	Human health criteria – Commercial Residential Land Use	Human health		
Soil Type	SILT	SILT	SILT	SILT	SILT	SILT		Human criteria - health	Regional background	
Location	Base	N Wall	E Wall	S Wall	W Wall	Base		Elements (Level 2) ^b		
Sample Depth, m	0.65	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.3		worker (unpaved) ^a		
Heavy Metals in soil, mg/kg										
Arsenic	6	13	9	4	4	6	20	70	6.35	
Cadmium ^c	<0.1	0.12	0.11	<0.1	<0.1	<0.1	3	1,300	0.14	
Chromium ^d	30	16	14	13	12	17	460	6,300	19.89	
Copper	6	20	14	7	6	6	>10,000	>10,000	11.68	
Lead	12.4	17.5	15.4	15.1	14.6	12.5	210	3,300	19.75	
Nickel	11	9	8	8	8	12	400 ^c	6,000 ^c	13.91	
Zinc	37	280	87	88	68	37	7,400°	400,000 ^c	59.58	

Table 5: Area 2 Validation Sample Analysis

Bold text indicates that the concentration exceeds the Residential land use criterion.

^b ECan (2007) Background Concentrations of Selected Trace Elements in Canterbury Soils. Exceedances are shaded.

° Assumes soil pH of 5.



Sample Name	A3VS1	A3VS2	A3VS3	A3VS4	A3VS5	Human health criteria –	Human health	Regional background - Trace Elements (Level 2) ^b		
Soil Type	SILT	SILT	SILT	SILT	SILT		luman criteria - health riteria – Commercial kesidential and Use vorker (unpaved) ^a			
Location	Base	N Wall	E Wall	S Wall	W Wall	Residential Land Use				
Sample Depth, m	0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5					
Heavy Metals in soil, mg/kg										
Arsenic	3	4	4	3	5	20	70	6.35		
Cadmium ^c	<0.1	0.12	<0.1	<0.1	<0.1	3	1,300	0.14		
Chromium ^d	12	13	13	13	13	460	6,300	19.89		
Copper	4	6	4	4	4	>10,000	>10,000	11.68		
Lead	10.3	14.6	14.8	14.8	14.4	210	3,300	19.75		
Nickel	10	9	9	8	9	400 ^c	6,000°	13.91		
Zinc	33	108	55	51	63	7,400°	400,000°	59.58		

 Table 6:
 Area 3a Validation Sample Analysis

Bold text indicates that the concentration exceeds the Residential land use criterion.

^b ECan (2007) Background Concentrations of Selected Trace Elements in Canterbury Soils. Exceedances are shaded.

° Assumes soil pH of 5.



Sample Name	A3VS6	A3VS7	A3VS8	A3VS9	A3VS10	Human health criteria – Residential	Human health	Regional background - Trace Elements (Level 2) ^b		
Soil Type	SILT	SILT	SILT	SILT	SILT		criteria - Commercial / industrial outdoor worker (unpaved) ^a			
Location	Base	N Wall	E Wall	S Wall	W Wall	Residential				
Sample Depth, m	0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5					
Heavy Metals in soil, mg/kg										
Arsenic	4	3	4	3	3	20	70	6.35		
Cadmium ^c	<0.1	<0.1	<0.1	<0.1	<0.1	3	1,300	0.14		
Chromium ^d	14	13	12	13	13	460	6,300	19.89		
Copper	5	4	3	3	4	>10,000	>10,000	11.68		
Lead	10.6	13.8	14.2	13	14.2	210	3,300	19.75		
Nickel	12	9	8	8	9	400 ^c	6,000°	13.91		
Zinc	36	50	47	47	158	7,400°	400,000°	59.58		

Table 7: Area 3b Validation Sample Analysis

Bold text indicates that the concentration exceeds the Residential land use criterion.

^b ECan (2007) Background Concentrations of Selected Trace Elements in Canterbury Soils. Exceedances are shaded.

° Assumes soil pH of 5.



Sample Name	A4VS1	A4VS2	A4VS3	A4VS4	A4VS5	A4VS6		Human health	
Soil Type	SILT	SILT	SILT	SILT	SILT	SILT	Human health	criteria - Commercial / industrial outdoor	Regional background
Location	Base	Base	N Wall	E Wall	S Wall	W Wall	Residential Land Use ^a		/ industrial outdoor
Sample Depth, m	0.5	-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5		worker (unpaved) ^a	
Heavy Metals in soil, mg/kg									
Arsenic	3	3	3	3	3	3	20	70	6.35
Cadmium ^c	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	3	1,300	0.14
Chromium ^d	12	12	11	12	11	13	460	6,300	19.89
Copper	5	4	4	4	3	3	>10,000	>10,000	11.68
Lead	11	11.8	11.4	12.6	12.7	13.5	210	3,300	19.75
Nickel	10	9	8	8	8	10	400°	6,000°	13.91
Zinc	33	45	45	43	50	50	7,400°	400,000°	59.58

Table 8: Area 4 Validation Sample Analysis

Bold text indicates that the concentration exceeds the Residential land use criterion.

^b ECan (2007) Background Concentrations of Selected Trace Elements in Canterbury Soils. Exceedances are shaded.

° Assumes soil pH of 5.



Sample Name	A5VS1	A5VS2	A5VS3	A5VS4	A5VS5	A5VS6		Human health	
Soil Type	SILT	SILT	SILT	SILT	SILT	SILT	Human health	criteria - Commercial / industrial outdoor	Regional background
Location	Base	Base	N Wall	E Wall	S Wall	W Wall	Residential Land Use		Elements (Level 2) ^b
Sample Depth, m	0.5	0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5		worker (unpaved)ª	
Heavy Metals in soil, mg/kg									
Arsenic	5	4	5	16	8	4	20	70	6.35
Cadmium ^c	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	3	1,300	0.14
Chromium ^d	17	21	14	18	18	14	460	6,300	19.89
Copper	6	5	8	13	6	5	>10,000	>10,000	11.68
Lead	12.6	14.1	14.9	15.3	15.2	14.5	210	3,300	19.75
Nickel	14	11	9	9	8	10	400°	6,000°	13.91
Zinc	44	45	52	50	51	53	7,400°	400,000°	59.58

Table 9: Area 5 Validation Sample Analysis

Bold text indicates that the concentration exceeds the Residential land use criterion.

^b ECan (2007) Background Concentrations of Selected Trace Elements in Canterbury Soils. Exceedances are shaded.

° Assumes soil pH of 5.



Sample Name	A6VS1	A6VS2	A6VS3	A6VS4	A6VS5	A6VS6	A6VS7	A6VS8	A6VS9		Human health	
Soil Type	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	SAND	Human health	criteria -	Regional
Location	Base	Base	Base	N Wall	S Wall	Base	Base	Base	Base	Residential Land Use	Commercial / industrial	Trace Elements (Level 2) ^b
Sample Depth, m	0.3	0.3	0.3	0.0-0.5	0.0-0.5	1.75	1.25	0.3	0.3		(unpaved) ^a	
Heavy Metals in	soil, mg/kg											
Arsenic	3	3	3	3	3	3	3	4	4	20	70	6.35
Cadmium ^c	<0.1	<0.1	<0.1	<0.1	0.37	<0.10	<0.1	0.2	0.16	3	1,300	0.14
Chromium ^d	12	13	14	12	12	13	14	12	12	460	6,300	19.89
Copper	12	10	220	52	7	6	138	40	54	>10,000	>10,000	11.68
Lead	13.7	14.2	12.2	13.2	17.96	10.4	11.9	15.7	16.6	210	3,300	19.75
Nickel	8	9	11	9	8	11	12	7	8	400 ^c	6,000°	13.91
Zinc	48	49	45	46	51	41	39	320	470	7,400 ^c	400,000°	59.58

Table 10: Area 6 Validation Sample Analysis

^a Human health criteria from the NES except where noted.

Bold text indicates that the concentration exceeds the Residential land use criterion.

^b ECan (2007) Background Concentrations of Selected Trace Elements in Canterbury Soils. Exceedances are shaded

° Assumes soil pH of 5.



Sample Name	A3VS1	A3VS2	A3VS3	A3VS4	A3VS5		Human health	
Soil Type	SILT	SILT	SILT	SILT	SILT	Human health	criteria - Commercial	Regional background - Trace Elements (Level 2) ^b
Location	Base	N Wall	E Wall	S Wall	W Wall	Residential Land Use	/ industrial outdoor	
Sample Depth, m	0.3	0.0-0.3	0.0-0.3	0.0-0.3	0.0-0.3		worker (unpaved) ^a	
Heavy Metals	in soil, mg/ŀ	g						
Arsenic	4	4	4	4	4	20	70	6.35
Cadmium ^c	<0.10	<0.1	<0.1	<0.1	<0.1	3	1,300	0.14
Chromium ^d	14	13	13	12	13	460	6,300	19.89
Copper	6	5	6	4	4	>10,000	>10,000	11.68
Lead	15.7	15.6	15.7	15.2	15	210	3,300	19.75
Nickel	9	8	9	8	10	400 ^c	6,000°	13.91
Zinc	59	55	53	51	54	7,400 ^c	400,000 ^c	59.58

Table 11: Area 9 Validation Sample Analysis

^a Human health criteria from the NES except where noted.

Bold text indicates that the concentration exceeds the Residential land use criterion.

^b ECan (2007) Background Concentrations of Selected Trace Elements in Canterbury Soils. Exceedances are shaded.

° Assumes soil pH of 5.



Sample Name	T_SS1	T_SS2	Concrete		Human health	Pagional	
Soil Type	SAND	SAND	Concrete	Human health	criteria - Commercial	Regional background	
Location	Base	Base	-	Residential Land Use	/ industrial outdoor	Elements (Level 2) ^b	
Sample Depth, m	2.0-2.5	2.0-2.5			worker (unpaved) ^a		
Heavy Metals	in soil, mg/kg						
Arsenic	2	3	4	20	70	6.35	
Cadmium ^c	<0.1	<0.1	<0.1	3	1,300	0.14	
Chromium ^d	12	14	14	460	6,300	19.89	
Copper	5	7	5	>10,000	>10,000	11.68	
Lead	8.0	12.5	7.1	210	3,300	19.75	
Nickel	9	10	9	400 ^c	6,000°	13.91	
Zinc	34	46	30	7,400 ^c	400,000 ^c	59.58	

Table 12: Area 10 Validation Sample Analysis

^a Human health criteria from the NES except where noted.

Bold text indicates that the concentration exceeds the Residential land use criterion.

^b ECan (2007) Background Concentrations of Selected Trace Elements in Canterbury Soils. Exceedances are shaded.

° Assumes soil pH of 5.

^d Criteria for chromium were conservatively selected.

9 Conceptual Site Model

A conceptual site model consists of four primary components. For contaminants to present a risk to human health or an environmental receptor, all four components are required to be present and connected. The four components of a conceptual site model are:

- Source of contamination;
- Pathway(s) in which contamination could potentially mobilise along (e.g. vapour or groundwater migration);
- Sensitive receptor(s) which may be exposed to the contaminants; and
- An exposure route, where the sensitive receptors and contaminants come into contact (e.g. ingestion, inhalation, dermal contact).

The potential source, pathway, receptor linkages at this subject site are provided in Table 13.



Table 13: Conceptual Site Model

Potential Sources	Contaminants of Concern	Exposure Route and Pathways	Receptors	Acceptance Risk?
479 East Maddisons Road Burn drum/pit Area 1	Heavy metals Polycyclic aromatic hydrocarbons	Dermal contact with impacted soil, inhalation of dust and incidental ingestion during earthworks and long term use of the site. Groundwater migration.	Redevelopment workers Future subsurface maintenance workers Future site users Surrounding environment	Yes, Heavy metals present below land use criteria.
503 East Maddisons Road Burn pile Area 2	Heavy Metals Polycyclic aromatic hydrocarbons	Dermal contact with impacted soil, inhalation of dust and incidental ingestion during earthworks and long term use of the site. Groundwater migration.	Redevelopment workers Future subsurface maintenance workers Future site users Surrounding environment	Yes, Heavy metals present below land use criteria.
523 East Maddisons Road Burn piles Area 3	Heavy Metals Polycyclic aromatic hydrocarbons	Dermal contact with impacted soil, inhalation of dust and incidental ingestion during earthworks and long term use of the site. Groundwater migration	Redevelopment workers Future subsurface maintenance workers Future site users Surrounding environment	Yes, Heavy metals present below land use criteria.
583 East Maddisons Road Waste pile Area 4	Heavy Metals	Dermal contact with impacted soil, inhalation of dust and incidental ingestion during earthworks and long term use of the site. Groundwater migration	Redevelopment workers Future subsurface maintenance workers Future site users Surrounding environment	Yes, Heavy metals present below land use criteria.



Potential Sources	Contaminants of Concern	Exposure Route and Pathways	Receptors	Acceptance Risk?
858 Selwyn Road Burn pile Area 5	Heavy Metals	Dermal contact with impacted soil, inhalation of dust and incidental ingestion during earthworks and long term use of the site. Groundwater migration	Redevelopment workers Future subsurface maintenance workers Future site users Surrounding environment	Yes, Heavy metals present below land use criteria.
858 Selwyn Road Sheep foot	Heavy metals	Dermal contact with impacted soil, inhalation of dust and incidental ingestion during earthworks and long term use of the site.	Redevelopment workers Future subsurface maintenance workers Future site users	Yes, Heavy metals present below land use criteria.
bath Area 6		Groundwater migration	Surrounding environment	Yes, copper levels remaining in the soil considered low – therefore unlikely to affect groundwater.
870 Selwyn Road Former Coal Storage Area Area 8	Heavy metals	Dermal contact with impacted soil, inhalation of dust and incidental ingestion during earthworks and long term use of the site. Groundwater migration	Redevelopment workers Future subsurface maintenance workers Future site users Surrounding environment	Yes, the soils below the concrete slab had no visual or olfactory indications of impact it was, therefore considered that the soils are unlikely to have been impacted by the former coal storage.
583 East Maddisons Road Burn Drum Area 9	Heavy metals	Dermal contact with impacted soil, inhalation of dust and incidental ingestion during earthworks and long term use of the site. Groundwater migration	Redevelopment workers Future subsurface maintenance workers Future site users Surrounding environment	Yes, Heavy metals present below land use criteria.



Potential Sources	Contaminants of Concern	Exposure Route and Pathways	Receptors	Acceptance Risk?
870 Selwyn Road Underground Tank	Heavy metals OCPs ONOPs	Dermal contact with impacted soil, inhalation of dust and incidental ingestion during earthworks and long term use of the site. Groundwater migration	Redevelopment workers Future subsurface maintenance workers Future site users Surrounding environment	Yes, Heavy metals, OCPs and ONOPs present below land use criteria for both soils samples and concrete sample.

10 Conclusions

Following the completion of remedial works described in ENGEO's Remedial Action Plan (RAP), ENGEO was engaged by Hughes Developments Limited to complete site validation and reporting to determine if the site is suitable for the proposed residential land use.

A total of 47 soil samples were taken from across the eight validation areas. The validation samples were analysed for contaminants of concern associated with the former land uses that were previously identified as being above the proposed land use guideline criteria.

The material excavated from site was disposed of at Kate Valley Landfill for all eight remedial areas.

All eight areas were excavated and validated in one site visit with all 47 soil samples collected returning concentrations of heavy metals below the NES residential land use criteria.

Information from contractors on-site shows that the identified contaminated material was disposed of to a suitable waste facility.

Special Waste Manifests issued by WasteCo, and weighbridge dockets issued by Kate Valley Landfill indicate that approximately 178.22 tonnes of material was removed from the site and disposed of at Kate Valley Landfill.

Based on our investigation, aforementioned documents and laboratory analysis results, further remediation of the identified areas of concern are not considered to be required, and the site is therefore deemed suitable for the intended residential land use.

It is recommended that the remainder of the site redevelopment work is completed under a contractor earthworks plan that provides contingency measures should additional areas of concern be identified during any soil disturbance works.



11 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Hughes Developments Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.
- iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.
- iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.
- v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by

Natalie Flatman Environmental Scientist

Report reviewed by

Dave Robotham, CEnvP SC Principal Environmental Consultant



12 References

ECan (2007a). Background Concentrations of Selected Trace Elements in Canterbury Soils. Addendum 1: Additional Samples and Timaru Specific Background Levels. Report prepared for Environment Canterbury by Tonkin & Taylor Limited, Christchurch, New Zealand. Report Number R07/1/2. Tonkin & Taylor Reference: 50875.003.

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MfE (2012). Users' guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.





FIGURES







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CWS Kate Valley Landfill

WEIGHING DOCKET 988396 26 Mar 2021 3:43 pm

Reg NDQ576 WasteCo NZ Limited

Tag Id 887269 Wasteco Special Waste

1st Load: Special Waste

Permit Number : C6049 Billing Customer : Wasteco NZ Limited Manifest Number : 46003

> Gross 26,380 Kg Tare 14,980 K Net 11,400 K

WEIGHING DOCKET 988397 26 Mar 2021 3:43 pm

Reg NDQ576 WasteCo NZ Limited

Tag Id 887269 Wasteco Special Waste

Trailer WCT002

2nd Load: Special Waste

Permit Number : C6049 Billing Customer : Wasteco NZ Limited Manifest Number : 46003

> Gross 20,400 Kg Tare 8,080 K Net 12,320 K

CWS Kate Valley Landfill

WEIGHING DOCKET 988725 31 Mar 2021 8:21 am

Reg NDQ576 WasteCo NZ Limited

Tag Id 887269 Wasteco Special Waste

1st Load: Special Waste

Permit Number : C6049 Billing Customer : Wasteco NZ Limited Manifest Number : 46008

> Gross 24,260 Kg Tare 15,700 K Net 8,560 K

WEIGHING DOCKET 988726 31 Mar 2021 8:21 am

Reg NDQ576 WasteCo NZ Limited

Tag Id 887269 Wasteco Special Waste

Trailer WCT002

2nd Load: Special Waste

Permit Number : C6049 Billing Customer : Wasteco NZ Limited Manifest Number : 46008

> Gross 20,560 Kg Tare 9,240 K Net 11,320 K

BEG

CWS Kate Valley Landfill

WEIGHING DOCKET 988940 1 Apr 2021 1:52 pm

Reg NDQ576 WasteCo NZ Limited

Tag Id 887269 Wasteco Special Waste

1st Load: Special Waste

Permit Number : C6049 Billing Customer : Wasteco NZ Limited Manifest Number : 46010

> Gross 24,620 Kg Tare 15,820 K Net 8,800 K

WEIGHING	DOCKET	988941
1 A.pr 2021	1:52 pm	

Reg NDQ576 WasteCo NZ Limited

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Tag Id 887269 Wasteco Special Waste

Trailer WCT002

2nd Load: Special Waste

Permit Number : C6049 Billing Customer : Wasteco NZ Limited Manifest Number : 46010

> Gross 18,460 Kg Tare 9,240 K Net 9,220 K

> > ----

WI	EIGHING DOCKET 988876
1	Apr 2021 9 18 am
Reg ND	Q576 WasteCo NZ Limited
Tag Id 80	37269
Wastecc	Special Waste
1st Load	Special Waste
Permit N	umber : C6049
Billing C	ustomer : Wasteco NZ Limited
Manifest	Number : 46009
	Gross 25,640 Kg Tare 15,680 K Net 9,960 K
	IGHING DOCKET 988879 Apr 2021 918 am
WE	IGHING DOCKET 988879
1 /	Apr 2021 918 am
Reg NDC	1576 WasteCo NZ Limited
WE	IGHING DOCKET 988879
1 /	Apr 2021 9-18 am
Reg NDC	3576 WasteCo NZ Limited
Tag Id 88	7269
Wasteco	Special Waste
WE	IGHING DOCKET 988879
1 /	Apr 2021 9 18 am
Reg NDC	3576 WasteCo NZ Limited
Tag Id 88	7269
Wasteco	Special Waste
Trailer Wi	CT002
WE	IGHING DOCKET 988879
1 /	Apr 2021 9:18 am
Reg NDC	0576 WasteCo NZ Limited
Tag Id 88	7269
Wasteco	Special Waste
Trailer Wi	CT002
2nd Load	Special Waste
WE	IGHING DOCKET 988879
1 /	Apr 2021 9:18 am
Reg NDC	0576 WasteCo NZ Limited
Tag Id 88	7269
Wasteco	Special Waste
Trailer W	CT002
2nd Load	: Special Waste
Permit Nu	Imber : C6049
Billing Cu	stomer : Wasteco NZ Limited
Manifest M	Number : 46009

CWS Kate Valley Landfili

WEIGHING DOCKET 988933 1 Apr 2021 1:3

Tag id 144027 Frews Isuzu (25/05/2

Special Waste Manifest

MANIFEST No. 46011

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ag id 144027 rews Isuzu (25/05/20)	1 Blent	NZ Limi	<u>teca</u>		
st Load: Special Waste	hriste	ANCA			
ermit Number : C6049 illing Customer : Wasteco NZ Limited lanifest Number : 46011		Contact Phone	277825885	Fax S	
	· Details	If different from Pe	rmit Holder above	.)	
Gross 24,200 Kg Tare 15,080 K Net 9,120 K	intract. East n	ndadisons	Road		,
landing for the second	lesto A	Contact Phone 07	74952070	Fax	
and a state of the s	<u>taimiz</u>	nated	<u>Saíl</u>		
	2526	\leq			
WEIGHING DOCKET 988934 1 Apr 2021 1:34 pm				<u></u>	•
Reg MSB399 Frews Contracting Ltd		One or two bins (cii	cie) I	<u></u>	
Tag Id 144027 Frews Isuzu (25/05/20)	ls	Immedia	ate Container Turr	naround Requested	
Trailer 2N186		<u>Atoschad</u>			
2nd Load. Special Waste		<u> </u>		****	
Permit Number : C6049 Billing Customer : Wasteco NZ Limited	<u></u>	Driver Name	Jick Ma	<u>(</u>	
Manifest Number : 46011	<u>7764</u>				
. Gross 25,400 Kg		Container No.	1.16 6	a har ha	
Tare 8,360 K Net 17,040 K				Permit Verified	
an hadvara kancasti antikan ang kanut kanakan dan kanya tamun na tang ang kanya sa kanya sa kanya sa kanya kany		Time of Arrival		Special handling	
	<u>.</u>	.	DI		4
	¥	L.	1 . L		<u></u>
Operator / Technician Notes					

Transporter Copy June 2019

LMP 4-3 F Issue: 7

PO Box 142 Amberley 7441 Phone: 03 359 1800 Canterbury Phone: 03 359 1800 Waste Services Email: kvpad@cws.co.nz

CWS Kate Valley Landfill

WEIGHING DOCKET 989110 6 Apr 2021 8:23 am

Reg MSB399 Frews Contracting Ltd

Tag ld 144027 Frews Isuzu (25/05/20)

1st Load: Special Waste

Permit Number : C6049 Billing Customer : Wasteco NZ Limited Manifest Number : 46012

> Gross 24,740 Kg Tare 15,160 K Net 9,580 K

WEIGHING DOCKET 989111 6 Apr 2021 8:23 am

ستشمير ويراريهم ومراجع ومرور ويتقر والمنصوا والمحمد والمراجعة والهراريين والمحمورة الم

المحاجبة والمزال فوجه بنشية يار وجويد للمة بهيجم

Reg MSB399 Frews Contracting Ltd

Tag ld 144027 Frews Isuzu (25/05/20)

Trailer 2N186

2nd Load: Special Waste

Permit Number : C6049 Billing Customer : Wasteco NZ Limited Manifest Number : 46012

> Gross 21,560 Kg Tare 8,380 K Net 13,180 K

> > ----

CWS Kate Valley Landfill

WEIGHING DOCKET 989178 6 Apr 2021 12 52 pm

Reg MSB399 Frews Contracting Ltd

Tag id 144027 Frews Isuzu (25/05/20)

1st Load, Special Waste

Permit Number - C6049 Billing Customer - Wasteco NZ Limited Manifest Number - 46014

> Gross 23 720 Kg Tare 15 080 K Net 8,640 K

WEIGHING DOCKET 989179 6 Apr 2021 12:52 pm

Reg MSB399 Frews Contracting Ltd

Tag ld 144027 Frews Isuzu (25/05/20).

Trailer 2N188

2nd Load, Special Waste

Permit Number : C6049 Billing Customer : Wasteco NZ Limited Manifest Number : 46014

> Gross 24,820 Kg Tare - 6,380 K Net - 16,440 K

2

WEIGHING DOCKET 989207 6 Apr 2021 2:53 pm

Reg NDQ576 WasteCo NZ Limited

Tag Id 887269 Wasteco Special Waste

Trailer WCT002

2nd Load: Special Waste

Permit Number : C6049 Billing Customer : Wasteco NZ Limited Manifest Number : 46013

> Gross 21,320 Kg Tare 9,240 K Net 12,080 K

Get Outlook for Android

CWS Kate Valley Landfill

WEIGHING DOCKET 989206 6 Apr 2021 2:53 pm

Reg NDQ576 WasteCo NZ Limited

Tag Id 887269 Wasteco Special Waste

1st Load Special Waste

Permit Number : C6049 Billing Customer : Wasteco NZ Limited Manifest Number : 46013

> Gross 24,220 Kg Tare 15,780 K Net 8,440 K

APPENDIX 2: Laboratory Certificates

Hill Laboratories TRIED, TESTED AND TRUSTED

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

T 0508 HILL LAB (44 555 22) Т

Page 1 of 5

- +64 7 858 2000
- Е mail@hill-labs.co.nz

W www.hill-laboratories.com

Certificate of Analy	vsis
	/

Client: Contact:	Engeo Limit Natalie Flat C/- Engeo L PO Box 373 Christchurc	ted man Limited 3 h 8140		Lat Dat Qu Orc Clic Sul	o No: te Received: te Reported: ote No: der No: ent Reference: bmitted By:	2569092 26-Mar-2021 31-Mar-2021 82742 12903.000.009 Natalie Flatma	SPv1 9 in
Sample Ty	pe: Soil						
		Sample Name:	A1 VS1 26-Mar-2021	A1 VS2 26-Mar-2021	A1 VS3 26-Mar-2021	A1 VS4 26-Mar-2021	A1 VS5 26-Mar-2021
		Lab Number:	2569092.1	2569092.2	2569092.3	2569092.4	2569092.5
Heavy Metals	s, Screen Level			1	1		
Total Recove	rable Arsenic	mg/kg dry wt	5	3	3	3	3
Total Recove	rable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recove	rable Chromium	n mg/kg dry wt	19	13	14	14	13
Total Recove	rable Copper	mg/kg dry wt	4	3	4	4	4
Total Recove	rable Lead	mg/kg dry wt	16.0	15.0	15.2	15.3	15.2
Total Recove	rable Nickel	mg/kg dry wt	9	9	9	10	10
Total Recove	rable Zinc	mg/kg dry wt	59	50	54	56	53
		Sample Name:	A2 VS1 26-Mar-2021	A2 VS2 26-Mar-2021	A2 VS3 26-Mar-2021	A2 VS4 26-Mar-2021	A2 VS5 26-Mar-2021
		Lab Number:	2569092.6	2569092.7	2569092.8	2569092.9	2569092.10
Heavy Metals	s, Screen Level						
Total Recove	rable Arsenic	mg/kg dry wt	6	13 ^{#1}	9	4	4
Total Recove	rable Cadmium	mg/kg dry wt	< 0.10	0.12	0.11	< 0.10	< 0.10
Total Recove	rable Chromium	n mg/kg dry wt	30	16	14	13	12
Total Recove	rable Copper	mg/kg dry wt	6	20	14	7	6
Total Recove	rable Lead	mg/kg dry wt	12.4	17.5	15.4	15.1	14.6
Total Recove	rable Nickel	mg/kg dry wt	11	9	8	8	8
Total Recove	rable Zinc	mg/kg dry wt	37	280	87	88	68
		Sample Name: Lab Number:	A2 VS6 26-Mar-2021 2569092.11	A3 VS1 26-Mar-2021 2569092.12	A3 VS2 26-Mar-2021 2569092.13	A3 VS3 26-Mar-2021 2569092.14	A3 VS4 26-Mar-2021 2569092.15
Individual Tes	sts						
Dry Matter		g/100g as rcvd	-	98	-	-	-
Heavy Metals	s, Screen Level						
Total Recove	rable Arsenic	mg/kg dry wt	6	3	4	4	3
Total Recove	rable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.12	< 0.10	< 0.10
Total Recove	rable Chromium	n mg/kg dry wt	17	12	13	13	13
Total Recove	rable Copper	mg/kg dry wt	6	4	6	4	4
Total Recove	rable Lead	mg/kg dry wt	12.5	10.3	14.6	14.8	14.8
Total Recove	rable Nickel	mg/kg dry wt	12	10	9	9	8
Total Recove	rable Zinc	mg/kg dry wt	37	33	108	55	51
Polycyclic Ar	omatic Hydroca	rbons Screening in S	oil*				
Total of Repo	orted PAHs in So	oil mg/kg dry wt	-	< 0.3	-	-	-
1-Methylnaph	Ithalene	mg/kg dry wt	-	< 0.010	-	-	-
2-Methylnaph	Ithalene	mg/kg dry wt	-	< 0.010	-	-	-
Acenaphthyle	ene	mg/kg dry wt	-	< 0.010	-	-	-
Acenaphthen	е	mg/kg dry wt	-	< 0.010	-	-	-
Anthracene		ma/ka drv wt	-	< 0.010	-	-	-

CCREDITED

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

Sample Type: Soil						
Sa	mple Name:	A2 VS6	A3 VS1	A3 VS2	A3 VS3	A3 VS4
	oh Number	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021
Polyayalia Aramatia Hydrocarbon		2009092.11	2009092.12	2009092.13	2569092.14	2009092.15
	is Screening in S		. 0.010			
	mg/kg dry wt	-	< 0.010	-	-	-
Benzolajpyrene (BAP)	mg/kg dry wt	-	< 0.010	-	-	-
Equivalency Factor (PEF) NES*	mg/kg dry wt	-	< 0.03	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	< 0.03	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	< 0.010	-	-	-
Benzo[e]pyrene	mg/kg dry wt	-	< 0.010	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.010	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.010	-	-	-
Chrysene	mg/kg dry wt	-	< 0.010	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.010	-	-	-
Fluoranthene	mg/kg dry wt	-	< 0.010	-	-	-
Fluorene	mg/kg dry wt	-	< 0.010	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.010	-	-	-
Naphthalene	mg/kg dry wt	-	< 0.05	-	-	-
Perylene	mg/kg dry wt	-	< 0.010	-	-	-
Phenanthrene	mg/kg dry wt	-	< 0.010	-	-	-
Pyrene	mg/kg dry wt	-	< 0.010	-	-	-
Sa	mple Name:	A3 VS5	A3 VS6	A3 VS7	A3 VS8	A3 VS9
-	-	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021
L	ab Number:	2569092.16	2569092.17	2569092.18	2569092.19	2569092.20
Individual Lests					1	
Dry Matter	g/100g as rcvd	98	-	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	4	3	4	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	13	14	13	12	13
Total Recoverable Copper	mg/kg dry wt	4	5	4	3	3
Total Recoverable Lead	mg/kg dry wt	14.4	10.6	13.8	14.2	13.0
Total Recoverable Nickel	mg/kg dry wt	9	12	9	8	8
Total Recoverable Zinc	mg/kg dry wt	63	36	50	47	47
Polycyclic Aromatic Hydrocarbon	is Screening in S	oil*				
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	-	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.011	-	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.011	-	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.011	-	-	-	-
Acenaphthene	mg/kg dry wt	< 0.011	-	-	-	-
Anthracene	mg/kg dry wt	< 0.011	-	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.011	-	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	-	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.03	-	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.03	-	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011	-	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.011	-	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	-	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	-	-	-	-
Chrysene	mg/kg dry wt	< 0.011	-	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	-	-	-	-
Fluoranthene	mg/kg dry wt	< 0.011	-	-	-	-
Fluorene	mg/kg dry wt	< 0.011	-	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	-	-	-	-

Sample Type: Soil						
	Sample Name:	A3 VS5	A3 VS6	A3 VS7	A3 VS8	A3 VS9
	-	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021
	Lab Number:	2569092.16	2569092.17	2569092.18	2569092.19	2569092.20
Polycyclic Aromatic Hydrocar	bons Screening in S	ioil*	1			
Naphthalene	mg/kg dry wt	< 0.06	-	-	-	-
Perylene	mg/kg dry wt	< 0.011	-	-	-	-
Phenanthrene	mg/kg dry wt	< 0.011	-	-	-	-
Pyrene	mg/kg dry wt	< 0.011	-	-	-	-
	Sample Name:	A3 VS10	A4 VS1	A4 VS2	A4 VS3	A4 VS4
	•	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021
	Lab Number:	2569092.21	2569092.22	2569092.23	2569092.24	2569092.25
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	3	3	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	13	12	12	11	12
Total Recoverable Copper	mg/kg dry wt	4	5	4	4	4
Total Recoverable Lead	mg/kg dry wt	14.2	11.0	11.8	11.4	12.6
Total Recoverable Nickel	mg/kg dry wt	9	10	9	8	8
Total Recoverable Zinc	mg/kg dry wt	158	33	45	45	43
	Sample Name	A4 VS5	A4 VS6	A5 VS1	A5 VS2	A5 VS3
	Cample Name.	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021
	Lab Number:	2569092.26	2569092.27	2569092.28	2569092.29	2569092.30
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	3	5	4	5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	13	17	21	14
Total Recoverable Copper	mg/kg dry wt	3	3	6	5	8
Total Recoverable Lead	mg/kg dry wt	12.7	13.5	12.6	14.1	14.9
Total Recoverable Nickel	mg/kg dry wt	8	10	14	11	9
Total Recoverable Zinc	mg/kg dry wt	50	50	44	45	52
	Comula Nomer				A6\/\$1	A6.V62
	Sample Name:	A5 V34 26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021
	Lab Number:	2569092.31	2569092.32	2569092.33	2569092.34	2569092.35
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	16	8	4	3	3
Total Recoverable Cadmium	ma/ka drv wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	18	18	14	12	13
Total Recoverable Copper	ma/ka drv wt	13	6	5	12	10
Total Recoverable Lead	ma/ka drv wt	15.3	15.2	14.5	13.7	14.2
Total Recoverable Nickel	ma/ka dry wt	9	8	10	8	9
Total Recoverable Zinc	mg/kg dry wt	50	51	53	48	49
	Sample Name:	A6 VS3 26-Mar-2021	A6 VS4 26-Mar-2021	A6 VS5 26-Mar-2021	A6 VS6 26-Mar-2021	A6 VS7 26-Mar-2021
	Lab Number:	2569092.36	2569092.37	2569092.38	2569092.39	2569092.40
Heavy Metals, Screen Level						
Total Recoverable Arsenic	ma/ka drv wt	3	3	3	3	3
Total Recoverable Cadmium	ma/ka drv wt	< 0.10	< 0.10	0.37	< 0.10	< 0.10
Total Recoverable Chromium	ma/ka dry wt	14	12	12	13	14
Total Recoverable Copper	ma/ka dry wt	220	52	7	6	138
Total Recoverable Lead	mg/kg dry wt	12.2	13.2	179	10.4	11.9
Total Recoverable Nickal	mg/kg dry wt	11	0	Ω	11	10
Total Recoverable Zinc	mg/kg dry wt	45	46	51	Δ1	30
		τυ	ΨΨ		1	
	Sample Name:	A6 VS8 26-Mar-2021	A6 VS9 26-Mar-2021	A9 VS1 26-Mar-2021	A9 VS2 26-Mar-2021	A9 VS3 26-Mar-2021
	Lab Number:	2569092.41	2569092.42	2569092.43	2569092.44	2569092.45
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	4	4	4	4
Total Recoverable Cadmium	mg/kg dry wt	0.20	0.16	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	12	12	14	13	13

Sample Type: Soil						
	Sample Name:	A6 VS8	A6 VS9	A9 VS1	A9 VS2	A9 VS3
	•	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021	26-Mar-2021
	Lab Number:	2569092.41	2569092.42	2569092.43	2569092.44	2569092.45
Heavy Metals, Screen Level						
Total Recoverable Copper	mg/kg dry wt	40	54	6	5	6
Total Recoverable Lead	mg/kg dry wt	15.7	16.6	15.7	15.6	15.7
Total Recoverable Nickel	mg/kg dry wt	7	8	9	8	9
Total Recoverable Zinc	mg/kg dry wt	320	470	59	55	53
	Sample Name:	A9 VS4 26-Mar-2021	A9 VS5 26-Mar-2021			
	Lab Number:	2569092.46	2569092.47			
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	4	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	-	-	-
Total Recoverable Chromium	mg/kg dry wt	12	13	-	-	-
Total Recoverable Copper	mg/kg dry wt	4	4	-	-	-
Total Recoverable Lead	mg/kg dry wt	15.2	15.0	-	-	-
Total Recoverable Nickel	mg/kg dry wt	8	10	-	-	-
Total Recoverable Zinc	mg/kg dry wt	51	54	-	-	-

Analyst's Comments

^{#1} It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample. Replicate 1 = 13mg/kg, replicate 2 = 17mg/kg.

Appendix No.1 - Chain of Custody

Summary of Methods

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

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-47
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	12, 16
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	1-47
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.05 mg/kg dry wt	12, 16
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	12, 16
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	12, 16
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	12, 16

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

Testing was completed between 30-Mar-2021 and 31-Mar-2021. For completion dates of individual analyses please contact the laboratory.

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

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

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

		ratorie		ANAL Hill Laboratories Li	MASIS REQUEST
Quo	ite No		28 D Priva	uke Street, Hamilt ate Bag 3205	on 3204 256 9092
Prin	nary Contact		Ham	liton 3240, New 26	
Sub	mitted By		T (0508 HILL LAB (44 +64 7 858 2000	4 555 22) Received by: Grace Convey
Clie	nt Name ENGEO Ltd		Er W/v	nail@hill-labs.co.n www.hill-laboratorie	z ss.com
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Chr	stchurch	Postcode 8023	Sen		
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Clien	Reference 12903.000.0	69	Rec	eived at	Date & Time:
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□ o	ther			Sample and An	alysis details checked
				Signature:	
			Pr	iority 🗌 L	.ow 🗹 Normal 🔲 High
				Urgent (A	SAP, extra charge applies, please contact lab first)
			Req	uested Reporting	Date:
No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
No. 1	Sample Name ATA AI VSI	Sample Date 26 /3/21	Sample Time	Sample Type ES	Tests Required (if not as per Quote) Heavy metals
No. 1 2	Sample Name AAAAAIVSI AIVS2	Sample Date 26 /3/21	Sample Time	Sample Type ES	Tests Required (if not as per Quote) Heavy metals
No. 1 2 3	Sample Name AZA AI USI AI US2 AI US3	Sample Date 26/3/21	Sample Time	Sample Type ES	Tests Required (if not as per Quote) Heavy metals
No. 1 2 3 4	Sample Name AFAL AI USI AI US2 AI US3 AI US4	Sample Date 26/3/2L	Sample Time	Sample Type ES	Tests Required (if not as per Quote) Heavy metals
No. 1 2 3 4 5	Sample Name AZ AI USI AI US2 AI US3 AI US4 AI USS	Sample Date 26/3/21	Sample Time	Sample Type ES	Tests Required (if not as per Quote) Heavy metals
No. 1 2 3 4 5 6	Sample Name ATAL AI USI AI US2 AI US3 AI US4 AI US5 AZ USI	Sample Date 26 /3/2L	Sample Time	Sample Type ES	Tests Required (if not as per Quote) Heavy metals
No. 1 2 3 4 5 6 7	Sample Name AA AI VSI AI VS2 AI VS3 AI VS4 AI VS4 AI VS5 A2 VS1 A2 VS2	Sample Date 26 /3/2L	Sample Time	Sample Type ES	Tests Required (if not as per Quote) Heavy metals
No. 1 2 3 4 5 6 7 8	Sample Name AI AI VSI AI $VS2$ AI $VS3$ AI $VS4$ AI $VS4$ AI $VS5$ AZ VSI AZ VSZ AZ VSZ	Sample Date 26/3/2L	Sample Time	Sample Type ES	Tests Required (if not as per Quote) Heary metals
No. 1 2 3 4 5 6 7 8 9	Sample Name AAA AI VSI AI VS2 AI VS3 AI VS4 AI VS4 AI VS5 A2 VS1 A2 VS2 A2 VS3 A2 VS4	Sample Date 26/3/21	Sample Time	Sample Type ES	Tests Required (if not as per Quote) Heavy metals
No. 1 2 3 4 5 6 7 8 9 10	Sample Name AI AI VSI AI $VS2$ AI $VS3$ AI $VS4$ AI $VS4$ AI $VS5$ $A2$ VSI $A2$ $VS2$ $A2$ $VS4$ $A2$ $VS4$ $A2$ $VS4$ $A2$ $VS4$ $A2$ $VS4$ $A2$ $VS5$	Sample Date 26/3/21	Sample Time	Sample Type ES	Tests Required (if not as per Quote) Heavy metals
No. 1 2 3 4 5 6 7 8 9 10 11	Sample Name AI AI VSI AI $VS2$ AI $VS3$ AI $VS4$ AI $VS4$ AI $VS5$ $A2$ $VS1$ $A2$ $VS3$ $A2$ $VS4$ $A2$ $VS4$ $A2$ $VS4$ $A2$ $VS4$ $A2$ $VS5$ $A2$ $VS6$	Sample Date 26/3/21	Sample Time	Sample Type ES	Tests Required (if not as per Quote) Heavy metals

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	A3 VS2	26/3/21		ES	Heavy nubali
14	A3 VS3				Heavy metals
15	A3 VS4				Heavy metals
16	A3 VSS				Heavy we had PAHS
17	A3 VS6				Heavy metal)
18	A3VS7			an a	Heavy metals
19	A3 VSQ			And the second sec	Heavy mebals
20	A3 V89	ge subang turi di tra su			Heavy methods
21	A3 VSID				.1/
22	A4 USI				Heavy metal
23	A4 VS2			******	
24	A4 VS3				
25	A4 VS4				
26	A4 VSS			San de la casa de la c	
27	A4 VSB			4 Section 200	
28	AS USI				the Heary metals
29	AS VS2				
30	A5 VS3				
31	A5 US4				
32	A5 VSS				
33	AS US6			C. In the second se	<i>y</i>
34	A6 VSI	CONTRACT, SALES			Heavy metals
35	A6 V52	Contraction of the second seco			
36	A6 VS3				
37	A6 V54				
38	A6 V55				
39	A6 VS6				
40	A6 V57	V			V

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	A6 VS8	26/5/21		ES	Heary metals
14	AG VS9	1		j.	
15	AG VSI				
16	AG VSR				
17	A9 VI3				
18	AQ VS4				
19	A9 VSS				
20					
21					
22					
23					
24					
25					
26					
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28					
29					
30					
31					
32					
33			-		
34					
35					
36					
37					
38					
39					
40					

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Page 1 of 4

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U GI III U AIG			1010

Client:	Engeo Limited	Lab No:	2742947	SPv2
Contact:	Natalie Flatman	Date Received:	22-Oct-2021	
	C/- Engeo Limited	Date Reported:	03-Nov-2021	
	PO Box 373	Quote No:	114209	
	Christchurch 8140	Order No:		
		Client Reference:	12903.000.009	
		Submitted By:	Natalie Flatman	

Sample Type: Soil

	Sample Name:	T_SS1 20-Oct-2021	T_SS2 20-Oct-2021			
	Lab Number:	2742947.1	2742947.2			
Individual Tests						'
Dry Matter	g/100g as rcvd	89	92	-	-	-
Heavy Metals with Mercury, S	Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	2	3	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	-	-	-
Total Recoverable Chromium	mg/kg dry wt	12	14	-	-	-
Total Recoverable Copper	mg/kg dry wt	5	7	-	-	-
Total Recoverable Lead	mg/kg dry wt	8.0	12.5	-	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	-	-	-
Total Recoverable Nickel	mg/kg dry wt	9	10	-	-	-
Total Recoverable Zinc	mg/kg dry wt	34	46	-	-	-
Organochlorine Pesticides So	creening in Soil					
Aldrin	mg/kg dry wt	< 0.011	< 0.011	-	-	-
alpha-BHC	mg/kg dry wt	< 0.011	< 0.011	-	-	-
beta-BHC	mg/kg dry wt	< 0.011	< 0.011	-	-	-
delta-BHC	mg/kg dry wt	< 0.011	< 0.011	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.011	< 0.011	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.011	< 0.011	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.011	< 0.011	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.07	< 0.07	-	-	-
Dieldrin	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Endosulfan I	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Endosulfan II	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Endrin	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Endrin ketone	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Heptachlor	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.011	< 0.011	-	-	-
Methoxychlor	mg/kg dry wt	< 0.011	< 0.011	-	-	-

CCREDITED

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

Sample Type:	Soil					
	Sample Name:	T_SS1	T_SS2			
		20-Oct-2021	20-Oct-2021			
0	Lab Number:	2742947.1	2742947.2			
Organonitro&phos	sphorus Pesticides Screen in Se	oil by GCMS		1		
Acetochlor	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Alachlor	mg/kg dry wt	< 0.05	< 0.05	-	-	-
Atrazine	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Atrazine-desethyl	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Atrazine-desisopro	opyl mg/kg dry wt	< 0.11	< 0.11	-	-	-
Azaconazole	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Azinphos-methyl	mg/kg dry wt	< 0.11	< 0.11	-	-	-
Benalaxyl	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Bitertanol	mg/kg dry wt	< 0.11	< 0.11	-	-	-
Bromacil	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Bromopropylate	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Butachlor	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Captan	mg/kg dry wt	< 0.11	< 0.11	-	-	-
Carbaryl	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Carbofuran	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Chlorfluazuron	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Chlorothalonil	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Chlorpyrifos	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Chlorpyrifos-meth	yl mg/kg dry wt	< 0.06	< 0.06	-	-	-
Chlortoluron	mg/kg dry wt	< 0.11	< 0.11	-	-	-
Cyanazine	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Cyfluthrin	mg/kg dry wt	< 0.07	< 0.07	-	-	-
Cyhalothrin	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Cypermethrin	mg/kg dry wt	< 0.13	< 0.13	-	-	-
Deltamethrin (inclu	uding mg/kg dry wt	< 0.06	< 0.06	-	-	-
Tralomethrin)						
Diazinon	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Dichlofluanid	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Dichloran	mg/kg dry wt	< 0.2	< 0.2	-	-	-
Dichlorvos	mg/kg dry wt	< 0.09	< 0.09	-	-	-
Difenoconazole	mg/kg dry wt	< 0.09	< 0.09	-	-	-
Dimethoate	mg/kg dry wt	< 0.11	< 0.11	-	-	-
Diphenylamine	mg/kg dry wt	< 0.11	< 0.11	-	-	-
Diuron	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Fenpropimorph	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Fluazifop-butyl	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Fluometuron	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Flusilazole	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Fluvalinate	mg/kg dry wt	< 0.05	< 0.05	-	-	-
Furalaxyl	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Haloxyfop-methyl	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Hexaconazole	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Hexazinone	mg/kg dry wt	< 0.03	< 0.03	-	-	-
IPBC (3-lodo-2-pr butylcarbamate)	opynyl-n- mg/kg dry wt	< 0.3	< 0.3	-	-	-
Kresoxim-methyl	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Linuron	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Malathion	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Metalaxyl	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Methamidophos	mg/kg dry wt	< 0.3	< 0.3	-	-	-
Metolachlor	mg/kg dry wt	< 0.05	< 0.05	-	-	-
Metribuzin	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Molinate	mg/kg dry wt	< 0.11	< 0.11	-	-	-
Myclobutanil	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Naled	mg/kg dry wt	< 0.3	< 0.3	-	-	-
Norflurazon	mg/kg dry wt	< 0.11	< 0.11	-	-	-

Sample Type: Soil								
Sa	mple Name:	T_SS1	T_SS2					
I	ab Number:	2742947.1	20-0ct-2021					
Organonitro&phosphorus Pestici	des Screen in So	bil by GCMS						
Oxadiazon	ma/ka drv wt	< 0.06	< 0.06	-	-	-		
Oxyfluorfen	mg/kg dry wt	< 0.03	< 0.03	-	-	-		
Paclobutrazol	ma/ka dry wt	< 0.06	< 0.06	-	-	-		
Parathion-ethvl	ma/ka drv wt	< 0.06	< 0.06	-	-	-		
Parathion-methyl	ma/ka dry wt	< 0.06	< 0.06	-	-	-		
Pendimethalin	ma/ka dry wt	< 0.06	< 0.06	-	-	-		
Permethrin	ma/ka dry wt	< 0.03	< 0.03	-	-	-		
Pirimicarb	ma/ka dry wt	< 0.06	< 0.06	-	-	-		
Pirimiphos-methyl	ma/ka drv wt	< 0.06	< 0.06	-	-	-		
Prochloraz	ma/ka dry wt	< 0.3	< 0.3	-	-	-		
Procymidone	ma/ka dry wt	< 0.06	< 0.06	-	-	-		
Prometryn	ma/ka dry wt	< 0.03	< 0.03	-	-	-		
Propachlor	ma/ka dry wt	< 0.06	< 0.06	-	-	-		
Propanil	ma/ka drv wt	< 0.2	< 0.2	-	-	-		
Propazine	ma/ka drv wt	< 0.03	< 0.03	-	-	-		
Propiconazole	ma/ka drv wt	< 0.05	< 0.05	-	-	-		
Pvriproxvfen	ma/ka drv wt	< 0.06	< 0.06	-	-	-		
Quizalofop-ethyl	ma/ka drv wt	< 0.06	< 0.06	-	-	-		
Simazine	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Simetryn	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Sulfentrazone	mg/kg dry wt	< 0.3	< 0.3	-	-	-		
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	mg/kg dry wt	< 0.11	< 0.11	-	-	-		
Tebuconazole	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Terbacil	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Terbufos	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Terbumeton	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Terbuthylazine	mg/kg dry wt	< 0.03	< 0.03	-	-	-		
Terbuthylazine-desethyl	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Terbutryn	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Thiabendazole	mg/kg dry wt	< 0.3	< 0.3	-	-	-		
Thiobencarb	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Tolylfluanid	mg/kg dry wt	< 0.03	< 0.03	-	-	-		
Triazophos	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Trifluralin	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Vinclozolin	mg/kg dry wt	< 0.06	< 0.06	-	-	-		
Sample Type: Concrete								
Sa	mple Name:	Concrete 20-Oct-2021						
L	ab Number:	2742947.3						
Heavy metals, screen As,Cd,Cr,C	Cu,Ni,Pb,Zn,Hg			1				
Total Recoverable Arsenic	mg/kg dry wt	4	-	-	-	-		
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-		
I otal Recoverable Chromium	mg/kg dry wt	14	-	-	-	-		
I otal Recoverable Copper	mg/kg dry wt	5	-	-	-	-		
I otal Recoverable Lead	mg/kg dry wt	7.1	-	-	-	-		
I otal Recoverable Mercury	mg/kg dry wt	< 0.10	-	-	-	-		
I otal Recoverable Nickel	mg/kg dry wt	9	-	-	-	-		
I otal Recoverable Zinc	mg/kg dry wt	30	-	-	-	-		
Analyst's Comments								
Appendix No.1 - Chain of Custody								
Appoint the transmission of transmissi								

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		Sample No				
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-3				
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP- MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-2				
Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS	Sonication extraction, GC-ECD and GC-MS analysis. In-house based on US EPA 8081 and US EPA 8270.	0.010 - 0.2 mg/kg dry wt	1-2				
Dry Matter (Env) Dried at 103°C for 4-22hr (removes 3-5% more water than air dry), gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.		0.10 g/100g as rcvd	1-2				
Sample Type: Concrete							
Test	Method Description	Default Detection Limit	Sample No				
Heavy metals, screen As,Cd,Cr,Cu,Ni,Pb,Zn,Hg	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg dry wt	3				
Rockgrind*	Crush to ~2mm. Subcontracted to Waikato University.	-	3				
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	3				

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

Testing was completed between 26-Oct-2021 and 03-Nov-2021. For completion dates of individual analyses please contact the laboratory.

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

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

Ara Heron BSc (Tech) Client Services Manager - Environmental

Quote NoHill Laboratories TRIED, TESTED AND TRUSTEDQuote No114209Primary Contact Natalie Flatman228306Submitted ByNatalie Flatman228306	ANALYSIS Date Recv: 22-Oct-21 06:27 R J Hill Laboratories Limite: 274 2947 Private Bag 3205 Hamilton 3240 New Zealanc Received by: Nathaniel Sue T 0508 HILL LAB (44 555 T +64 7 858 2000 E mail@hill-labs.co.nz W www.hill-laboratories.com		
Client Name Engeo Limited 160117	CHAIN OF CUSTODY RECORD		
Phone 03 328 9012 Mobile 027335014 Email info@engea.co.nz Info@engea.co.nz Info Inf <th>Sent to Date & Time: 21/10/2021 Hill Laboratories Name: N Flatman Tick if you require COC to be emailed back Signature: Received at Date & Time: Hill Laboratories Date & Time: Name: Name:</th>	Sent to Date & Time: 21/10/2021 Hill Laboratories Name: N Flatman Tick if you require COC to be emailed back Signature: Received at Date & Time: Hill Laboratories Date & Time: Name: Name:		
Results To Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.	Signature:		
Email Primary Contact Email Submitter Email Client Email Other Other	Condition Temp: Room Temp Chilled Frozen 10.7		
Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported. ADDITIONAL INFORMATION / KNOWN HAZARDS	Sample & Analysis details checked Signature:		
	Priority Low Normal Figh Urgent (ASAP, extra charge applies, please contact lab first) NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 14 working days following the day of receipt of the samples at the laboratory.		
Quoted Sample Types	Requested Reporting Date:		

Soil (Soil), Concrete (Conc)

No.	Sample Name	Sample Date/Time_Sample Type_Tests Required				
1	T-SSI	20/10/21	ES	OCP. DNOP, Heavy metal ind Hg		
2	T-552	20/10/21	ES	5		
3	Concrete	20/10/21	Converte	Concrete crush & heavy metal incl Hg		
4						
5						
6						
7						
8						
9						
10						