Detailed Environmental Site Investigation

Harrow Green

Lot 2 DP 61162

Springston Rolleston Road
Rolleston

Submitted to:

Kevler Developments Ltd.

Wiley Geotechnical Ltd.
Level 1, 10 Logistics Drive, Christchurch
PO Box 21171, Edgeware, Christchurch 8143

Contents

1 Executive Summary

Wiley Geotechnical Limited (WGL) was requested by Kevler Developments Ltd. to provide a Detailed environmental Site Investigation report (DSI) for the proposed residential development at Lot 2 DP 61162, Springston Rolleston Road, Rolleston (herein referred to as 'the site').

This DSI follows on from a Preliminary environmental Site Investigation report (PSI), produced by WGL, dated 3 August 2021, and should be read in conjunction with the PSI report. The PSI concluded that a DSI is necessary, as a HAIL activity has been confirmed on the site. We identified a risk area adjacent to the garage on the north side of the site, where tyres have been stored for a prolonged period. This activity is recognised by the Ministry for the Environment (MfE) as Hazardous Activities and Industries List (HAIL) activity (Category G4 – Scrap yards including automotive dismantling, wrecking or scrap metal yards). Potential contaminants in the soils on the site, resulting from this activity, may pose a risk to human health.

As part of this DSI, soil sampling was undertaken on the site obtain representative samples of the soil within the risk area. The soil samples were transported by WGL to RJ Hill Laboratories (Hills) to analyse the concentrations of contaminants (if any) present and to determine whether or not they pose an acceptable risk to human health. The laboratory results were used to quantify the risks (if any) to human health. We compared the laboratory results to assessment criteria, selected in accordance with the MfE (2011) *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations* (herein referred to as the NES) and the MfE (2011), *Contaminated Land Management Guidelines No. 2, to assess risk to human health*.

Laboratory results indicated that contaminants are not present at concentrations that could pose an unacceptable risk to human health, as a result of the proposed development of the site for residential use. It is therefore recommended that the proposed development of the site be approved as a Controlled Activity under Regulation 9(1).

2 Introduction

Wiley Geotechnical Limited (WGL) was requested by Kevler Developments Ltd. to provide a Detailed environmental Site Investigation report (DSI) to quantify the potential risks to health at Lot 2 DP 61162, Springston Rolleston Road, Rolleston. A Site Location Plan is presented in Appendix 1.

This DSI Report follows the results of a preliminary environmental site investigation (PSI), produced by WGL, dated 3 August 2021. The purpose of this investigation is to assess the potential risks to human health, to determine whether the development can be considered a Controlled Activity under the NES.

This report was prepared in general accordance with the MfE (2021) *Contaminated Land Management Guidelines (CLMG) No. 1: Reporting on Contaminated Sites in New Zealand* and MfE (2021) *CLMG No. 5: Site Investigation and Analysis of Soils*.

3 Objectives

The objective of this investigation was to assess whether the hazardous activities identified in the site's history have resulted in contamination impacts that may pose an unacceptable risk to human health during, and subsequent to, residential development.

4 Site History Summary

This DSI report should be read in conjunction with the PSI report, dated 3 August 2021. Not all information provided in the PSI report has been reproduced in this DSI report.

4.1. Wiley Geotechnical Ltd. PSI Report (2021)

WGL undertook a PSI to assess information relating to the site's past and present uses, as well as to identify any other environmental issues which may be on record. We summarise the findings of the PSI investigation below.

The following activities or industries noted on the MfE Hazardous Activities and Industries List (HAIL; 2011) were identified during review of the site history:

- Category A1 – Agrichemicals including commercial premises used by spray contractors for filling, storing or washing out tanks for agrichemical application.
    - This category is represented by the use of fertiliser on the property.
- Category G4 – Scrap yards including automotive dismantling, wrecking or scrap metal yards.
    - This category is represented by used tyres stored in and around the garage.
- Category G5 – Waste disposal to land.
    - This category is represented by a green waste pile.

While three HAIL activities were identified on the proposed new residential use area, only the storage of tyres at the site is considered to pose a potential risk to human health. Based on aerial imagery and site observations, tyres appear to have been stored next to the garage for approximately 10 years.

The investigations undertaken have identified a risk area adjacent to the garage on the north side of the site where the tyres have been stored. The location of the risk area is shown on the Risk Area Map in Appendix 2. Contaminants related to this activity may be present in the soils. Based on our investigation, we consider that NES regulations apply to the site, according to criteria specified in NES Regulation 5.

4.2. Proposed Development and Regulatory Context

The site is currently undeveloped; historically, it has been used for grazing animals. The majority of the site comprises pasture, with a garage located on the north side of the site and an old deer shed near the centre of the site.

The site is intended to be developed for medium density residential use with lot sizes up to 650 m^2. Based on the evidence gathered during the PSI, the proposed development cannot be considered a Permitted Activity under NES Regulation 8(4)(b) owing to HAIL activities having previously occurred at the site. Therefore, a DSI is required to assess whether the proposed development can be undertaken as a Controlled Activity under NES Regulation 9.

5 Intrusive investigation

The following scope of work was undertaken to assess whether contamination impacts, resulting from the identified HAIL activity, are present at concentrations that may pose an unacceptable risk to human health:

- Collection of two soil samples from two locations within the identified risk area, where tyres have been stored.
- Visual and olfactory inspection of soil samples in the field;
- Submission of two soil samples to Hill Laboratories for analysis of a suite of common heavy metals and Polyaromatic Hydrocarbons (PAHs);
- Interpretation of laboratory results, in terms of the adopted human health criteria for residential land use and excavation / redevelopment earthworks;
- Present the findings of the investigation, including the suitability of the site for redevelopment and residential use, and recommendations to manage impacted areas (if any).

6 Sampling and Analysis Plan

Based on our site observations and historical aerial photographs available on Environment Canterbury's Canterbury Maps website, we developed a soil sampling plan for the site.

To assess whether the proposed development of the site qualifies as a Controlled Activity under NES Regulation 9, two soil samples were taken from two locations within the identified risk area. The locations of our sampling points are considered to be representative of the soils across the risk area.

6.1. Soil Sampling

WGL visited the site on 13 May 2022 to collect soil samples. Two samples were collected from two locations (refer to the Risk Area Map presented in Appendix 2). Sample information is summarised in Table 1.

Table 1: List of Samples

Sample Name and Location	Sample Depth (m)	Soil Type	Laboratory Analytes
SS01	0 – 0.2	Silt with trace sand and gravel.	Heavy Metals, Polyaromatic Hydrocarbons.
SS02	0 – 0.2	Silt with trace sand and gravel.	Heavy Metals, Polyaromatic Hydrocarbons.

6.2. Sampling Methodology

The following was undertaken during the soil sampling works:

- Samples were collected from the surface to 0.2 m below ground level (bgl) at two locations. Two tyres remaining at the site were carefully lifted to obtain soil samples from directly beneath each tyre, then replaced in the same position to avoid further soil contamination. The vegetation growth surrounding each tyre and the soil condition beneath each tyre indicated that the tyres had been in place for some time. The locations, sample names, depths, description of the material represented by each sample and the laboratory analytes are described in Table 1.
- Samples were compressed directly into laboratory supplied containers using a new pair of nitrile gloves for each sample. Prior to sampling, the equipment (hand auger) was decontaminated using a triple wash procedure with potable water, Decon 90 solution and deionised water;
- Visual and olfactory inspections of each sample were performed for indicators of contamination;
- Placement of samples into a chilly bin and transported, under standard WGL chain of custody procedures, to RJ Hill Laboratories (Hills) for analysis; and
- WGL requested that Hills test samples for the analytes described in Table 1.

7 Quality Assurance / 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, accredited by International Accreditation New Zealand (IANZ), to conduct laboratory analyses; and
- 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.

8 Investigation Criteria

The criteria were selected to evaluate the risks to human health during redevelopment earthworks or maintenance of underground services, and for future residential site use.

8.1. NES

The NES, which has been in effect since 1 January 2012, introduced soil contaminant standards (SCSs) for 12 priority contaminants for the protection of human health under a variety of land use scenarios.

The investigation criteria referenced in this report has been selected from the NES to assess risks to human health. Given the proposed use of the site as a medium density residential community, contaminant concentrations in soil were compared to human health criteria for residential use (10% produce).

Contaminant concentrations in soil were also compared to human health criteria for commercial / industrial land use based on an outdoor worker scenario. Commercial / industrial SCSs are used as surrogate values to assess the short-term risk to earthworks contractors on site during future development activities.

8.2. Soil Criteria

The assessment criteria referenced in this report have been selected in line with the NES and the MfE (2011), *Contaminated Land Management Guidelines No. 2* to assess risks to human health for residential (10% produce) land use and during the commercial / industrial land use exposure scenarios, which act as a surrogate for earthworks development and maintenance of underground services.

Where a soil contaminant standard (SCS) was not available, other appropriate criteria for residential (10% produce) land use were sourced from Australian National Environmental Protection Council (1999) *Guideline on the Investigation Levels for Soil and Water*. Other appropriate criteria for commercial / industrial (earthworks) land use were sourced from the United States Environmental Protection Agency (2019) *Regional Screening Levels*, and MfE (1997) *Guidelines for Assessing and Managing Contaminated Gasworks Sites in New Zealand*.

Criteria for background concentrations of heavy metals were taken from the *Background concentrations of selected trace elements in Canterbury soils* report, commissioned by Environment Canterbury (2007). Criteria for background concentrations of polyaromatic hydrocarbons (PAHs) were taken from the Contaminated Land Management User Guide: *Background/Typical concentrations of polyaromatic hydrocarbons (PAHs) in Christchurch urban soils*.

9 Results

Soil testing indicates that the levels of all contaminants analysed were below the adopted criteria for residential (10% produce) land use, and commercial /industrial (earthworks) activity. Results were also below adopted background concentrations. Based on the results of the soil analysis, we consider that the HAIL activities identified on site are highly unlikely to result in a risk to human health should the activity of residential development proceed. The full laboratory certificates are presented in Appendix 3.

10 Conceptual Site Model

A contamination conceptual site model, presented in Table 2, consists of three primary components to allow the potential for risk to be determined. These are:

- Source of contamination;
- Pathway to allow the contamination to mobilise; and
- Sensitive receptors which may be impacted by the contamination.

Table 2: Conceptual Site Model

Source	Pathway	Receptor
Long-term storage of tyres (heavy metals and PAHs)	Dermal absorption (direct contact); Ingestion and / or inhalation of soil; Leaching of contaminants to groundwater; Inhalation of dust;	Maintenance / Excavation workers; Future residents.
Acceptable risk to human health?	Yes: All soil contaminants analysed are below assessment criteria for residential (10% produce) land use, and for future development workers (commercial / industrial criteria).	

11 Conclusions

During this investigation soil samples were collected from locations where soil will be subject to disturbance during earthworks operations.

Based on our investigation, HAIL activities have previously been identified at the site. While three HAIL activities were identified on the proposed new residential use area, only the storage of tyres at the site is considered to pose a potential risk to human health. A risk area was identified, adjacent to the garage on the north side of the site where the tyres have been stored.

Soil sampling was undertaken in the location of the stored tyres to evaluate the risk to future residents and site workers. Soil analysis results indicate that all soil contaminants analysed are below assessment criteria for residential (10% produce) land use, and for future development workers (commercial / industrial criteria). Further, soil samples returned results below adopted background concentrations. Therefore, we consider soil contaminants at the site to be highly unlikely to pose a potential risk to human health.

Based on the current contamination status of the site, given the potential sources identified, it is considered highly unlikely that there will be a risk to human health from chemical contamination of the new residential development, if the following activities are done to the piece of land:

- Subdividing the property, as proposed, for residential use;
- Developing the land for residential use;
- Future occupation of new residential dwellings at the site.

12 Recommendations

It is recommended that residential development of the land be allowed as a Controlled Activity under the NES, because the requirements of Rule 9(1) have been met. Future applications for subdivision / development / disturbance of the site should be assessed in terms of activities identified in this investigation and any potential new HAIL activities that could occur at the site at any time after this report was written.

If any non-naturally occurring material is unearthed at any part of the site during future soil disturbance events, work should stop immediately and a suitably qualified environmental practitioner should be engaged to assess the risk to human health prior to recommencing earthworks.

13 References

Environment Canterbury. (2007), Background concentrations of selected trace elements in Canterbury soils. Report number R07/1/2, ISBN: 978-1-86937-699-4.

Environment Canterbury. (2007), Contaminated Land Management User Guide: Background/Typical concentrations of polyaromatic hydrocarbons (PAHs) in Christchurch urban soils. Report No R07/19.

Environment Canterbury, Canterbury Maps. Retrieved May 2022 from https://apps.canterburymaps.govt.nz/AdvancedViewer/

Environment Canterbury, Consent Search. Retrieved May 2022 from https://ecan.govt.nz/data/consent-search/

Environmental Protection Agency (2019) Regional Screening Levels. Accessed May 2022 from: https://www.epa.gov/risk/regional-screening-levels-rsls.

Ministry for the Environment. (2011) Users' Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.

Ministry for the Environment. (2021) Contaminated Land Management Guidelines No.1: Reporting on Contaminated Sites in New Zealand.

Ministry for the Environment. (2011) Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values. ISBN: 978-0-478-37259-5.

Ministry for the Environment. (2021) Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils. ISBN:987-0-478-37260-1

Ministry for the Environment. (2011) Ministry for the Environment Hazardous Activities and Industries List.

Ministry for the Environment. (1997) Guidelines for Assessing and Managing Contaminated Gasworks Sites in New Zealand.

Selwyn District Council. Rates Information. Retrieved May 2022, from https://www.selwyn.govt.nz/services/rates/property-search

Wiley Geotechnical Ltd. (2021) Preliminary Environmental Site Investigation. Reference C21123.002.000.

LIMITATIONS

(i) This report has been prepared for the use of our client, Kevler Developments Ltd., and their professional advisers, and the relevant Regional 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) Assessments made in this report are based on the ground conditions indicated from published sources, site inspections and subsurface investigations described in this report based on accepted normal methods of site investigations. Variations in ground conditions may exist between test locations and therefore have not been taken into account in the report.

(iii) This Limitation should be read in conjunction with the IPENZ/ACENZ Standard Terms of Engagement.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned if you require any further information.

Report prepared by

Helen Kellett

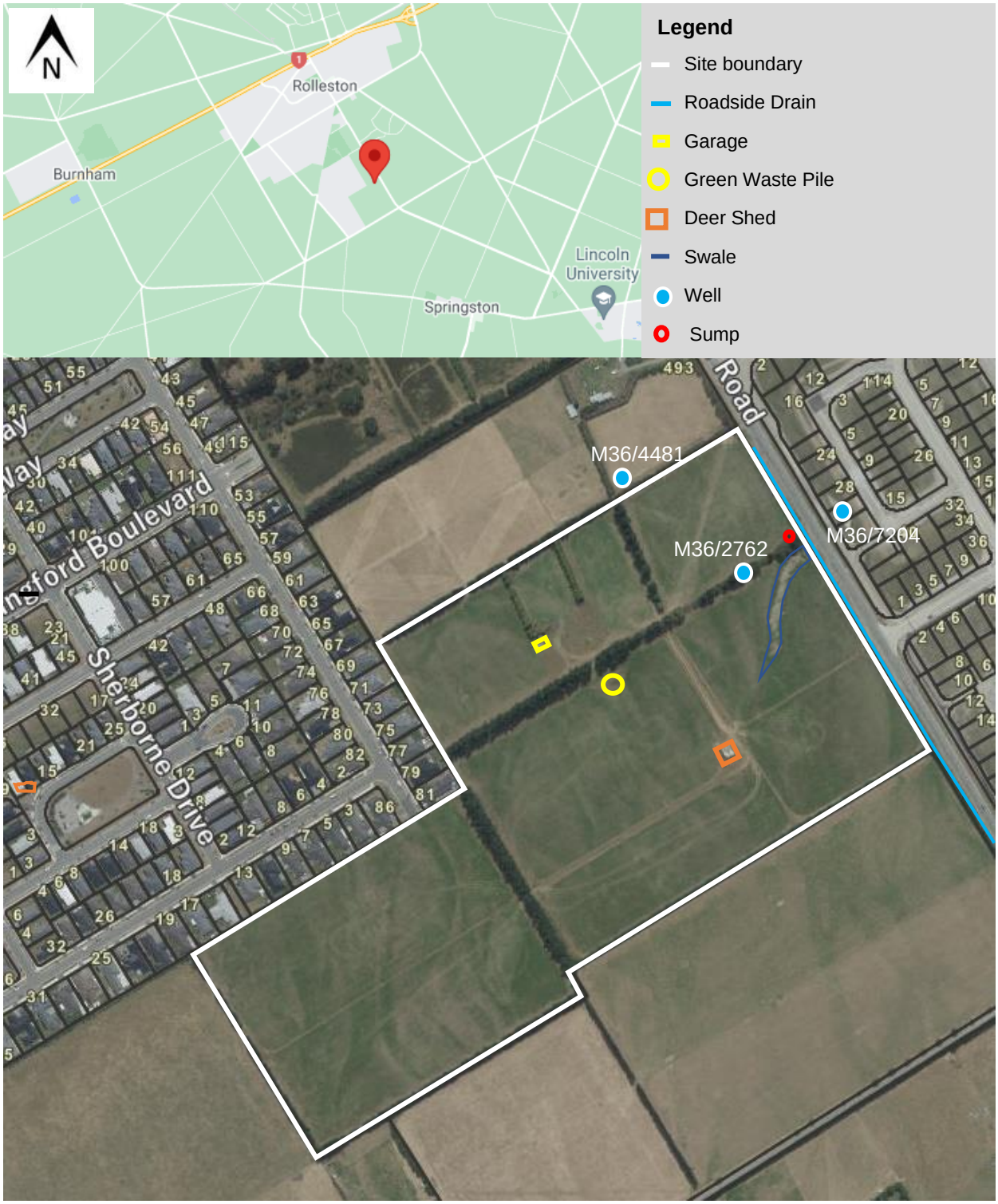
Environmental Scientist

Reviewed by

Claude Midgley, CEnvP

Associate Environmental Scientist

Appendix 1: Site Location Plan



Images sourced from Google Maps and Canterbury Maps. Well locations sourced from Environment Canterbury.

Appendix 2: Risk Area Map

Images sourced from Google Maps

Appendix 3: Laboratory Results

Hill Laboratories
TRIED, TESTED AND TRUSTED

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

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Certificate of Analysis

Client:	Wiley Geotechnical Limited	**Lab No:**	2987066	SPv1
Contact:	Helen Kellett	**Date Received:**	13-May-2022	
	C/- Wiley Geotechnical Limited	**Date Reported:**	19-May-2022	
	PO Box 21171	**Quote No:**	76081	
	Edgeware	**Order No:**	C21123	
	Christchurch 8143	**Client Reference:**	C21123	
		Submitted By:	Helen Kellett	

Sample Type: Soil

Sample Name:		SS01 13-May-2022 4:48 pm	SS02 13-May-2022 4:55 pm			
Lab Number:		2987066.1	2987066.2			
Individual Tests						
Dry Matter	g/100g as rcvd	89	90	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	4	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.11	0.12	-	-	-
Total Recoverable Chromium	mg/kg dry wt	12	12	-	-	-
Total Recoverable Copper	mg/kg dry wt	5	5	-	-	-
Total Recoverable Lead	mg/kg dry wt	13.1	15.6	-	-	-
Total Recoverable Nickel	mg/kg dry wt	9	8	-	-	-
Total Recoverable Zinc	mg/kg dry wt	54	82	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Acenaphthene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Anthracene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.011	< 0.012	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.016	< 0.012	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Chrysene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Fluoranthene	mg/kg dry wt	0.013	0.016	-	-	-
Fluorene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.017	< 0.012	-	-	-
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Perylene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Phenanthrene	mg/kg dry wt	< 0.011	< 0.012	-	-	-
Pyrene	mg/kg dry wt	0.016	0.015	-	-	-

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-2
Total of Reported PAHs in Soil	Sonication extraction, GC-MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	1-2
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-2
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	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
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	1-2
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	1-2

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

Testing was completed between 18-May-2022 and 19-May-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.

Ara Heron BSc (Tech)
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