Sampling Summary Report - 1484 and 1534 Teviot Road

Hawkeswood Civil Limited have engaged Environmental Consultants Otago Limited (EC Otago) to prepare this summary report detailing the soil sampling and analysis that has been undertaken of two areas of land within adjoining properties at 1484 and 1534 Teviot Road (Figure 1). The area of land within 1484 Teviot Road presently contains a farm shed and stock yards, and the area of land within 1534 Teviot Road formerly contained a set of stockyards in the 1970s. A statement of EC Otago's experience as a suitably qualified and experienced person is attached as Appendix A.

This report has been prepared in response to a Section 92 (s92) request for further information dated 16 November 2023 from Central Otago District Council (CODC) in relation to Land Use Consent RC 230325 to establish and operate an alluvial gold mining operation. Of relevance to this report, the letter stated "*10. Confirm if the stockyard area is excluded from mining operations*". Both the existing and the former stock yard locations are within the presently proposed mining extent and this report addresses both locations.

The area subject of this investigation is a part of a large area of land near Millers Flat between Teviot Road and the Clutha River. Part of the proposed mining site, 1484 Teviot Road, has been addressed in a Preliminary Site Investigation (PSI)[1] prepared by EC Otago in 2022, and this report is supplementary to the PSI. The stockyard areas subject of the s92 letter contained within 1534 Teviot Road lie outside (to the immediate south of) the extent of the area covered by the PSI which had the primary purpose of assessing the Hazardous Activities and Industries List (HAIL) status of the former Millers Flat landfill site in a former railways gravel quarry.

Figure 1: The property at 1534 Teviot Road, outlined in a yellow dashed line with the areas subject of this investigation outlined with a dashed blue line (CODC GIS, Digital map data sourced from LINZ, CC BY 4.0 NZ).

[1] EC Otago, 2022. *Preliminary Site Investigation 1484 Teviot Road Millers Flat.*

Site History

The site history is relatively well represented by the historical photographic records in the PSI, with the earliest image from 1903 and aerial images covering the site dating 1944, 1959, 1963, 1968, 1969, 1974, 1975, 1980 and 1983 from the Retrolens website, from 1951, from the VC Browne collection, and images from 2005 to 2020 from Google Earth, from 2008, 2009 and 2012 from Google Street View, and undated more recent photography from the CODC GIS.

The historical photography shows the old yards within 1534 Teviot Road are not present in any image prior to and including 1968 but are present in the 1974 (Figure 2). The yards are no longer evident in the imagery from 1980 and 1983 (not shown), however these images are of poorer quality. The former yards are confirmed to be absent by the next image in 2005. The current yards are not present in the 1983 image but are present in the 2005 Google Earth image. The farm shed located by the current yards is not present in 2005 but is evident in a Google Street View image dated January 2008.

Site Inspection

The site inspection included an on-site meeting with the property owner (Alan Parker) on 27 November 2023 which confirmed that the sampling undertaken on that date at the old yard area was correctly located. Mr Parker has lived on the property since the 1960s as his father owned the land before him. He remembers the old yards as being a small ramshackle facility that did not work effectively so it was removed and had only been in place for about ten years.

The location of the old yards was on a low gravel ridge to the south of the present gravel access road and farm track. This feature is evident as the more sparsely vegetated feature in the central foreground of Figure 3 to the right of the farm track. There is no evidence of the yards remaining at this location.

Figure 2: The stockyard sites are shown as red circles over the 1974 aerial with sampling locations shown with lilac dots. The location of the 1974 stockyards was confirmed by overlying the 1974 image on a current Garmin Maps image with the sampling locations and scaled and registered against the three power poles circled in lilac (Sourced from http://retrolens.nz and licensed by LINZ CC-BY 3.0).

The current stockyard area is located beside the farm shed on the right hand side of Figure 3. These yards and shed are a relatively recent construction and post-date the historical use of persistent pesticides such as Organochlorine Pesticides (OCP). The shed is used to garage a tractor and agricultural spray unit and to store bulk agrichemicals. It was used for hay storage in the 2008-2012 Google Street View images. There is a 2,000 l above ground diesel tank at the rear of the shed as shown in Figure 4. The shed incudes a walled off chemical store at the rear of one of the shed bays as shown in Figure 5. The only agrichemicals stored were various brands of glyphosate (herbicides) in a mix of bulk containers of between 20 l and 1,000 l capacity. The shed area is tidy but there are extensive areas of bare ground surrounding the shed that would indicate that glyphosate has been spilled or equipment washed out in this area. There is no evidence of significant fuel spillage associated with the fuel tank.

Figure 3: Aerial photo showing the current yards and shed area on the right and former yard location on the left by the intersection of the farm track and access road (27 November 2023).

Figure 4: Bulk storage of fuel and glyphosate at rear of shed. The shed housed a tractor and spray unit and also an agrichemicals store that contained bulk glyphosate. The land around the shed shows vegetation that appears to have been affected by chemical spillage.

Figure 5: The farm shed with agrichemical enclosure at rear of left-hand bay.

Soil sampling

As a result of the potential for soil contamination arising from historical stock treatments at stockyards and from chemicals storage in and adjacent to the farm shed, sampling and analysis of the soil was undertaken by EC Otago on 27 November 2023. Twelve samples were collected across the former stockyard area and nine samples were collected adjacent to the shed and the current stockyard area as shown in Figure 6. Three samples were collected adjacent to the race area of the current yards, one sample by the fuel tank and four samples were taken around the immediate vicinity of the shed and bulk chemical storage area.

Samples collected from the current and former stockyards were analysed as composite samples consisting of three sub-samples each for heavy metals and OCP (the primary contaminants of concern associated with livestock treatments). The samples from adjacent to the tractor shed and bulk fuel tank (Yards B and C composites) were analysed for polycyclic aromatic hydrocarbons (PAH) rather than OCP, to assess for hydrocarbon contamination.

Figure 6: The sampling locations shown with green dots and sample label (Image © 2024 Airbus, Google Earth).

Results

The results are summarised in Table 1 and the full laboratory analysis reports are attached as Appendix B.

The results show that heavy metal concentrations in all samples are consistent with predicted background levels based on the underlying geology.

The PAH results are summarised in Table 1 as the Benzo[a]pyrene equivalent (BAP_{eq}) which represents the carcinogenic components. Concentrations of BAP_{eq} were below the limits of laboratory detection, however low levels of pyrene were detected in the Yards B composite (0.96 mg/kg dry weight).

The OCP results are summarised in Table 1 as the total DDT isomers, which is the only OCP detected. Low levels of 4,4'-DDE were detected in the MF C composite, however the total DDT isomer concentration is well below levels typically found in provincial land.

Table 1: Summary results of laboratory analysis

Sample [A]	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	DDT	BAP_{eq} [B]
Composite samples: Former stockyards (1534 Teviot Road)									
MF A1, MF A2 and MF A3	6	< 0.10	7	7	13.9	6	41	< 0.07	-
MF B1, MF B2 and MF B3	6	0.12	7	7	14.2	6	40	< 0.07	-
MF C1, MF C2 and MF C3	8	0.13	8	8	15.6	6	45	< 0.07	-
MF D1, MF D2 and MF D3	5	0.15	9	7	23	6	40	< 0.07	-
Composite samples: Current stockyards and shed (1484 Teviot Road)									
Yards A1, A2, A3	5	< 0.10	8	9	13.1	6	49	< 0.08	-
Yards B1, B2, B3	5	< 0.10	7	9	13.8	6	44	-	< 0.028
Yards C1, C2, C3	5	< 0.10	7	10	11.7	6	47	-	< 0.029
Predicted Background [C]									
Median	2.38	0.065	11.76	11.23	7.11	6.24	23.61	0.053	0.052
95th Quantile	9.97	0.33	56.88	48.14	25.83	35.15	97.97	0.245	0.64

[A] Results for total concentration analysis in mg/kg dry weight. Sample numbers are as marked in Figure 6. Cells highlighted yellow exceed the predicted background concentration.

[B] The benzo(a)pyrene equivalent (BAP_{eq}) is calculated as the sum of each of the detected concentrations of nine carcinogenic PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene and indeno(1,2,3-cd) pyrene), multiplied by their respective potency equivalency factors from Table 40 in the *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health* (Ministry for the Environment, 2011. Wellington).

[C] Landcare Research, 2015. *Background soil concentrations of selected trace elements and organic contaminants in New Zealand*. Predicted median and 95th Quantile reported for the site (Chemical4 Factor: mudstone Pakihi). BAP_{eq} and DDT for provincial land applied.

Conclusions

The results of sampling and analysis indicate that contaminant concentrations at all sampling locations are consistent with the predicted background levels, indicating that the presence of the stockyards on the site does not constitute a HAIL activity. Consequently, the *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (NES) does not apply to these two sections of land.

All contaminant concentrations reported were found to be well below the applicable human and environmental health guidelines and the site soils are highly unlikely to present a risk to human or environmental health.

Prepared by:

Ciaran Keogh, MBA, MRRP

Reviewed by:

Bernice Chapman, CEnvP, PhD, MEIANZ

Reference: 361-22 Millers Flat Stockyards
Date: 12 February 2024

Appendix A EC Otago Statement of Experience

Environmental Consultants Otago Limited (EC Otago) was established in Dunedin in 2014 when the principal, Ciaran Keogh, recognized the need for a dedicated environmental consultancy in the region. The company is particularly focused on contaminated land issues, with more than 400 site investigations completed. EC Otago undertakes the preparation of Preliminary and Detailed Site Investigation Reports, Assessments of Environmental Effects, Site Remedial Action Plans, Soil Disposition Reports and Site Validation Reports, working together with other environmental consultancies when a broader range of experience is required.

Ciaran Keogh - Principal and Senior Environmental Planner
Master of Regional and Resource Planning, Master of Business Administration.

Ciaran has over 13 years' experience focussing specifically on contaminated land investigations in Otago, and over 30 years' experience in environmental and RMA planning, and executive management in regional and local government. His experience includes feasibility, planning and visual assessments, site rehabilitation projects for landfills, mines and transmission lines and switchyards, and management of the preparation of regional and district plans and the supporting policy.

Ciaran has previously worked as the Director of Planning with Taupo District Council, CEO of Clutha District Council, General Manager of Wakool Shire Council (Australia) and CEO of Environment Southland.

Bernice Chapman - Senior Contaminated Land Consultant
CEnvP, PhD in Biochemistry, Member of the Environment Institute of Australia and New Zealand.

Berni is a Certified Environmental Practitioner (Certification Number 1376) who has worked in consultancy firms for over 20 years in the waste management, waste-to-energy and contaminated land sectors, with a focus on contaminated land management for the past 7 years with EC Otago. She has a strong ethos of waste minimisation, containment and management, the effective operation of existing resources with beneficial reuse where possible, protection of the environment and overall sustainability coupled with a pragmatic approach from direct involvement in day-to-day operations. Her experience includes preliminary and detailed site investigations, sampling and analysis, site remediation, feasibility studies, problem solving and process design. This work includes the management of a range of environmentally polluting industrial effluents, contaminated land investigations and site remediation.

Berni has previously worked as Laboratory Manager for Waste Solutions Ltd, an Associate for CPG New Zealand Ltd, and a Wastewater Treatment Specialist for ADI Systems.

Aleasha King – Contaminated Land Consultant
Graduate diploma in Geology, Master in Geophysics.

Aleasha is a Contaminated Land Consultant with a background in geology and geophysics and a strong commitment to the environment. Her experience in contaminated land investigations includes three years with EC Otago undertaking preliminary and detailed site investigations, sampling, data analysis and site remediation.

Aleasha has previously worked in Engineering Geology with experience in site soils investigations and bearing capacity assessments. For her master's degree, she studied the structure of the Alpine Fault at a formerly unmapped location on the West Coast of New Zealand.

Appendix B Hills Laboratory Analysis Reports

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Hamilton 3240 New Zealand

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www.hill-labs.co.nz

Certificate of Analysis

Client:	Environmental Consultants Otago Limited	**Lab No:**	3416107 SPv1
Contact:	Ciaran Keogh	**Date Received:**	28-Nov-2023
	C/- Environmental Consultants Otago Limited	**Date Reported:**	01-Dec-2023
	PO Box 5522	**Quote No:**	86979
	Dunedin 9058	**Order No:**	
		Client Reference:	Millers Flat
		Submitted By:	Bernice Chapman

Sample Type: Soil

Sample Name:		Composite of MF A1, MF A2 and MF A3	Composite of MF B1, MF B2 and MF B3	Composite of MF C1, MF C2 and MF C3	Composite of MF D1, MF D2 and MF D3
Lab Number:		3416107.13	3416107.14	3416107.15	3416107.16
Individual Tests					
Dry Matter	g/100g as rcvd	91	93	87	89
Heavy Metals, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	6	6	8	5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.12	0.13	0.15
Total Recoverable Chromium	mg/kg dry wt	7	7	8	9
Total Recoverable Copper	mg/kg dry wt	7	7	8	7
Total Recoverable Lead	mg/kg dry wt	13.9	14.2	15.6	23
Total Recoverable Nickel	mg/kg dry wt	6	6	6	6
Total Recoverable Zinc	mg/kg dry wt	41	40	45	40
Organochlorine Pesticides Screening in Soil					
Aldrin	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
alpha-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
beta-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
delta-BHC	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
gamma-BHC (Lindane)	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
cis-Chlordane	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
trans-Chlordane	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
2,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
4,4'-DDD	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
2,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
4,4'-DDE	mg/kg dry wt	< 0.011	< 0.011	0.023	< 0.011
2,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
4,4'-DDT	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
Total DDT Isomers	mg/kg dry wt	< 0.07	< 0.07	< 0.07	< 0.07
Dieldrin	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
Endosulfan I	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
Endosulfan II	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
Endosulfan sulphate	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
Endrin	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
Endrin aldehyde	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
Endrin ketone	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
Heptachlor	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
Heptachlor epoxide	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
Hexachlorobenzene	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011
Methoxychlor	mg/kg dry wt	< 0.011	< 0.011	< 0.012	< 0.011

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 Labs, 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%.	-	13-16
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	13-16
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	13-16
Dry Matter	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	13-16
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-12

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

Testing was completed between 28-Nov-2023 and 01-Dec-2023. 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)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Environmental Consultants Otago Limited	**Lab No:**	3416542 SPv1
Contact:	Ciaran Keogh C/- Environmental Consultants Otago Limited PO Box 5522 Dunedin 9058	**Date Received:**	28-Nov-2023
		Date Reported:	05-Dec-2023
		Quote No:	86979
		Order No:	
		Client Reference:	Millers Flat
		Submitted By:	Bernice Chapman

Sample Type: Soil

Sample Name:		Composite of Yards A1, Yards A2 and Yards A3	Composite of Yards B1, Yards B2 and Yards B3	Composite of Yards C1, Yards C2 and Yards C3
Lab Number:		3416542.10	3416542.11	3416542.12
Individual Tests				
Dry Matter	g/100g as rcvd	81	84	85
Heavy Metals, Screen Level				
Total Recoverable Arsenic	mg/kg dry wt	5	5	5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	8	7	7
Total Recoverable Copper	mg/kg dry wt	9	9	10
Total Recoverable Lead	mg/kg dry wt	13.1	13.8	11.7
Total Recoverable Nickel	mg/kg dry wt	6	6	6
Total Recoverable Zinc	mg/kg dry wt	49	44	47
Organochlorine Pesticides Screening in Soil				
Aldrin	mg/kg dry wt	< 0.012	-	-
alpha-BHC	mg/kg dry wt	< 0.012	-	-
beta-BHC	mg/kg dry wt	< 0.012	-	-
delta-BHC	mg/kg dry wt	< 0.012	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.012	-	-
cis-Chlordane	mg/kg dry wt	< 0.012	-	-
trans-Chlordane	mg/kg dry wt	< 0.012	-	-
2,4'-DDD	mg/kg dry wt	< 0.012	-	-
4,4'-DDD	mg/kg dry wt	< 0.012	-	-
2,4'-DDE	mg/kg dry wt	< 0.012	-	-
4,4'-DDE	mg/kg dry wt	< 0.012	-	-
2,4'-DDT	mg/kg dry wt	< 0.012	-	-
4,4'-DDT	mg/kg dry wt	< 0.012	-	-
Total DDT Isomers	mg/kg dry wt	< 0.08	-	-
Dieldrin	mg/kg dry wt	< 0.012	-	-
Endosulfan I	mg/kg dry wt	< 0.012	-	-
Endosulfan II	mg/kg dry wt	< 0.012	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.012	-	-
Endrin	mg/kg dry wt	< 0.012	-	-
Endrin aldehyde	mg/kg dry wt	< 0.012	-	-
Endrin ketone	mg/kg dry wt	< 0.012	-	-
Heptachlor	mg/kg dry wt	< 0.012	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.012	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.012	-	-
Methoxychlor	mg/kg dry wt	< 0.012	-	-

Sample Type: Soil				
Sample Name:		Composite of Yards A1, Yards A2 and Yards A3	Composite of Yards B1, Yards B2 and Yards B3	Composite of Yards C1, Yards C2 and Yards C3
Lab Number:		3416542.10	3416542.11	3416542.12
Polycyclic Aromatic Hydrocarbons Screening in Soil*				
Total of Reported PAHs in Soil	mg/kg dry wt	-	< 1.5	< 0.3
1-Methylnaphthalene	mg/kg dry wt	-	< 0.12	< 0.012
2-Methylnaphthalene	mg/kg dry wt	-	< 0.12	< 0.012
Acenaphthylene	mg/kg dry wt	-	< 0.12	< 0.012
Acenaphthene	mg/kg dry wt	-	< 0.12	< 0.012
Anthracene	mg/kg dry wt	-	< 0.12	< 0.012
Benzo[a]anthracene	mg/kg dry wt	-	< 0.012	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	< 0.012	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	< 0.028	< 0.029
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	< 0.028	< 0.029
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	< 0.012	< 0.012
Benzo[e]pyrene	mg/kg dry wt	-	< 0.012	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.012	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.012	< 0.012
Chrysene	mg/kg dry wt	-	< 0.012	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.012	< 0.012
Fluoranthene	mg/kg dry wt	-	< 0.012	< 0.012
Fluorene	mg/kg dry wt	-	< 0.12	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.012	< 0.012
Naphthalene	mg/kg dry wt	-	< 0.6	< 0.06
Perylene	mg/kg dry wt	-	< 0.012	< 0.012
Phenanthrene	mg/kg dry wt	-	< 0.12	< 0.012
Pyrene	mg/kg dry wt	-	0.96	< 0.012

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 Labs, 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%.	-	10-12
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	11-12
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	10-12
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	10
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.010 - 0.05 mg/kg dry wt	11-12
Dry Matter	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	10-12
Composite Environmental Solid Samples*	Individual sample fractions mixed together to form a composite fraction.	-	1-9
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.	0.024 mg/kg dry wt	11-12

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	11-12

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

Testing was completed between 28-Nov-2023 and 05-Dec-2023. 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.

Kim Harrison MSc
Client Services Manager - Environmental