JOB MEMORANDUM

To:	Martin Dancy		
CC:	Tony Hayman	From:	Geosciences Ltd
Date:	16 November 2021	Reference:	Mem-1676/SQI/Nov21
Subject:	**Soil Quality Investigation of Lot 2 of Subdivision of 404-424 Whitmore Road, Takatu.**		

Martin Dancy (the Client) requested Geosciences Ltd (GSL) to conduct a soil quality investigation (SQI) of a portion of the piece of land encompassed by 404-424 Whitmore Road, Takatu to address the requirements of Condition 8 subdivision consent SUB69376340. The properties are legally described as Lots 1, 2, 3, and 4 DP 510358 and encompasses an area of approximately 36 Ha, (Figure 1).

1 OBJECTIVE & PURPOSE

As a result of the use of a recycled tyre rubber material in the surface of a horse arena on the site, an assessment of the soil underlying the arena area of a portion of Lot 2 of the subdivision has been requested by Auckland Council. Specifically, condition 8 of subdivision consent SUB60376340 states:

> 8. *Prior to obtaining approval under Section 224(c) of the Resource Management Act 1991, the shallow sand and rubber chip layer within the former horse-riding arena area on Lot 2 must be removed and disposed of at a suitable landfill facility (unless Council's Team Leader Compliance Monitoring NW1 agrees in advance and in writing to an alternative) and the site contamination status of the remaining underlying soil on Lot 2 must be assessed by a suitably qualified and experienced contaminated land practitioner (SQEP), and a relevant report must be submitted to the Council for certification.*
>
> *If the contamination status within the former horse riding area is found to exceed the Soil Contaminant Standards set out in the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health, Ministry for the Environment (2011) of the Resource Management Act 1991, a Site Validation Report (SVR) shall be prepared by a SQEP in accordance with the Contaminated Land Management Guidelines, Nos 1 & 5, Ministry for the Environment (revised 2011) and provided to the Council. This must be presented to the Council for certification.*
>
> ***Advice Note:***
>
> *It is recommended that apart from the removing of the shallow sand and rubber-chip layer, another 100 mm layer of the underlying soil be scraped off, as well, prior to validation testing, as it may contain some elevated levels of contaminants.*

The objective and purpose of this investigation is therefore to investigate the soil quality underlying the arena in accordance with the requirements of the above consent condition and the MfE Contaminated Land Management Guidelines No. 1 *"Reporting on Contaminated Sites in New Zealand"* and No.5 *"Site Investigation and Analysis of Soils"*.

2 SOIL SAMPLING AND ANALYSIS

GSL personnel undertook an inspection of the site on 5 November 2021 for the purposes of collecting soil samples. A mechanical excavator was utilised to access the soil underlying the horse riding arena and four test pits were cut to the subgrade horizon underlying the arena. In all locations a similar profile was recorded, being 50-100mm thickness of coarse sand and shredded rubber material overlying a thickness of approximately 200 mm of compacted gravel hardstand, in turn directly overlying natural volcanic rich silty clay of the Pakiri Formation of Warkworth Subgroup deposits.

As the rubber chip material was noted to be evenly distributed through the uppermost sandy layer, and any impacts to the underlying soil would be through the diffuse percolation of rainwater from the sandy and rubber layer down through the compacted metal and into the subgrade below, a uniform distribution of any potential impacts to the underlying soil is to be expected. Consequently, GSL considers that four soil sample locations evenly distributed across the proposed building platform on the horse riding arena is sufficient to address the soil quality underlying the horse riding arena.

Soil samples were collected from the uppermost exposed soil layer underlying the sand / rubber and compacted gravel layer, being the subgrade horizon in each of the four test pits. Soil samples were collected using a stainless steel hand auger and were placed directly into laboratory provided glass sample jars with the date, sample identification number, GSL job identification number, depth, and initials of the sampler noted on the label. Jars were then placed in a chilly bin with ice packs in order to preserve any volatile compounds in the soil.

Soil sample locations are indicated on Figure 2.

2.1 QA/QC PROCEDURES

In undertaking this investigation, GSL has been cognisant of appropriate QA/QC procedures to maintain soil quality, including the following controls:

- Sampling equipment was decontaminated between samples using a soft soap solution in accordance with GSL's internal quality control procedures.
- Soil samples were dispatched by courier in a box containing a chain of custody form (CoC) indicating the analysis required to Eurofins Environment Testing in Penrose, Auckland for analysis. Soil samples were analysed for a suite of seven heavy metals and polycyclic aromatic hydrocarbons (PAHs).
- Utilisation of an appropriately accredited laboratory for analysis of samples. Eurofins are accredited by International Accreditation New Zealand (IANZ) for the analyses conducted and have included QA/QC processes in their assessment.

Consequently, appropriate QA/QC procedures have been followed during this assessment.

2.2 ANALYTICAL RESULTS

A summary of the analytical results is provided in Table 1 below. Copies of the laboratory transcripts are appended to this memorandum, while indicative soil sample locations are shown in Figure 2.

Table 1: Analytical Results[1]

	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	BaP
SS1	2.7	0.02	36	4.7	3.4	1.4	<5	ND
SS2	3.3	<0.01	43	5.1	4.3	1.9	<5	ND
SS3	2.9	0.01	36	4.3	3.4	1.5	<5	ND
SS4	3.6	0.01	42	4.8	4.5	1.6	<5	ND
NES[2]	17	0.8	290	>10,000	160	NL	NL	6
Background[3]	0.4 - 12	<0.1 - 0.65	3-125	20-90	<5 - 65	4-320	54-1,160	ND

Notes:

1. All concentrations, reported in mg/kg;
2. National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect human Health - Rural residential landuse with 25% homegrown produce.
3. Auckland Regional Council Technical Publication No. 153 - Naturally occurring background concentration ranges for inorganic elements in volcanic soils in the Auckland Region
4. Values in **BOLD** exceed the NES criteria, values **in BOLD** exceed the background ranges

2.3 DISCUSSION

All soil samples returned concentrations of heavy metals within the expected naturally occurring background concentrations for volcanic soil in the Auckland Region and concentrations of PAHs below the laboratory limits of reporting. Therefore, all soil samples are considered consistent with the AUP(OP) definition of cleanfill material.

3 SITE CONTAMINATION ASSESSMENT

Assessment of soil underlying the shredded rubber utilised within the horse area has determined that all priority contaminants are within the expected naturally occurring background ranges. Therefore, the piece of land meets the definition of land not covered under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health and does not meet the definition of contaminated land under the AUP(OP). As all concentrations of contaminants fall within the expected naturally occurring background ranges, and / or below the laboratory limits of detection, there is no requirement for any further validation soil sampling or site validation reporting as noted in Condition 8 of SUB60376340.

As the material directly underlying the arena meets the AUP(OP) definition of cleanfill, no further work, once the surficial sand and rubber layer has been removed and the arena decommissioned, is considered necessary.

4 CONCLUDING COMMENT

Assessment of soil underlying the horse riding arena on Lot 2 of the subdivision has revealed that the soil is consistent with the expected naturally occurring background ranges for volcanic soils of the Auckland Region and would therefore be consistent with the AUP(OP) definition of cleanfill.

No further work, with respect to Condition 8 of SUB60376340, or the NES, is considered necessary.

Thank you for the opportunity to undertake this investigation. Should you have any queries regarding this report please do not hesitate to contact us on 09 475 0222.

Report prepared on behalf of GSL by:	Report authorised on behalf of GSL by:
	
David Wilkinson Senior Environmental Scientist Geosciences Ltd	Carl O'Brien Director Geosciences Ltd

Disclaimer

This report is provided on the condition that Geosciences Ltd disclaims all liability to any person or entity other than the client and Auckland Council in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by any such person in reliance, whether in whole or in part, on the contents of this report. Furthermore, Geosciences Ltd disclaims all liability in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by the client, or any such person in reliance, whether in whole or any part of the contents of this report of all matters not stated in the brief outlined in our proposal and according to our general terms and conditions and special terms and conditions for contaminated sites.

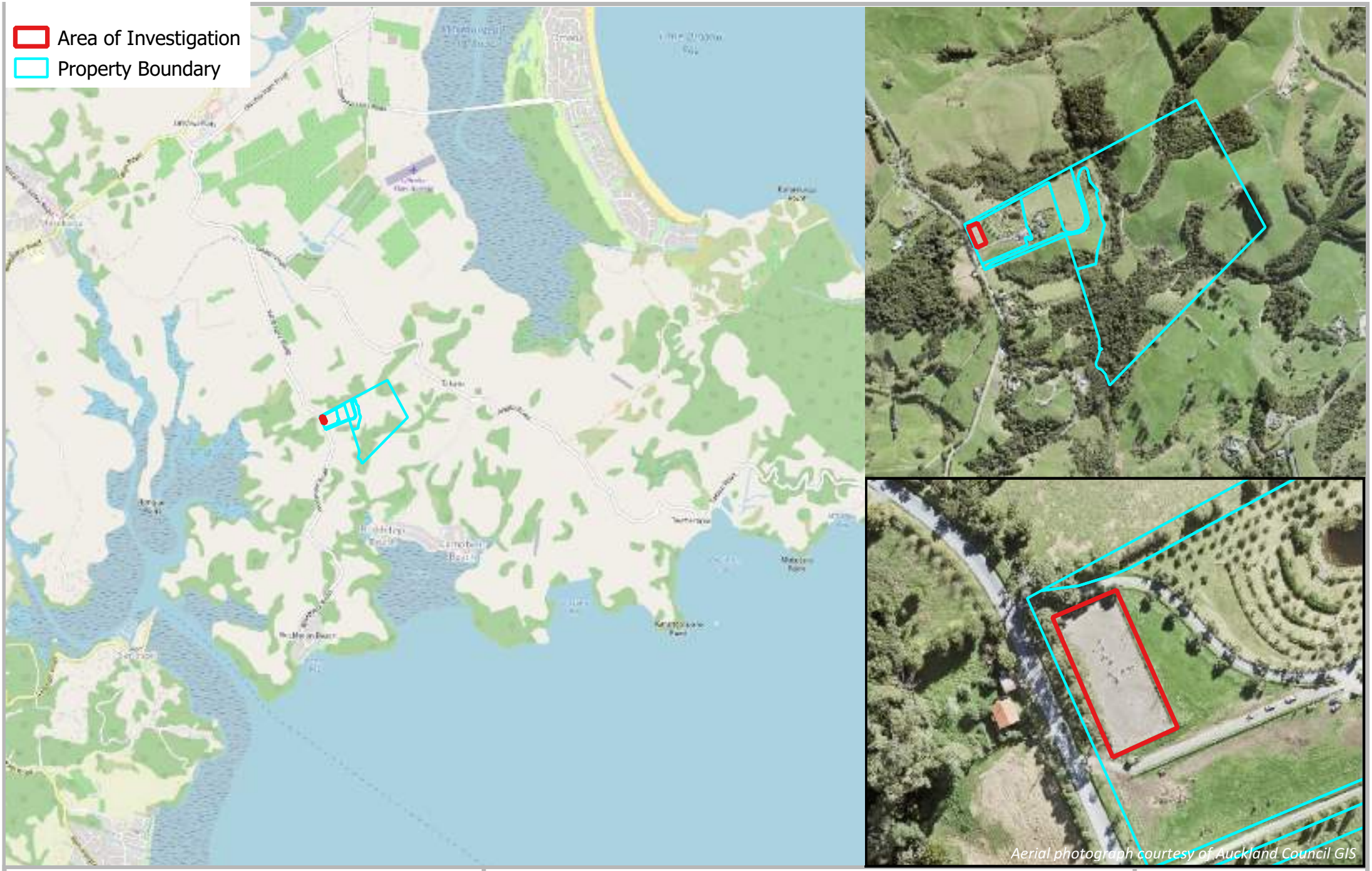
Statement

This site investigation has been managed by a suitably qualified and experienced practitioner (SQEP); and reported on in accordance with the current edition of the Ministry for the *Environment's Contaminated Land Management Guidelines No.1 – Reporting on Contaminated Sites in New Zealand.*

Limitations

The conclusions and all information in this Report are given strictly in accordance with and subject to the following limitations and recommendations:

1. The assessment undertaken to form this conclusion is limited to the scope of work agreed between GSL and the client, or the client's agent as outlined in this Report. This report has been prepared for the sole benefit of the client and neither the whole nor any part of this report may be used or relied upon by any other party.
2. The investigations carried out for the purposes of the report have been undertaken, and the report has been prepared, in accordance with normal prudent practice and by reference to applicable environmental regulatory authority and industry standards, guidelines and assessment criteria in existence at the date of this report.
3. This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by GSL for use of any part of this report in any other context.
4. This Report was prepared on the dates and times as referenced in the report and is based on the conditions encountered on the site and information reviewed during the time of preparation. GSL accepts no responsibility for any changes in site conditions or in the information reviewed that have occurred after this period of time.
5. Where this report indicates that information has been provided to GSL by third parties, GSL has made no independent verification of this information except as expressly stated in the report. GSL assumes no liability for any inaccuracies in or omissions to that information.
6. Environmental studies identify actual sub-surface conditions only at those points where samples are taken and when they are taken. Actual conditions between sampling locations or differ from those inferred. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from that predicted. Nothing can be done to prevent the unanticipated and GSL does not guarantee that contamination does not exist at the site.
7. No investigations have been undertaken into any off-site conditions, or whether any adjoining sites may have been impacted by contamination or other conditions originating from this site. The conclusion set out above is based solely on the information and findings contained in this report.
8. Except as specifically stated above, GSL makes no warranty, statement or representation of any kind concerning the suitability of the site for any purpose or the permissibility of any use, development or re-development of the site.
9. GSL makes no determination or recommendation regarding a decision to provide or not to provide financing with respect to the site. The on-going use of the site and/or use of the site for any different purpose may require the owner/user to manage and/or remediate site conditions, such as contamination and other conditions, including but not limited to conditions referred to in this report.
10. Except as required by law, no third party may use or rely on, this report unless otherwise agreed by GSL in writing. Where such agreement is provided, GSL will provide a letter of reliance to the agreed third party in the form required by GSL.
11. To the extent permitted by law, GSL expressly disclaims and excludes liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this Report. GSL does not admit that any action, liability or claim may exist or be available to any third party.
12. Except as specifically stated in this section, GSL does not authorise the use of this report by any third party.



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ENVIRONMENTAL
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Tel: (09) 475 0222

Figure 1 - Site Locality

404-424 Whitmore Road, Takatu

Reference:	J1676
Date:	15/11/2021
Drawn:	DW
Approved:	COB

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Figure 2 - Sample Location Plan

Proposed Lot 2, 404-424 Whitmore Road, Takatu

Reference:	J1676
Date:	15/11/2021
Drawn:	CD
Approved:	DW

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

Geosciences Ltd
First Floor, 47 Clyde Road
Browns Bay
Auckland NZ 0630

Attention: **Chris Davies**

Report **838542-S**
Project name 424 WHITMORE RD
Project ID J1676
Received Date Nov 05, 2021

Client Sample ID			**SS1 150mm**	**SS2 150mm**	**SS3 150mm**	**SS4 150mm**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**K21-No14376**	**K21-No14377**	**K21-No14378**	**K21-No14379**
Date Sampled			**Oct 05, 2021**	**Oct 05, 2021**	**Oct 05, 2021**	**Oct 05, 2021**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons (NZ MfE)						
Acenaphthene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Anthracene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benz(a)anthracene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene TEQ (lower bound)*	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene TEQ (medium bound)*	0.03	mg/kg	0.04	0.04	0.04	0.04
Benzo(a)pyrene TEQ (upper bound)*	0.03	mg/kg	0.08	0.08	0.08	0.08
Benzo(b&j)fluoranthene[N07]	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g.h.i)perylene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(k)fluoranthene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Chrysene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Dibenz(a.h)anthracene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1.2.3-cd)pyrene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Naphthalene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Pyrene	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
p-Terphenyl-d14 (surr.)	1	%	INT	INT	INT	INT
2-Fluorobiphenyl (surr.)	1	%	INT	INT	INT	INT
Metals M7 (NZ MfE)						
Arsenic	0.1	mg/kg	2.7	3.3	2.9	3.6
Cadmium	0.01	mg/kg	0.02	< 0.01	0.01	0.01
Chromium	0.1	mg/kg	36	43	36	42
Copper	0.1	mg/kg	4.7	5.1	4.3	4.8
Lead	0.1	mg/kg	3.4	4.3	3.4	4.5
Nickel	0.1	mg/kg	1.4	1.9	1.5	1.6
Zinc	5	mg/kg	< 5	< 5	< 5	< 5
% Moisture	1	%	29	29	29	29

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Polycyclic Aromatic Hydrocarbons (NZ MfE)	Auckland	Nov 08, 2021	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water by GC MSMS			
Metals M7 (NZ MfE)	Auckland	Nov 08, 2021	6 Months
- Method: LTM-MET-3040 Metals in Waters Soils Sediments by ICP-MS			
% Moisture	Auckland	Nov 08, 2021	14 Days
- Method: LTM-GEN-7080 Moisture Content in Soil by Gravimetry			

eurofins | Environment Testing

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Project Name: 424 WHITEMORE RD
Project ID: J1676

Order No.:
Report #: 838542
Phone: 0011 64 9 4760 454
Fax:

Received: Nov 5, 2021 9:00 AM
Due: Nov 12, 2021
Priority: 5 Day
Contact Name: Chris Davies

Eurofins Analytical Services Manager : Karishma Patel

Sample Detail						Moisture Set	Metals M7 (NZ MfE)	Polycyclic Aromatic Hydrocarbons (NZ MfE)
Auckland Laboratory - IANZ# 1327						X	X	X
Christchurch Laboratory - IANZ# 1290								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	SS1 150mm	Oct 05, 2021		Soil	K21-No14376	X	X	X
2	SS2 150mm	Oct 05, 2021		Soil	K21-No14377	X	X	X
3	SS3 150mm	Oct 05, 2021		Soil	K21-No14378	X	X	X
4	SS4 150mm	Oct 05, 2021		Soil	K21-No14379	X	X	X
Test Counts						4	4	4

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

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

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

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

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

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs..

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM where no positive PFAS results have been reported have been reviewed and no data was affected.

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QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Polycyclic Aromatic Hydrocarbons (NZ MfE)							
Acenaphthene	mg/kg	< 0.03			0.03	Pass	
Acenaphthylene	mg/kg	< 0.03			0.03	Pass	
Anthracene	mg/kg	< 0.03			0.03	Pass	
Benz(a)anthracene	mg/kg	< 0.03			0.03	Pass	
Benzo(a)pyrene	mg/kg	< 0.03			0.03	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.03			0.03	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.03			0.03	Pass	
Chrysene	mg/kg	< 0.03			0.03	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.03			0.03	Pass	
Fluoranthene	mg/kg	< 0.03			0.03	Pass	
Fluorene	mg/kg	< 0.03			0.03	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.03			0.03	Pass	
Naphthalene	mg/kg	< 0.1			0.1	Pass	
Phenanthrene	mg/kg	< 0.03			0.03	Pass	
Pyrene	mg/kg	< 0.03			0.03	Pass	
Method Blank							
Metals M7 (NZ MfE)							
Arsenic	mg/kg	< 0.1			0.1	Pass	
Cadmium	mg/kg	< 0.01			0.01	Pass	
Chromium	mg/kg	< 0.1			0.1	Pass	
Copper	mg/kg	< 0.1			0.1	Pass	
Lead	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 0.1			0.1	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons (NZ MfE)							
Acenaphthene	%	104			70-130	Pass	
Acenaphthylene	%	85			70-130	Pass	
Anthracene	%	108			70-130	Pass	
Benz(a)anthracene	%	112			70-130	Pass	
Benzo(a)pyrene	%	119			70-130	Pass	
Benzo(b&j)fluoranthene	%	129			70-130	Pass	
Benzo(g.h.i)perylene	%	91			70-130	Pass	
Benzo(k)fluoranthene	%	102			70-130	Pass	
Chrysene	%	115			70-130	Pass	
Dibenz(a.h)anthracene	%	71			70-130	Pass	
Fluoranthene	%	74			70-130	Pass	
Fluorene	%	72			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	74			70-130	Pass	
Naphthalene	%	96			70-130	Pass	
Phenanthrene	%	72			70-130	Pass	
Pyrene	%	73			70-130	Pass	
LCS - % Recovery							
Metals M7 (NZ MfE)							
Arsenic	%	98			80-120	Pass	
Cadmium	%	93			80-120	Pass	
Chromium	%	99			80-120	Pass	
Copper	%	98			80-120	Pass	
Lead	%	98			80-120	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Nickel			%	98			80-120	Pass	
Zinc			%	101			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons (NZ MfE)				Result 1					
Acenaphthene	K21-No21257	NCP	%	106			70-130	Pass	
Acenaphthylene	K21-No21257	NCP	%	84			70-130	Pass	
Anthracene	K21-No21257	NCP	%	102			70-130	Pass	
Benz(a)anthracene	K21-No21257	NCP	%	81			70-130	Pass	
Benzo(a)pyrene	K21-No21257	NCP	%	88			70-130	Pass	
Benzo(b&j)fluoranthene	K21-No07943	NCP	%	74			70-130	Pass	
Benzo(g.h.i)perylene	K21-No21257	NCP	%	96			70-130	Pass	
Benzo(k)fluoranthene	K21-No00987	NCP	%	113			70-130	Pass	
Chrysene	K21-No21257	NCP	%	107			70-130	Pass	
Dibenz(a.h)anthracene	K21-No21257	NCP	%	74			70-130	Pass	
Fluoranthene	K21-No07943	NCP	%	75			70-130	Pass	
Fluorene	K21-No21257	NCP	%	72			70-130	Pass	
Indeno(1.2.3-cd)pyrene	K21-No21257	NCP	%	72			70-130	Pass	
Naphthalene	K21-No21257	NCP	%	91			70-130	Pass	
Phenanthrene	K21-No07943	NCP	%	82			70-130	Pass	
Pyrene	K21-No07943	NCP	%	82			70-130	Pass	
Spike - % Recovery									
Metals M7 (NZ MfE)				Result 1					
Arsenic	K21-No14579	NCP	%	87			75-125	Pass	
Cadmium	K21-No14579	NCP	%	88			75-125	Pass	
Chromium	K21-No14579	NCP	%	82			75-125	Pass	
Copper	K21-No14579	NCP	%	84			75-125	Pass	
Lead	K21-No14579	NCP	%	94			75-125	Pass	
Nickel	K21-No14579	NCP	%	83			75-125	Pass	
Zinc	K21-No14579	NCP	%	89			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Metals M7 (NZ MfE)				Result 1	Result 2	RPD			
Arsenic	K21-No14578	NCP	mg/kg	5.7	5.1	11	30%	Pass	
Cadmium	K21-No14578	NCP	mg/kg	0.17	0.16	9.0	30%	Pass	
Chromium	K21-No14578	NCP	mg/kg	22	25	9.0	30%	Pass	
Copper	K21-No14578	NCP	mg/kg	16	12	26	30%	Pass	
Lead	K21-No14578	NCP	mg/kg	16	14	11	30%	Pass	
Nickel	K21-No14578	NCP	mg/kg	13	11	19	30%	Pass	
Zinc	K21-No14578	NCP	mg/kg	53	51	4.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	K21-No14582	NCP	%	32	32	2.0	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised by:

Karishma Patel	Analytical Services Manager
Michael Ritchie	Senior Analyst-Organic (NZN)
Shasti Ramachandran	Senior Analyst-Metal (NZN)

Michael Ritchie
Head of Semi Volatiles (Key Technical Personnel)

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

CHAIN OF CUSTODY RECORD

Company	Geosciences Ltd
Address	47 Clyde Road, Browns Bay, Auckland, 0630
Contact Name	Chris Davies
Phone №	09 475 0222
Special Directions	
Purchase Order	
Quote ID №	

Project №	J1676
Project Name	424 Whitmore Rd
Sampler	CD
Handed over by	CD
Email for Invoice	[illegible]@geosciences.co.nz
Email for Results	chris@geosciences.co.nz; carl@geosciences.co.nz

Turnaround time: ☐ Overnight (reporting by 9am) ☐ Same day ☐ 1 day ☐ 2 days ☐ 3 days ☒ 5 days (Standard) ☐ Other

№	Client Sample ID	Sample Date/Time	Matrix	Metals (NZ MF)	PAH (NZ MF)	Jar (Glass or HDPE)	Sample Comments
1	SS1 150mm	5/10/2021	Soil	X	X	X	
2	SS2 150mm			X	X	X	
3	SS3 150mm			X	X	X	
4	SS4 150mm			X	X	X	
5							
6							
7							
8							
9							
10							
	Total Counts			4	4	4	

Method of Shipment	☐ Courier	☐ Hand Delivered	☐ Postal	Name: Chris Davies	Signature: CD	Date: 5/10/21
Received By		Signature	Date	Time	Temperature: 9.5
Received By: Kaushaya [illegible]		Signature: [signature]	Date: 8/10	Time: 9:00AM	Report №: 828542