



Environment Protection Authority

Captains Flat surface soil testing report



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The EPA tested soils on public and community spaces in Captains Flat in February 2021 to check for lead beyond the former Lake George Mine. This report summarises the test results.

Introduction

The former Lake George mine produced lead, zinc, copper, pyrite, silver and gold. When mining operations commenced in the area over 120 years ago, standards for environmental protection like dust management were very different. Soil and dust containing metals like lead would have been spread around the mine site during its operation, and at the loading site in the rail corridor. Waste was also stockpiled on the mine site.

Testing carried out by Transport for NSW has identified elevated lead levels in parts of the Captains Flat rail corridor beside the former Lake George Mine. This is likely to be the result of mined material being loaded onto rail cars for transportation.

While elevated levels of lead in and around the site of a former lead-producing mine are not unexpected, the NSW Government wanted to investigate levels of lead beyond the former Lake George mine site and rail corridor to keep the community safe and informed.

As part of the NSW Government investigation, the EPA carried out precautionary testing of surface soils on public and community spaces in the town, including the preschool, primary school, community hall, parks, roads and road reserves. The testing aimed to:

- identify if the surface soils are contaminated with lead, arsenic, copper and/or zinc
- work out if actions are required to protect human health.

Approach taken

Using a hand-held X-ray fluorescence (XRF) analyser, which is specialist equipment to measure lead, arsenic, copper and zinc in the field, the EPA screened soil to get an early indication of contaminant levels. If elevated levels were indicated, soil samples were collected and sent to a laboratory accredited by the National Association of Testing Authorities (NATA) for testing to confirm the levels of lead, arsenic, copper and zinc.

The soil testing involved shallow digging of surface soils, up to five small holes about 30–50 mm wide and 0–50 mm deep, within soft ground on each property, mostly in grassed areas, garden beds and vegetable gardens (i.e. outdoor areas that are not paved or concreted).

Figure 1 Screening soil at Captains Flat with an XRF analyser.
Photo: David Langston/EPA.



Test results

Eighty (80) screening tests were carried out around the town using the XRF analyser in the field. The EPA collected 33 soil samples for laboratory testing.

- **Attachment 1** shows the locations and the results of the surface soil testing.
- **Attachment 2** summarises the laboratory results for each location.
- **Attachment 3** gives the detailed laboratory reports.

Figure 2 An EPA sampler screening soil at Captains Flat. Photo: David Langston/EPA



What do the results mean?

The EPA has compared the results of the testing to national guidelines for contaminants in soil (known as the *National Environment Protection (Assessment of Site Contamination) Measure*). These guidelines provide health investigation levels which represent contamination levels in soil that warrant further investigation when exceeded. Exceedance of these levels does not necessarily indicate that there is a risk to human health. The way in which people are exposed to the contamination and how often this happens must also be considered to understand the potential risk to human health.

The comparison of results found that 14 of the 33 soil samples that were tested at the laboratory had concentrations of lead above the health investigation level for the relevant land use. Other

contaminants (i.e. arsenic, copper and zinc) were below the health investigation level for the relevant land use.

Tests carried out in the northern part of the village generally returned low readings, except for the park on the corner of Foxlow and Spring streets, known as Foxlow Parklet. A small disused garden at the school also returned slightly elevated lead levels, but the garden is not in use and is not accessible to students.

In the southern part of the village, closer to the former mine, readings were elevated above the health investigation levels for lead at some locations, including on the roadside on Foxlow Street, between the Captains Flat Hotel and the Captains Flat Fire Station, and at the preschool.

For residential land and schools, the health investigation level for lead is 300 mg/kg whereas the level for parks and reserves is 600 mg/kg. Levels higher than these indicate that there could be a risk to human health and further action is warranted, for example by considering the potential for exposure.

There are practical ways to manage potential exposure to lead in soil. More information on preventing lead exposure can be found on the [EPA's website](#).

Conclusion

Lead is present above the health investigation levels in some surface soils in public and community spaces in Captains Flat. The NSW Government will work with occupiers of these spaces and the community to help people understand the testing results and next steps. Managing lead in Captains Flat will require actions by the NSW Government, local council and community over several years. There are practical things community members can do to minimise their exposure to lead, such as:

- washing hands regularly to wash away dust
- covering patches of bare soil with grass or mulch to prevent dust
- using raised vegetable gardens with clean imported soil and washing vegetables before consuming.

Disclaimer

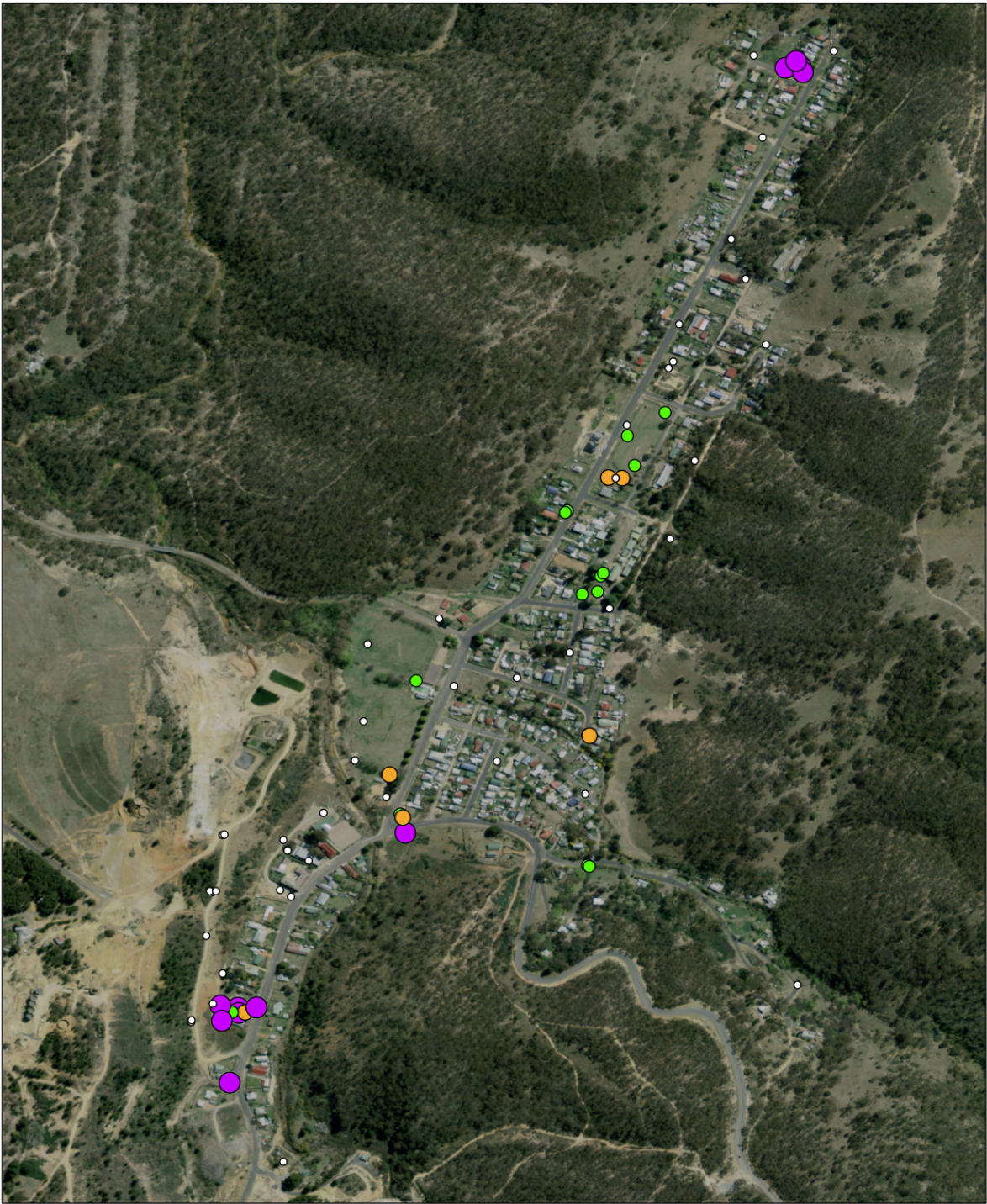
This report was prepared by the NSW Environment Protection Authority (EPA) to provide information about the soil testing that was carried out in the Captains Flat area in early 2021. The report is intended to guide the NSW Government in providing services, including public health services, to the community of Captains Flat in relation to the spread of lead from the former Lake George Captains Flat Mine. It is not intended to be used to establish a property's status for the purposes of any environmental planning or environment protection requirements relating to contaminated land, or in relation to the sale of land.

New information may be received after the publication of this report and readers should ensure they are using up-to-date information.

For individual medical advice, readers should consult their GP.

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Attachment 1: Map of testing locations



Legend

- XRF screening location

**Lead concentration (mg/kg)
Laboratory samples**

- < 300
- 300 - 600
- > 600

**Captains Flat
Precautionary Testing for
Lead in Surface Soils**

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This map is not guaranteed to be free from error or omission. The Department and its employees disclaim liability for any act done on the information in the map and any consequences of such acts or omissions.

0 0.05 0.11 0.165 0.22
Datum/Projection: GCS GDA 1994

N

Note: Where XRF screening indicated a lead concentration approaching the relevant health investigation level, a soil sample was collected and subject to laboratory analysis.

Attachment 2: Summary of laboratory results

See the section on “What do the results mean?” on pages 2 and 3 of this report for information to help you understand the results in this table.

ID Name	Sample date	Comments	Lead mg/kg	Arsenic mg/kg	Copper mg/kg	Zinc mg/kg
CFCC001	2-Feb-21	Preschool	790	24	140	920
CFCC002	2-Feb-21	Preschool	850	18	180	3200
CFCC003	2-Feb-21	Preschool	320	12	55	330
CFCC004	2-Feb-21	Preschool (sand pit)	1	<4	<1	3
CFPS001	2-Feb-21	Captains Flat School	10	<4	6	47
CFPS002	2-Feb-21	Captains Flat School	2	<4	1	4
CFPS003	2-Feb-21	Captains Flat School	240	15	36	350
CFPS004	2-Feb-21	Captains Flat School	200	16	40	480
CFPS005	2-Feb-21	Captains Flat School	150	19	22	130
CFPS006	2-Feb-21	Captains Flat School	190	21	32	210
CFPS007	2-Feb-21	Captains Flat School	140	10	33	220
CN004-a	2-Feb-21	Foxlow Parklet	2700	44	75	190
CN004-b	2-Feb-21	Foxlow Parklet	720	22	79	1200
CN004-c	2-Feb-21	Foxlow Parklet	2300	69	67	240
CN004-d	2-Feb-21	Foxlow Parklet	1100	27	96	1100
CN009-a CN009-b	2-Feb-21	Foxlow St between Newman and Montgomery St	225*	12*	45*	700*
CS004-a CS004-b	2-Feb-21	Willow Rd between Wattle Ave and Kurrajong St	320*	8*	93*	1340*
CS007	3-Feb-21	Braidwood Rd south of Men's Shed	700	79	110	1,100
CS010-a CS010-b	3-Feb-21	George St proximal to Captains Flat Rd intersection	260*	71*	46*	525*
CS013	3-Feb-21	Wilkins Park south of play area	400	13	73	550
CS015	3-Feb-21	Foxlow St south of Old Mine Road intersection	2,200	75	280	2,900
CS017	2-Feb-21	Pool grounds – grassed area	260	18	120	830
CS018	3-Feb-21	Outside preschool	1,900	66	300	3,000
NC001-a NC001-b NC001-c	2-Feb-21	Captains Flat Road (North) control sample	139**	25**	21**	111***

ID Name	Sample date	Comments	Lead mg/kg	Arsenic mg/kg	Copper mg/kg	Zinc mg/kg
NC002-a NC002-b NC002-c	2-Feb-21	Lillydale Road (South) control sample	38**	<4**	10**	123**
Cfcc07	9-Feb-21	Reserve behind preschool	3,100	58	450	440
Cfcc08	9-Feb-21	Reserve behind preschool	2,400	69	430	2,400
Cfcg002	9-Feb-21	School garden (not in use)	400	35	45	310
Cfcg001	9-Feb-21	School garden (not in use)	380	44	38	200
Ms-a	10-Feb-21	Men's Shed	18	<4	4	68
Ms-b	10-Feb-21	Men's Shed	560	33	130	930
Fs-b	11-Feb-21	Fire station	390	17	30	260
Fs-a	11-Feb-21	Fire station	320	10	65	1,600

* Average of duplicate samples

** Average of triplicate samples

Attachment 3: Full laboratory reports

These begin on the next page.

Personal information (such as names, signatures and test results from private land) has been redacted from the laboratory reports. Test results for water tanks have also been redacted, as they fall outside the scope of this report.



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CERTIFICATE OF ANALYSIS 260929

Client Details

Client	Department of Planning, Industry and Environment
Attention	[REDACTED]
Address	PO Box 29, LIDCOMBE, NSW, 1825

Sample Details

Your Reference	<u>20210021</u>
Number of Samples	32 Solid, 3 Liquid
Date samples received	04/02/2021
Date completed instructions received	04/02/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	08/02/2021
Date of Issue	08/02/2021

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *

Results Approved By

Hannah Nguyen, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Acid Extractable metals in soil						
Our Reference		260929-1	260929-2	260929-3	260929-4	260929-5
Your Reference	UNITS	210158	210159	210160	210161	210162
Sample ID		NC001-a	NC001-b	NC001-c	NC002-a	NC002-b
Date Sampled		02/02/2021	02/02/2021	02/02/2021	02/02/2021	02/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Arsenic	mg/kg	30	17	29	<4	<4
Copper	mg/kg	14	26	24	12	12
Lead	mg/kg	96	140	180	50	35
Zinc	mg/kg	73	150	110	210	100
Iron	mg/kg	15,000	13,000	12,000	16,000	21,000

Acid Extractable metals in soil						
Our Reference		260929-6	260929-7	260929-8	260929-9	260929-10
Your Reference	UNITS	210163	210164	210165	210166	210167
Sample ID		NC002-c	CFPS001	CFPS002	CFPS003	CFPS004
Date Sampled		02/02/2021	02/02/2021	02/02/2021	02/02/2021	02/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Arsenic	mg/kg	<4	<4	<4	15	16
Copper	mg/kg	7	6	1	36	40
Lead	mg/kg	29	10	2	240	200
Zinc	mg/kg	62	47	4	350	480
Iron	mg/kg	23,000	3,400	1,800	23,000	19,000

Acid Extractable metals in soil						
Our Reference		260929-11	260929-12	260929-13	260929-14	260929-15
Your Reference	UNITS	210168	210169	210170	210171	210172
Sample ID		CFPS005	CFPS006	CFPS007	CFCC001	CFCC002
Date Sampled		02/02/2021	02/02/2021	02/02/2021	02/02/2021	02/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Arsenic	mg/kg	19	21	10	24	18
Copper	mg/kg	22	32	33	140	180
Lead	mg/kg	150	190	140	790	850
Zinc	mg/kg	130	210	220	920	3,200
Iron	mg/kg	17,000	24,000	18,000	15,000	20,000

Acid Extractable metals in soil						
Our Reference		260929-16	260929-17	260929-19	260929-20	260929-21
Your Reference	UNITS	210173	210174	210176	210177	210178
Sample ID		CFCC003	CFCC004	CN004-a	CN004-b	CN004-c
Date Sampled		02/02/2021	02/02/2021	02/02/2021	02/02/2021	02/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Arsenic	mg/kg	12	<4	44	22	69
Copper	mg/kg	55	<1	75	79	67
Lead	mg/kg	320	1	2,700	720	2,300
Zinc	mg/kg	330	3	190	1,200	240
Iron	mg/kg	15,000	1,600	24,000	15,000	17,000

Acid Extractable metals in soil						
Our Reference		260929-22	260929-23	260929-24	260929-25	260929-26
Your Reference	UNITS	210179	210180	210181	210182	210183
Sample ID		CN004-d	CN009-a	CN009-b	CS004-a	CS004-b
Date Sampled		02/02/2021	02/02/2021	02/02/2021	02/02/2021	02/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Arsenic	mg/kg	27	11	13	8	8
Copper	mg/kg	96	42	48	85	100
Lead	mg/kg	1,100	200	250	290	350
Zinc	mg/kg	1,100	700	700	980	1,700
Iron	mg/kg	26,000	13,000	14,000	17,000	15,000

Acid Extractable metals in soil						
Our Reference		260929-27	260929-29	260929-30	260929-31	260929-32
Your Reference	UNITS	210184	210186	210187	210188	210189
Sample ID		CS017	CS007	CS010-a	CS010-b	CS013
Date Sampled		02/02/2021	03/02/2021	03/02/2021	03/02/2021	03/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Arsenic	mg/kg	18	79	70	71	13
Copper	mg/kg	120	110	46	46	73
Lead	mg/kg	260	700	260	260	400
Zinc	mg/kg	830	1,100	530	520	550
Iron	mg/kg	12,000	26,000	20,000	19,000	10,000

Acid Extractable metals in soil			
Our Reference		260929-33	260929-34
Your Reference	UNITS	210190	210191
Sample ID		CS015	CS018
Date Sampled		03/02/2021	03/02/2021
Type of sample		Solid	Solid
Date prepared	-	08/02/2021	08/02/2021
Date analysed	-	08/02/2021	08/02/2021
Arsenic	mg/kg	75	66
Copper	mg/kg	280	300
Lead	mg/kg	2,200	1,900
Zinc	mg/kg	2,900	3,000
Iron	mg/kg	23,000	34,000

Client Reference: 20210021

Moisture						
Our Reference		260929-1	260929-2	260929-3	260929-4	260929-5
Your Reference	UNITS	210158	210159	210160	210161	210162
Sample ID		NC001-a	NC001-b	NC001-c	NC002-a	NC002-b
Date Sampled		02/02/2021	02/02/2021	02/02/2021	02/02/2021	02/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	05/02/2021	05/02/2021	05/02/2021	05/02/2021	05/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Moisture	%	16	22	21	25	18

Moisture						
Our Reference		260929-6	260929-7	260929-8	260929-9	260929-10
Your Reference	UNITS	210163	210164	210165	210166	210167
Sample ID		NC002-c	CFPS001	CFPS002	CFPS003	CFPS004
Date Sampled		02/02/2021	02/02/2021	02/02/2021	02/02/2021	02/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	05/02/2021	05/02/2021	05/02/2021	05/02/2021	05/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Moisture	%	11	29	3.6	20	18

Moisture						
Our Reference		260929-11	260929-12	260929-13	260929-14	260929-15
Your Reference	UNITS	210168	210169	210170	210171	210172
Sample ID		CFPS005	CFPS006	CFPS007	CFCC001	CFCC002
Date Sampled		02/02/2021	02/02/2021	02/02/2021	02/02/2021	02/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	05/02/2021	05/02/2021	05/02/2021	05/02/2021	05/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Moisture	%	24	31	29	26	18

Moisture						
Our Reference		260929-16	260929-17	260929-19	260929-20	260929-21
Your Reference	UNITS	210173	210174	210176	210177	210178
Sample ID		CFCC003	CFCC004	CN004-a	CN004-b	CN004-c
Date Sampled		02/02/2021	02/02/2021	02/02/2021	02/02/2021	02/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	05/02/2021	05/02/2021	05/02/2021	05/02/2021	05/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Moisture	%	25	0.5	22	40	29

Client Reference: 20210021

Moisture						
Our Reference		260929-22	260929-23	260929-24	260929-25	260929-26
Your Reference	UNITS	210179	210180	210181	210182	210183
Sample ID		CN004-d	CN009-a	CN009-b	CS004-a	CS004-b
Date Sampled		02/02/2021	02/02/2021	02/02/2021	02/02/2021	02/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	05/02/2021	05/02/2021	05/02/2021	05/02/2021	05/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Moisture	%	27	38	33	30	30

Moisture						
Our Reference		260929-27	260929-29	260929-30	260929-31	260929-32
Your Reference	UNITS	210184	210186	210187	210188	210189
Sample ID		CS017	CS007	CS010-a	CS010-b	CS013
Date Sampled		02/02/2021	03/02/2021	03/02/2021	03/02/2021	03/02/2021
Type of sample		Solid	Solid	Solid	Solid	Solid
Date prepared	-	05/02/2021	05/02/2021	05/02/2021	05/02/2021	05/02/2021
Date analysed	-	08/02/2021	08/02/2021	08/02/2021	08/02/2021	08/02/2021
Moisture	%	17	13	27	24	29

Moisture			
Our Reference		260929-33	260929-34
Your Reference	UNITS	210190	210191
Sample ID		CS015	CS018
Date Sampled		03/02/2021	03/02/2021
Type of sample		Solid	Solid
Date prepared	-	05/02/2021	05/02/2021
Date analysed	-	08/02/2021	08/02/2021
Moisture	%	31	29

HM in water - total				
Our Reference		██████	██████	██████
Your Reference	UNITS	████	████	████
Sample ID		██████	██████	██████
Date Sampled		██████	██████	██████
Type of sample		██	██	██
Date prepared	-	██████	██████	██████
Date analysed	-	██████	██████	██████
Arsenic-Total	µg/L	█	█	█
Copper-Total	µg/L	█	█	█
Lead-Total	µg/L	█	█	█
Zinc-Total	µg/L	██	██	██
Iron-Total	µg/L	██	██	██

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.

Client Reference: 20210021

QUALITY CONTROL: Acid Extractable metals in soil				Duplicate				Sp ke Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-9	260929-2
Date prepared	-			08/02/2021	1	08/02/2021	08/02/2021		08/02/2021	08/02/2021
Date analysed	-			08/02/2021	1	08/02/2021	08/02/2021		08/02/2021	08/02/2021
Arsenic	mg/kg	4	Metals-020	<4	1	30	24	22	101	103
Copper	mg/kg	1	Metals-020	<1	1	14	13	7	102	105
Lead	mg/kg	1	Metals-020	<1	1	96	94	2	100	107
Zinc	mg/kg	1	Metals-020	<1	1	73	63	15	101	#
Iron	mg/kg	10	Metals-020	<10	1	15000	12000	22	117	##

QUALITY CONTROL: Acid Extractable metals in soil				Duplicate				Sp ke Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	260929-22
Date prepared	-			[NT]	11	08/02/2021	08/02/2021		08/02/2021	08/02/2021
Date analysed	-			[NT]	11	08/02/2021	08/02/2021		08/02/2021	08/02/2021
Arsenic	mg/kg	4	Metals-020	[NT]	11	19	14	30	103	93
Copper	mg/kg	1	Metals-020	[NT]	11	22	22	0	101	#
Lead	mg/kg	1	Metals-020	[NT]	11	150	130	14	100	##
Zinc	mg/kg	1	Metals-020	[NT]	11	130	110	17	103	##
Iron	mg/kg	10	Metals-020	[NT]	11	17000	15000	12	100	##

QUALITY CONTROL: Acid Extractable metals in soil				Duplicate				Sp ke Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	08/02/2021	08/02/2021		[NT]	[NT]
Date analysed	-			[NT]	21	08/02/2021	08/02/2021		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	21	69	77	11	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	21	67	77	14	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	21	2300	2500	8	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	21	240	240	0	[NT]	[NT]
Iron	mg/kg	10	Metals-020	[NT]	21	17000	18000	6	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil				Duplicate				Sp ke Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	31	08/02/2021	08/02/2021		[NT]	[NT]
Date analysed	-			[NT]	31	08/02/2021	08/02/2021		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	31	71	80	12	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	31	46	48	4	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	31	260	280	7	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	31	520	550	6	[NT]	[NT]
Iron	mg/kg	10	Metals-020	[NT]	31	19000	21000	10	[NT]	[NT]

QUALITY CONTROL: HM in water - total				Duplicate				Sp ke Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-									
Date analysed	-									
Arsenic-Total	µg/L									
Copper-Total	µg/L									
Lead-Total	µg/L									
Zinc-Total	µg/L									
Iron-Total	µg/L									

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

8 metals in soil:

- # Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.
- ## Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.



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CERTIFICATE OF ANALYSIS 261352

Client Details

Client	Department of Planning, Industry and Environment
Attention	[REDACTED]
Address	PO Box 29, LIDCOMBE, NSW, 1825

Sample Details

Your Reference	<u>20210025</u>
Number of Samples	4 Solid, 1 Liquid
Date samples received	10/02/2021
Date completed instructions received	10/02/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by 15/02/2021

Date of Issue 15/02/2021

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Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *

Results Approved By

Greta Petzold, Senior Chemist

Jaimie Loa-Kum-Cheung, Metals Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

Envirolab Reference: 261352

Revision No: R00



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Acid Extractable metals in soil					
Our Reference		261352-1	261352-2	261352-4	261352-5
Your Reference	UNITS	210220	210221	210223	210224
Sample ID		Cfcg001	Cfcg002	Cfcc07	Cfcc08
Date Sampled		09/02/2021	09/02/2021	09/02/2021	09/02/2021
Type of sample		Solid	Solid	Solid	Solid
Date prepared	-	12/02/2021	12/02/2021	12/02/2021	12/02/2021
Date analysed	-	12/02/2021	12/02/2021	12/02/2021	12/02/2021
Arsenic	mg/kg	44	35	58	69
Copper	mg/kg	38	45	450	430
Lead	mg/kg	380	400	3,100	2,400
Zinc	mg/kg	200	310	440	2,400
Iron	mg/kg	23,000	29,000	31,000	38,000

Client Reference: 20210025

Moisture					
Our Reference		261352-1	261352-2	261352-4	261352-5
Your Reference	UNITS	210220	210221	210223	210224
Sample ID		Cfcg001	Cfcg002	Cfcc07	Cfcc08
Date Sampled		09/02/2021	09/02/2021	09/02/2021	09/02/2021
Type of sample		Solid	Solid	Solid	Solid
Date prepared	-	11/02/2021	11/02/2021	11/02/2021	11/02/2021
Date analysed	-	12/02/2021	12/02/2021	12/02/2021	12/02/2021
Moisture	%	33	29	22	22

HM in water - total		
Our Reference		████████
Your Reference	UNITS	████████
Sample ID		████████
Date Sampled		████████
Type of sample		██████
Date prepared	-	████████
Date analysed	-	████████
Arsenic-Total	µg/L	█
Copper-Total	µg/L	██
Lead-Total	µg/L	██
Zinc-Total	µg/L	████
Iron-Total	µg/L	████

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.

Client Reference: 20210025

QUALITY CONTROL: Acid Extractable metals in soil				Duplicate			Sp ke Recovery %			
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-9	[NT]
Date prepared	-			12/02/2021	1	12/02/2021	12/02/2021		12/02/2021	[NT]
Date analysed	-			12/02/2021	1	12/02/2021	12/02/2021		12/02/2021	[NT]
Arsenic	mg/kg	4	Metals-020	<4	1	44	44	0	102	[NT]
Copper	mg/kg	1	Metals-020	<1	1	38	39	3	101	[NT]
Lead	mg/kg	1	Metals-020	<1	1	380	440	15	97	[NT]
Zinc	mg/kg	1	Metals-020	<1	1	200	190	5	106	[NT]
Iron	mg/kg	10	Metals-020	<10	1	23000	23000	0	126	[NT]

QUALITY CONTROL: HM in water - total				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			12/02/2021	[NT]	[NT]	[NT]	[NT]	12/02/2021	[NT]
Date analysed	-			12/02/2021	[NT]	[NT]	[NT]	[NT]	12/02/2021	[NT]
Arsenic-Total	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Copper-Total	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Lead-Total	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Zinc-Total	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Iron-Total	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	102	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
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NEPM	National Environmental Protection Measure
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Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
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Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

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Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Samples received in good order: Incorrect Preservation

Total metals: no unfiltered, preserved sample was received, therefore analysis was conducted from the unpreserved sample bottle.
Note: there is a possibility some elements may be underestimated.



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CERTIFICATE OF ANALYSIS 261468

Client Details

Client	Department of Planning, Industry and Environment
Attention	[REDACTED]
Address	PO Box 29, LIDCOMBE, NSW, 1825

Sample Details

Your Reference	<u>20210029</u>
Number of Samples	19 Solid, 2 Liquid
Date samples received	11/02/2021
Date completed instructions received	11/02/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	15/02/2021
Date of Issue	15/02/2021

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Results Approved By

Greta Petzold, Senior Chemist

Jaimie Loa-Kum-Cheung, Metals Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

Acid Extractable metals						
Our Reference		██████	██████	██████	██████	██████
Your Reference	UNITS	██████	██████	██████	██████	██████
Sample ID		██████	██████	██████	██████	██████
Date Sampled		██████	██████	██████	██████	██████
Type of sample		██	██	██	██	██
Date prepared	-	██████	██████	██████	██████	██████
Date analysed	-	██████	██████	██████	██████	██████
Arsenic	mg/kg	█	█	█	█	█
Copper	mg/kg	█	█	█	█	█
Lead	mg/kg	█	█	█	█	█
Zinc	mg/kg	█	█	█	█	█
Iron	mg/kg	██████	██████	██████	██████	██████

Acid Extractable metals						
Our Reference		██████	██████	██████	██████	██████
Your Reference	UNITS	██████	██████	██████	██████	██████
Sample ID		██████	██████	██████	██████	██████
Date Sampled		██████	██████	██████	██████	██████
Type of sample		██	██	██	██	██
Date prepared	-	██████	██████	██████	██████	██████
Date analysed	-	██████	██████	██████	██████	██████
Arsenic	mg/kg	█	█	█	█	█
Copper	mg/kg	█	█	█	█	█
Lead	mg/kg	█	█	█	█	█
Zinc	mg/kg	█	█	█	█	█
Iron	mg/kg	██████	██████	██████	██████	██████

Acid Extractable metals						
Our Reference		██████	██████	██████	██████	██████
Your Reference	UNITS	██████	██████	██████	██████	██████
Sample ID		██████	██████	██████	██████	██████
Date Sampled		██████	██████	██████	██████	██████
Type of sample		██	██	██	██	██
Date prepared	-	██████	██████	██████	██████	██████
Date analysed	-	██████	██████	██████	██████	██████
Arsenic	mg/kg	█	█	█	█	█
Copper	mg/kg	█	█	█	█	█
Lead	mg/kg	█	█	█	█	█
Zinc	mg/kg	█	█	█	█	█
Iron	mg/kg	██████	██████	██████	██████	██████

Acid Extractable metals						
Our Reference		██████	██████	261468-20	261468-21	██████
Your Reference	UNITS	██████	██████	210266	210267	██████
Sample ID		██████	██████	Ms-a	Ms-b	██████
Date Sampled		██████	██████	10/02/2021	10/02/2021	██████
Type of sample		██████	██████	Solid	Solid	██████
Date prepared	-	██████	██████	15/02/2021	15/02/2021	██████
Date analysed	-	██████	██████	15/02/2021	15/02/2021	██████
Arsenic	mg/kg	██████	██████	<4	33	██████
Copper	mg/kg	██████	██████	4	130	██████
Lead	mg/kg	██████	██████	18	560	██████
Zinc	mg/kg	██████	██████	68	930	██████
Iron	mg/kg	██████	██████	680	18,000	██████

Moisture						
Our Reference		██████	██████	██████	██████	██████
Your Reference	UNITS	██████	██████	██████	██████	██████
Sample ID		██████	██████	██████	██████	██████
Date Sampled		██████	██████	██████	██████	██████
Type of sample		██	██	██	██	██
Date prepared	-	██████	██████	██████	██████	██████
Date analysed	-	██████	██████	██████	██████	██████
Moisture	%	██	██	██	██	██

Moisture						
Our Reference		██████	██████	██████	██████	██████
Your Reference	UNITS	██████	██████	██████	██████	██████
Sample ID		██████	██████	██████	██████	██████
Date Sampled		██████	██████	██████	██████	██████
Type of sample		██	██	██	██	██
Date prepared	-	██████	██████	██████	██████	██████
Date analysed	-	██████	██████	██████	██████	██████
Moisture	%	██	██	██	██	██

Moisture						
Our Reference		██████	██████	██████	██████	██████
Your Reference	UNITS	██████	██████	██████	██████	██████
Sample ID		██████	██████	██████	██████	██████
Date Sampled		██████	██████	██████	██████	██████
Type of sample		██	██	██	██	██
Date prepared	-	██████	██████	██████	██████	██████
Date analysed	-	██████	██████	██████	██████	██████
Moisture	%	██	██	██	██	██

Moisture						
Our Reference		██████	██████	261468-20	261468-21	
Your Reference	UNITS	██████	██████	210266	210267	
Sample ID		██████	██████	Ms-a	Ms-b	
Date Sampled		██████	██████	10/02/2021	10/02/2021	
Type of sample		██	██	Solid	Solid	
Date prepared	-	██████	██████	15/02/2021	15/02/2021	
Date analysed	-	██████	██████	15/02/2021	15/02/2021	
Moisture	%	██	██	16	17	

HM - total			
Our Reference		██████	██████
Your Reference	UNITS	██████	██████
Sample ID		██████	██████
Date Sampled		██████	██████
Type of sample		████	████
Date prepared	-	██████	██████
Date analysed	-	██████	██████
Arsenic-Total	µg/L	█	█
Copper-Total	µg/L	█	█
Lead-Total	µg/L	█	█
Zinc-Total	µg/L	█	█
Iron-Total	µg/L	█	█

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.

Client Reference: 20210029

QUALITY CONTROL: Acid Extractable metals				Duplicate				Sp ke Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	261468-2
Date prepared	-			15/02/2021	1	15/02/2021	15/02/2021		15/02/2021	15/02/2021
Date analysed	-			15/02/2021	1	15/02/2021	15/02/2021		15/02/2021	15/02/2021
Arsenic	mg/kg	4	Metals-020	<4	1	30	27	11	111	72
Copper	mg/kg	1	Metals-020	<1	1	65	64	2	108	#
Lead	mg/kg	1	Metals-020	<1	1	53	53	0	107	71
Zinc	mg/kg	1	Metals-020	<1	1	200	210	5	115	95
Iron	mg/kg	10	Metals-020	<10	1	23000	18000	24	129	##

QUALITY CONTROL: Acid Extractable metals				Duplicate				Sp ke Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	15/02/2021	15/02/2021		[NT]	[NT]
Date analysed	-			[NT]	11	15/02/2021	15/02/2021		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	11	52	68	27	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	11	240	350	37	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	11	810	820	1	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	11	1000	1500	40	[NT]	[NT]
Iron	mg/kg	10	Metals-020	[NT]	11	23000	35000	41	[NT]	[NT]

Client Reference: 20210029

QUALITY CONTROL: HM - total				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W10	[NT]
Date prepared	-			15/02/2021	[NT]	[NT]	[NT]	[NT]	15/02/2021	[NT]
Date analysed	-			15/02/2021	[NT]	[NT]	[NT]	[NT]	15/02/2021	[NT]
Arsenic-Total	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Copper-Total	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Lead-Total	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Zinc-Total	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Iron-Total	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	97	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Acid Extractable Metals in Soil:

- The laboratory RPD acceptance criteria has been exceeded for 261468-11 for Zn & Fe. Therefore a triplicate result has been issued as laboratory sample number 261468-22.
- # Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.
- ## Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.



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CERTIFICATE OF ANALYSIS 261622

Client Details

Client	Department of Planning, Industry and Environment
Attention	[REDACTED]
Address	PO Box 29, LIDCOMBE, NSW, 1825

Sample Details

Your Reference	<u>20210031</u>
Number of Samples	5 Liquid, 15 Solid
Date samples received	12/02/2021
Date completed instructions received	12/02/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	18/02/2021
Date of Issue	18/02/2021

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Results Approved By

Jaimie Loa-Kum-Cheung, Metals Supervisor
Ken Nguyen, Reporting Supervisor
Manju Dewendrage, Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Acid Extractable metals in soil						
Our Reference		██████	██████	██████	██████	██████
Your Reference	UNITS	██████	██████	██████	██████	██████
Sample ID		██████	██████	██████	██████	██████
Date Sampled		██████	██████	██████	██████	██████
Type of sample		████	████	████	████	████
Date prepared	-	██████	██████	██████	██████	██████
Date analysed	-	██████	██████	██████	██████	██████
Arsenic	mg/kg	█	█	█	█	█
Copper	mg/kg	█	█	█	█	█
Lead	mg/kg	█	█	█	█	█
Zinc	mg/kg	█	█	█	█	█
Iron	mg/kg	████	████	████	████	████

Acid Extractable metals in soil						
Our Reference		██████	261622-8	261622-9	██████	██████
Your Reference	UNITS	██████	210292	210293	██████	██████
Sample ID		██████	Fs-a	Fs-b	██████	██████
Date Sampled		██████	11/02/2021	11/02/2021	██████	██████
Type of sample		████	Solid	Solid	████	████
Date prepared	-	██████	15/02/2021	15/02/2021	██████	██████
Date analysed	-	██████	15/02/2021	15/02/2021	██████	██████
Arsenic	mg/kg	█	10	17	█	█
Copper	mg/kg	█	65	30	█	█
Lead	mg/kg	█	320	390	█	█
Zinc	mg/kg	█	1,600	260	█	█
Iron	mg/kg	████	7,300	4,900	████	████

Acid Extractable metals in soil						
Our Reference		██████	██████	██████	██████	██████
Your Reference	UNITS	██████	██████	██████	██████	██████
Sample ID		██████	██████	██████	██████	██████
Date Sampled		██████	██████	██████	██████	██████
Type of sample		████	████	████	████	████
Date prepared	-	██████	██████	██████	██████	██████
Date analysed	-	██████	██████	██████	██████	██████
Arsenic	mg/kg	█	█	█	█	█
Copper	mg/kg	█	█	█	█	█
Lead	mg/kg	█	█	█	█	█
Zinc	mg/kg	█	█	█	█	█
Iron	mg/kg	████	████	████	████	████

Acid Extractable metals in soil		
Our Reference		[REDACTED]
Your Reference	UNITS	[REDACTED]
Sample ID		[REDACTED]
Date Sampled		[REDACTED]
Type of sample		[REDACTED]
Date prepared	-	[REDACTED]
Date analysed	-	[REDACTED]
Arsenic	mg/kg	[REDACTED]
Copper	mg/kg	[REDACTED]
Lead	mg/kg	[REDACTED]
Zinc	mg/kg	[REDACTED]
Iron	mg/kg	[REDACTED]

Moisture						
Our Reference		██████	██████	██████	██████	██████
Your Reference	UNITS	██████	██████	██████	██████	██████
Sample ID		██████	██████	██████	██████	██████
Date Sampled		██████	██████	██████	██████	██████
Type of sample		██	██	██	██	██
Date prepared	-	██████	██████	██████	██████	██████
Date analysed	-	██████	██████	██████	██████	██████
Moisture	%	██	██	██	██	██

Moisture						
Our Reference		██████	261622-8	261622-9	██████	██████
Your Reference	UNITS	██████	210292	210293	██████	██████
Sample ID		██████	Fs-a	Fs-b	██████	██████
Date Sampled		██████	11/02/2021	11/02/2021	██████	██████
Type of sample		██	Solid	Solid	██	██
Date prepared	-	██████	15/02/2021	15/02/2021	██████	██████
Date analysed	-	██████	16/02/2021	16/02/2021	██████	██████
Moisture	%	██	12	15	██	██

Moisture						
Our Reference		██████	██████	██████	██████	██████
Your Reference	UNITS	██████	██████	██████	██████	██████
Sample ID		██████	██████	██████	██████	██████
Date Sampled		██████	██████	██████	██████	██████
Type of sample		██	██	██	██	██
Date prepared	-	██████	██████	██████	██████	██████
Date analysed	-	██████	██████	██████	██████	██████
Moisture	%	██	██	██	██	██

HM in water - total						
Our Reference		██████	██████	██████	██████	██████
Your Reference	UNITS	██████	██████	██████	██████	██████
Sample ID		██████	██████	██████	██████	██████
Date Sampled		██████	██████	██████	██████	██████
Type of sample		██████	██████	██████	██████	██████
Date prepared	-	██████	██████	██████	██████	██████
Date analysed	-	██████	██████	██████	██████	██████
Arsenic-Total	µg/L	█	█	█	█	█
Copper-Total	µg/L	█	█	█	█	█
Lead-Total	µg/L	█	█	█	█	█
Zinc-Total	µg/L	█	█	█	█	█
Iron-Total	µg/L	█	█	█	█	█

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.

Client Reference: 20210031

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate			Sp ke Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	261622-3
Date prepared	-			15/02/2021	2	15/02/2021	15/02/2021		15/02/2021	17/02/2021
Date analysed	-			15/02/2021	2	15/02/2021	15/02/2021		15/02/2021	17/02/2021
Arsenic	mg/kg	4	Metals-020	<4	2	<4	<4	0	85	94
Copper	mg/kg	1	Metals-020	<1	2	3	4	29	84	95
Lead	mg/kg	1	Metals-020	<1	2	9	16	56	81	100
Zinc	mg/kg	1	Metals-020	<1	2	23	46	67	84	#
Iron	mg/kg	10	Metals-020	<10	2	1300	2100	47	119	##

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate			Sp ke Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	15/02/2021	15/02/2021		[NT]	[NT]
Date analysed	-			[NT]	11	15/02/2021	15/02/2021		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	11	6	5	18	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	11	25	32	25	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	11	170	190	11	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	11	390	480	21	[NT]	[NT]
Iron	mg/kg	10	Metals-020	[NT]	11	3900	4000	3	[NT]	[NT]

Client Reference: 20210031

QUALITY CONTROL: HM in water - total				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	261622-15
Date prepared	-			15/02/2021	1	15/02/2021	15/02/2021		15/02/2021	15/02/2021
Date analysed	-			18/02/2021	1	18/02/2021	18/02/2021		18/02/2021	18/02/2021
Arsenic-Total	µg/L	1	Metals-022	<1	1	<1	<1	0	95	94
Copper-Total	µg/L	1	Metals-022	<1	1	3	4	29	94	96
Lead-Total	µg/L	1	Metals-022	<1	1	<1	<1	0	98	94
Zinc-Total	µg/L	1	Metals-022	<1	1	650	670	3	99	94
Iron-Total	µg/L	10	Metals-022	<10	1	110	120	9	89	#

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
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Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Acid Extractable Metals in Soil:

- The laboratory RPD acceptance criteria has been exceeded for 261622-3 for Fe, Pb & Zn. Therefore a triplicate result has been issued as laboratory sample number 261622-21.
- # Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.
- ## Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

8 HM in water - total - # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.