A

Appendix A – Investigation Location Plan

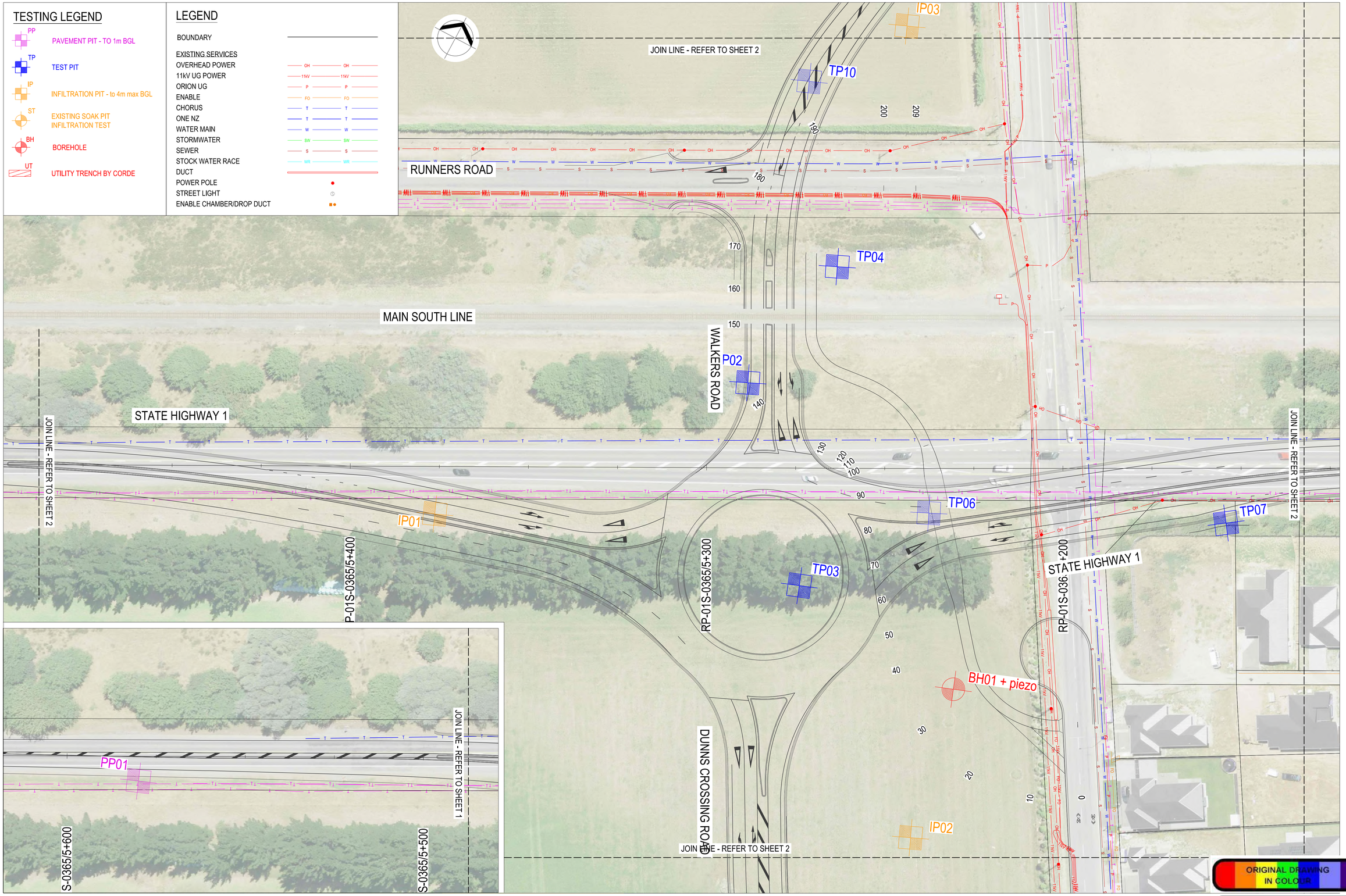
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TESTING LEGEND

- PP — PAVEMENT PIT - TO 1m BGL
- TP — TEST PIT
- IP — INFILTRATION PIT - to 4m max BGL
- ST — EXISTING SOAK PIT / INFILTRATION TEST
- BH — BOREHOLE
- UT — UTILITY TRENCH BY CORDE

LEGEND

- BOUNDARY
- EXISTING SERVICES
- OVERHEAD POWER (OH)
- 11kV UG POWER (11kV)
- ORION UG (P)
- ENABLE (FO)
- CHORUS (T)
- ONE NZ (T)
- WATER MAIN (W)
- STORMWATER (SW)
- SEWER (S)
- STOCK WATER RACE (WR)
- DUCT
- POWER POLE
- STREET LIGHT
- ENABLE CHAMBER/DROP DUCT



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A	FOR INFORMATION	BP	RY	DA	13.02.24
B	FINAL - FOR INVESTIGATION	BP	RY	DA	13.03.24
C	UPDATED PIT LOCATION - FOR INVESTIGATION	BP	RY	DA	19.06.24
D	UPDATED PIT LOCATION - POST INVESTIGATION	RA	NY	RY	02.10.24

Original Scale (A1) 1:500
Reduced Scale (A3) 1:1000

Design	B. PETERSON	12.03.24	Approved For Construction*
Drawn	R. ANDERSON	12.03.24	
Dsg Verifier	R. YOUNG	12.03.24	
Drg Check	M. HARRIS	12.03.24	Date

* Refer to Revision 1 for Original Signature

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 1 OF 14

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-00-CA-1001

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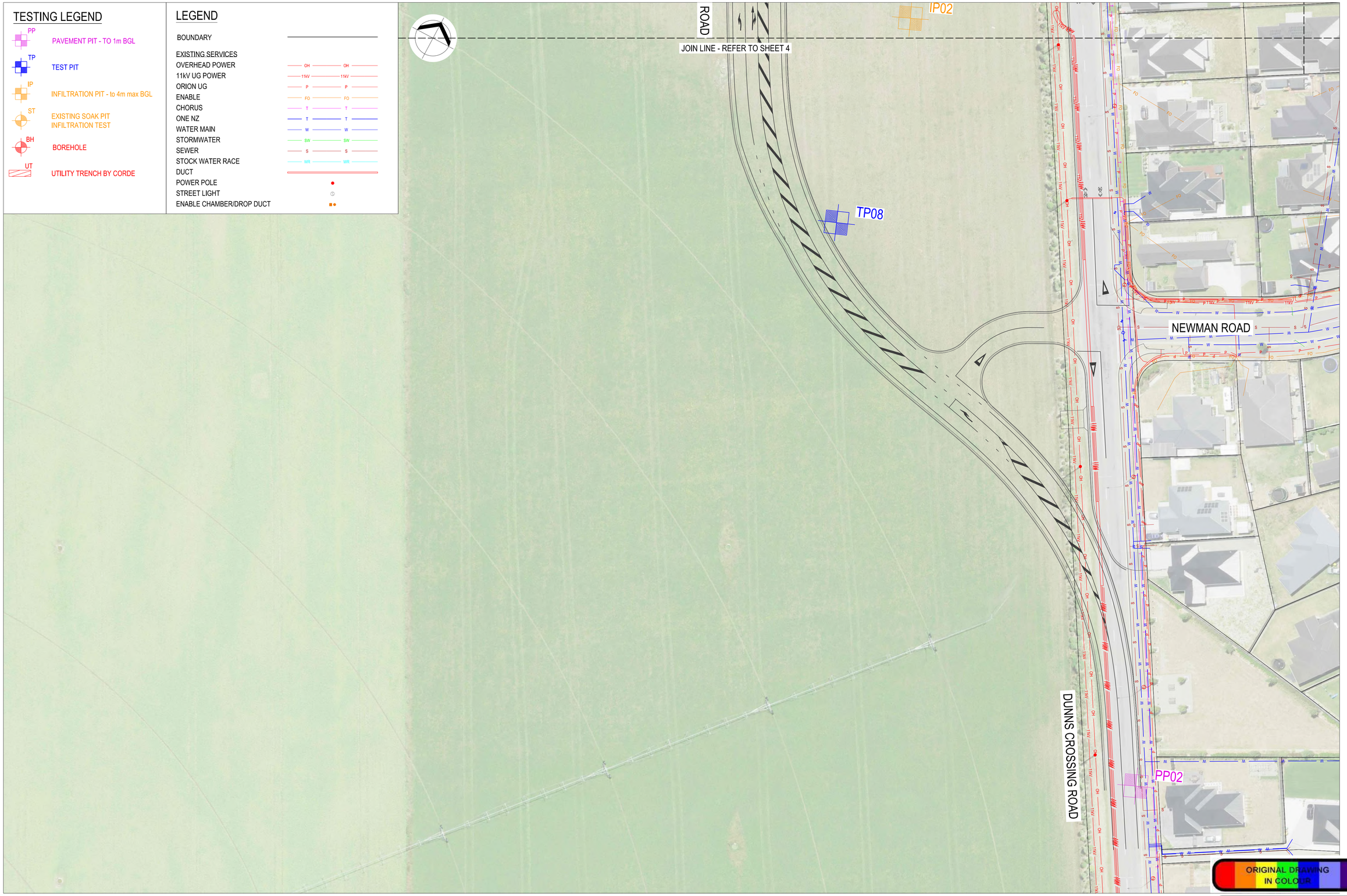
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TESTING LEGEND

- PP — PAVEMENT PIT - TO 1m BGL
- TP — TEST PIT
- IP — INFILTRATION PIT - to 4m max BGL
- ST — EXISTING SOAK PIT / INFILTRATION TEST
- BH — BOREHOLE
- UT — UTILITY TRENCH BY CORDE

LEGEND

- BOUNDARY
- EXISTING SERVICES
- OVERHEAD POWER (OH)
- 11kV UG POWER (11kV)
- ORION UG (P)
- ENABLE (FO)
- CHORUS (T)
- ONE NZ (T)
- WATER MAIN (W)
- STORMWATER (SW)
- SEWER (S)
- STOCK WATER RACE (WR)
- DUCT
- POWER POLE
- STREET LIGHT
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D	UPDATED PIT LOCATION - POST INVESTIGATION	RA	NY	RY	02.10.24

Original Scale (A1): 1:500
Reduced Scale (A3): 1:1000

Design	B. PETERSON	12.03.24	Approved For Construction*
Drawn	R. ANDERSON	12.03.24	
Dsg Verifier	R. YOUNG	12.03.24	
Drg Check	M. HARRIS	12.03.24	Date

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 2 OF 14

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-00-CA-1002

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TESTING LEGEND

- PP — PAVEMENT PIT - TO 1m BGL
- TP — TEST PIT
- IP — INFILTRATION PIT - to 4m max BGL
- ST — EXISTING SOAK PIT / INFILTRATION TEST
- BH — BOREHOLE
- UT — UTILITY TRENCH BY CORDE

LEGEND

- BOUNDARY
- EXISTING SERVICES
- OVERHEAD POWER (OH)
- 11kV UG POWER (11kV)
- ORION UG (P)
- ENABLE (FO)
- CHORUS (T)
- ONE NZ (T)
- WATER MAIN (W)
- STORMWATER (SW)
- SEWER (S)
- STOCK WATER RACE (WR)
- DUCT
- POWER POLE
- STREET LIGHT
- ENABLE CHAMBER/DROP DUCT

PP03

WALKERS ROAD

TP11

IP03

TP10

JOIN LINE - REFER TO SHEET 5

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Reduced Scale (A3) 1:1000

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Dsg Verifier	R. YOUNG	12.03.24	
Drg Check	M. HARRIS	12.03.24	Date

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 3 OF 14

Discipline: CIVIL ENGINEERING

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TESTING LEGEND

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- TP — TEST PIT
- IP — INFILTRATION PIT - to 4m max BGL
- ST — EXISTING SOAK PIT / INFILTRATION TEST
- BH — BOREHOLE
- UT — UTILITY TRENCH BY CORDE

LEGEND

- BOUNDARY
- EXISTING SERVICES
- OVERHEAD POWER (OH)
- 11kV UG POWER (11kV)
- ORION UG (P)
- ENABLE (FO)
- CHORUS (T)
- ONE NZ (T)
- WATER MAIN (W)
- STORMWATER (SW)
- SEWER (S)
- STOCK WATER RACE (WR)
- DUCT
- POWER POLE
- STREET LIGHT
- ENABLE CHAMBER/DROP DUCT

MAIN SOUTH LINE

PP04

STATE HIGHWAY 1

PP18

LIGNITE DRIVE

RP-01S-0365/5+100

RP-01S-0365/5+000

RP-01S-0365/4+900

RP-01S-0365/4+800

JOIN LINE - REFER TO SHEET 1

JOIN LINE - REFER TO SHEET 3

JOIN LINE - REFER TO PACKAGE 1

JOIN LINE - REFER TO SHEET 5

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Drg Check	M. HARRIS	12.03.24	Date

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 4 OF 14

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-00-CA-1004

Rev.: C

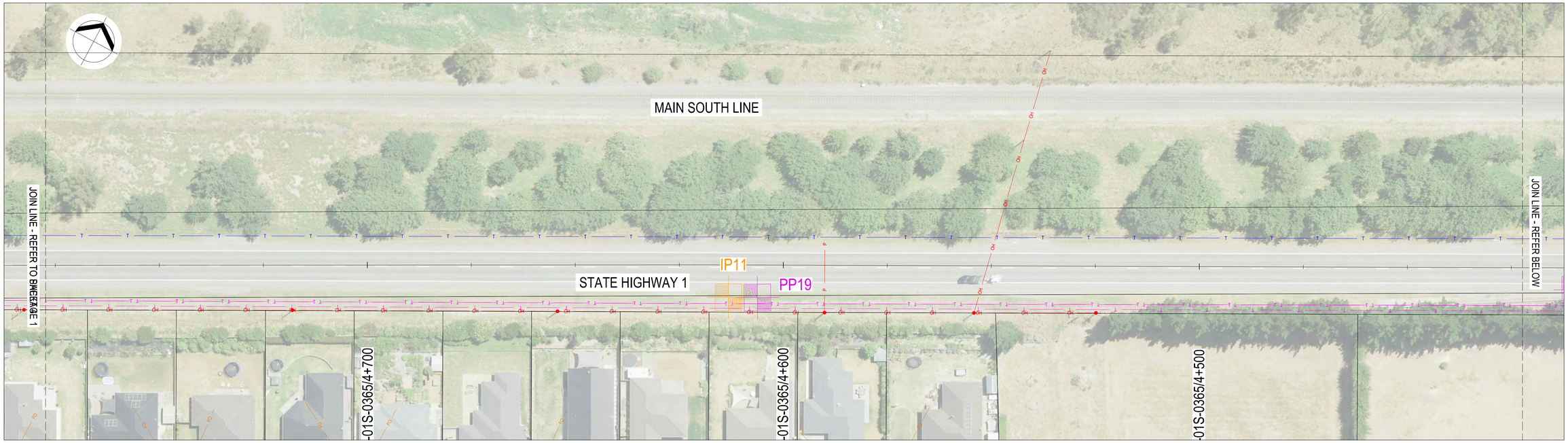
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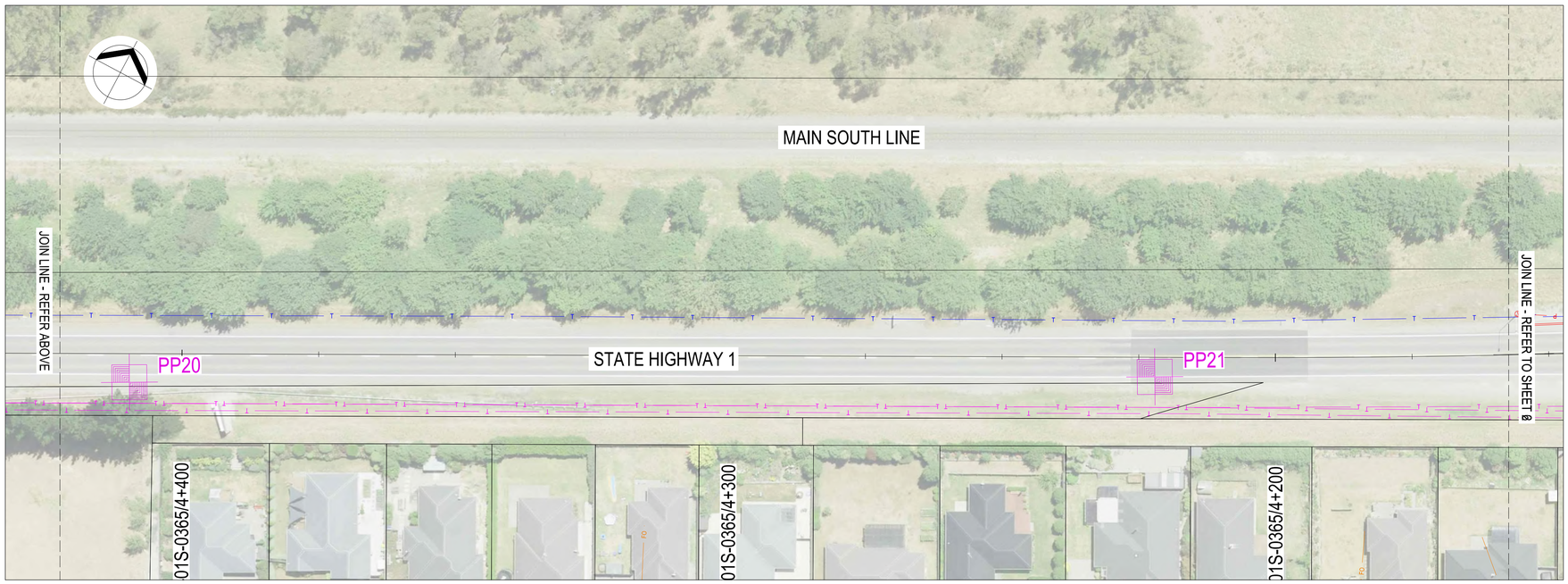
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TESTING LEGEND

- PP — PAVEMENT PIT - TO 1m BGL
- TP — TEST PIT
- IP — INFILTRATION PIT - to 4m max BGL
- ST — EXISTING SOAK PIT / INFILTRATION TEST
- BH — BOREHOLE
- UT — UTILITY TRENCH BY CORDE

LEGEND

BOUNDARY	
EXISTING SERVICES	
OVERHEAD POWER	OH — OH
11kV UG POWER	11kV — 11kV
ORION UG	P — P
ENABLE	FO — FO
CHORUS	T — T
ONE NZ	T — T
WATER MAIN	W — W
STORMWATER	SW — SW
SEWER	S — S
STOCK WATER RACE	WR — WR
DUCT	
POWER POLE	
STREET LIGHT	
ENABLE CHAMBER/DROP DUCT	

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Original Scale (A1)	1:500		
Reduced Scale (A3)	1:1000		
Design	B. PETERSON	12.03.24	Approved For Construction*
Drawn	R. ANDERSON	12.03.24	
Dsg Verifier	R. YOUNG	12.03.24	
Drg Check	M. HARRIS	12.03.24	Date

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Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 5 OF 14

Discipline: CIVIL ENGINEERING

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Rev.: C

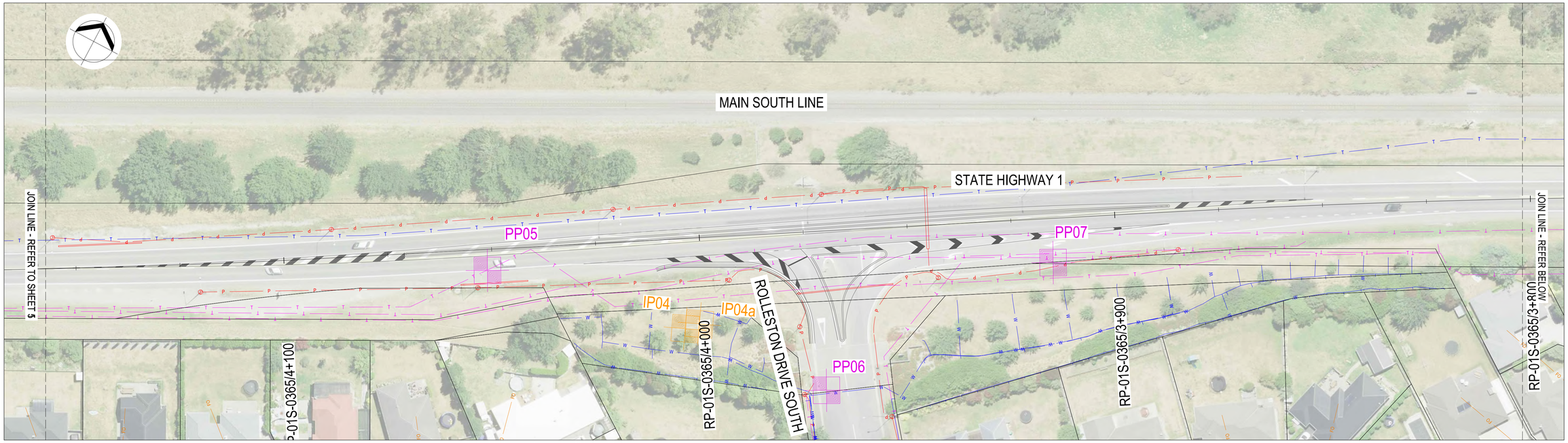
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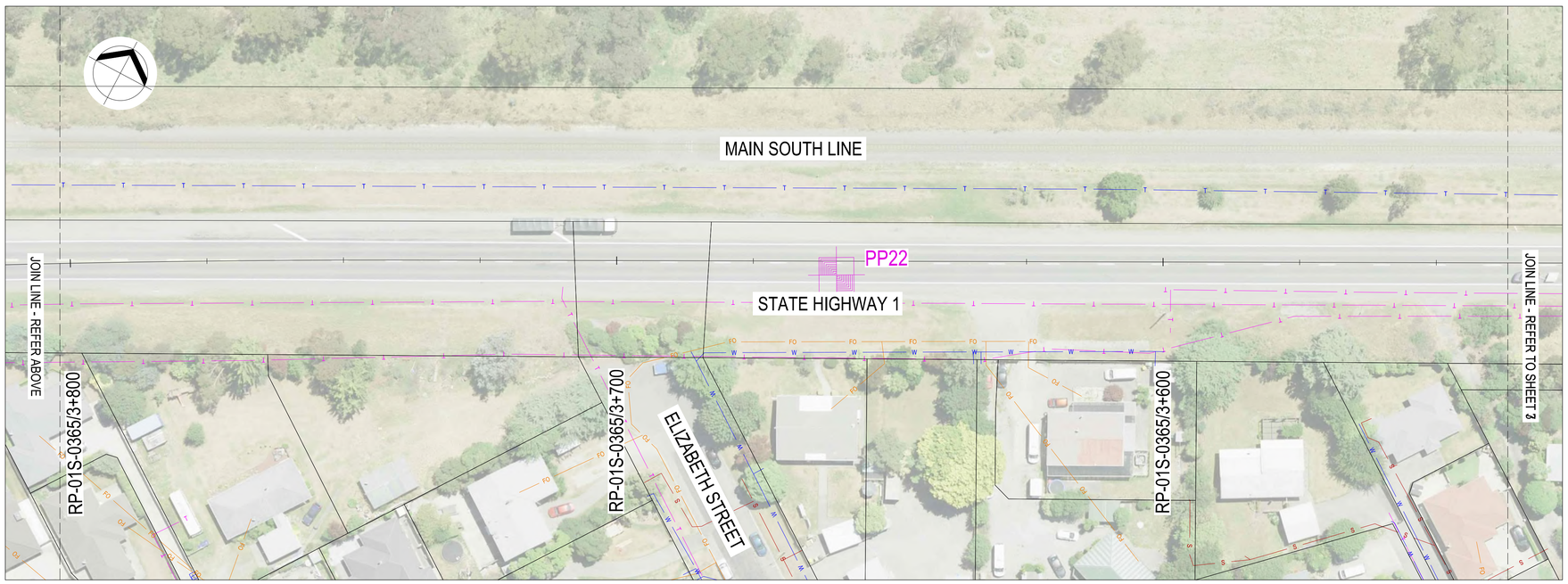
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TESTING LEGEND

- PP — PAVEMENT PIT - TO 1m BGL
- TP — TEST PIT
- IP — INFILTRATION PIT - to 4m max BGL
- ST — EXISTING SOAK PIT / INFILTRATION TEST
- BH — BOREHOLE
- UT — UTILITY TRENCH BY CORDE

LEGEND

BOUNDARY	
EXISTING SERVICES	
OVERHEAD POWER	OH
11kV UG POWER	11kV
ORION UG	P
ENABLE	FO
CHORUS	T
ONE NZ	T
WATER MAIN	W
STORMWATER	SW
SEWER	S
STOCK WATER RACE	WR
DUCT	
POWER POLE	
STREET LIGHT	
ENABLE CHAMBER/DROP DUCT	

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C	UPDATED PIT LOCATION - POST INVESTIGATION	RA	NY	RY	02.10.24

Design	B. PETERSON	12.03.24	Approved For Construction*
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Dsg Verifier	R. YOUNG	12.03.24	
Drg Check	M. HARRIS	12.03.24	Date

Original Scale (A1) 1:500
Reduced Scale (A3) 1:1000
* Refer to Revision 1 for Original Signature

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 6 OF 14

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-00-CA-1006

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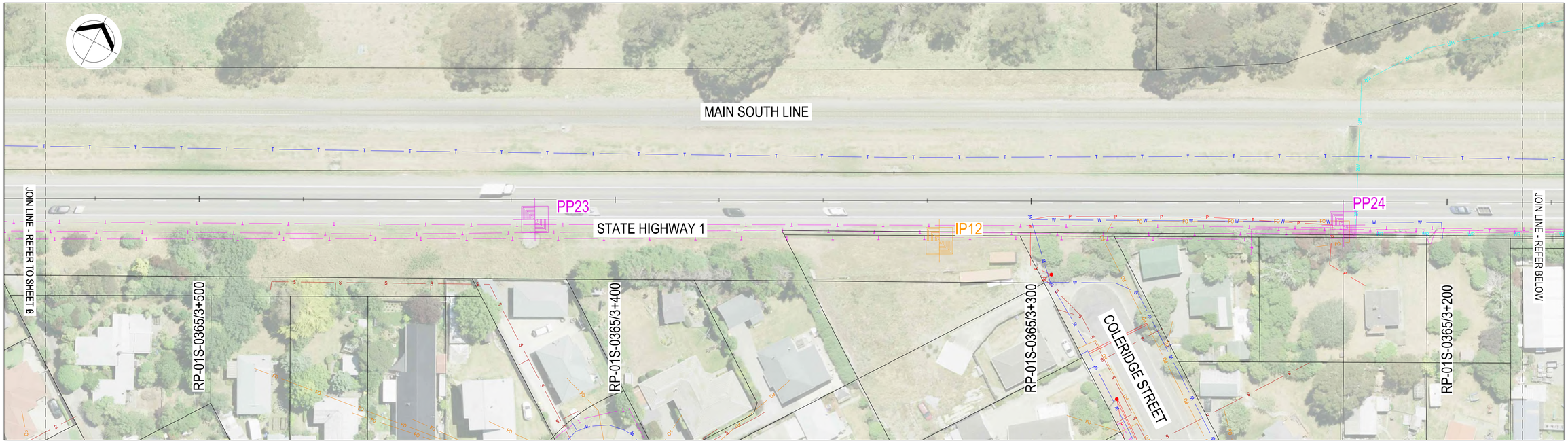
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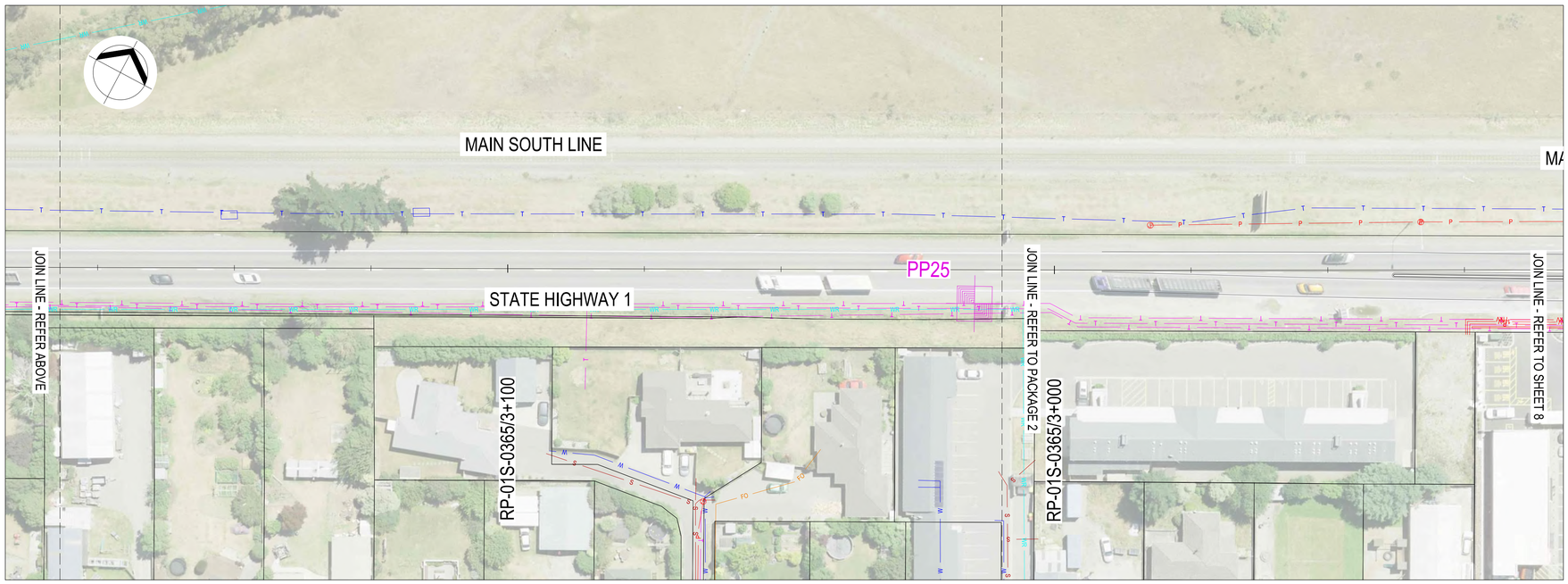
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TESTING LEGEND

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- TP — TEST PIT
- IP — INFILTRATION PIT - to 4m max BGL
- ST — EXISTING SOAK PIT / INFILTRATION TEST
- BH — BOREHOLE
- UT — UTILITY TRENCH BY CORDE

LEGEND

- BOUNDARY
- EXISTING SERVICES
- OVERHEAD POWER
- 11kV UG POWER
- ORION UG
- ENABLE
- CHORUS
- ONE NZ
- WATER MAIN
- STORMWATER
- SEWER
- STOCK WATER RACE
- DUCT
- POWER POLE
- STREET LIGHT
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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 7 OF 14

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-00-CA-1007

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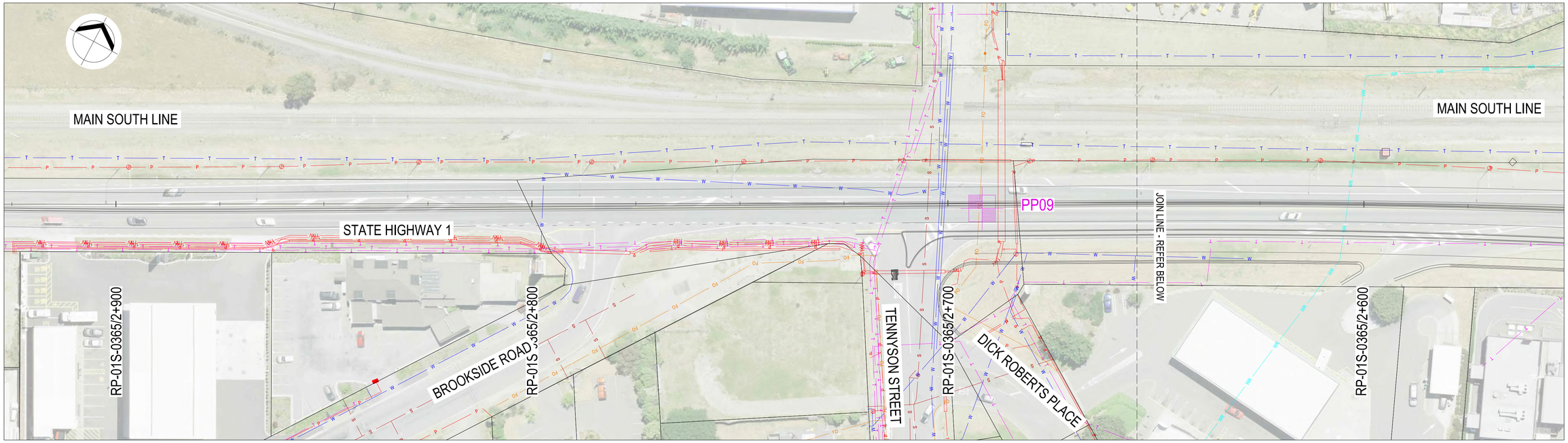
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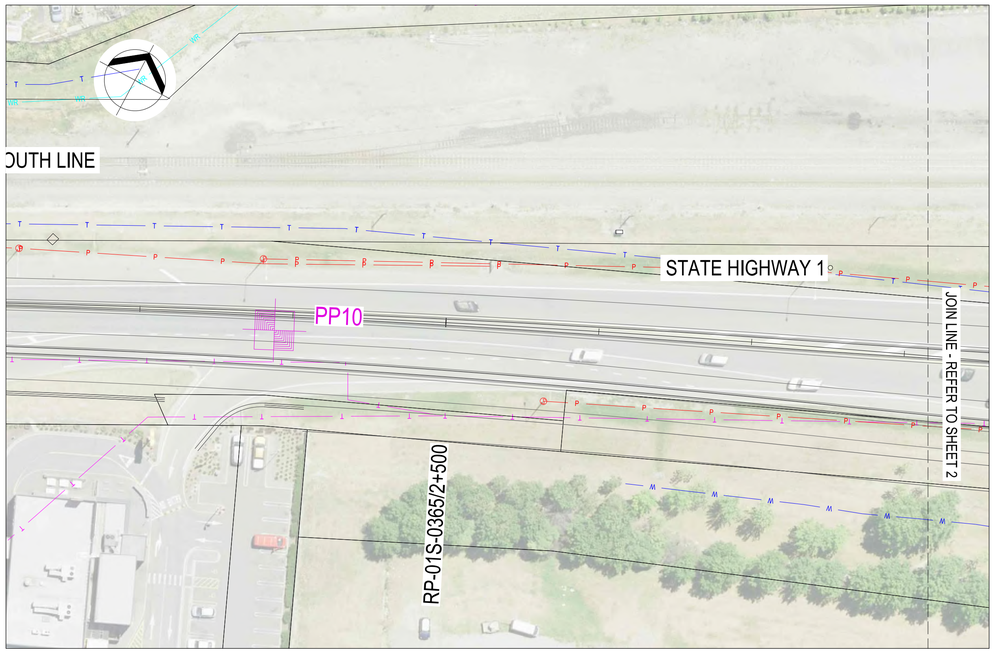
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TESTING LEGEND

PP	PAVEMENT PIT - TO 1m BGL
TP	TEST PIT
IP	INFILTRATION PIT - to 4m max BGL
ST	EXISTING SOAK PIT INFILTRATION TEST
BH	BOREHOLE
UT	UTILITY TRENCH BY CORDE

LEGEND

BOUNDARY	
EXISTING SERVICES	
OVERHEAD POWER	OH
11kV UG POWER	11kV
ORION UG	P
ENABLE	FO
CHORUS	T
ONE NZ	T
WATER MAIN	W
STORMWATER	SW
SEWER	S
STOCK WATER RACE	WR
DUCT	
POWER POLE	
STREET LIGHT	
ENABLE CHAMBER/DROP DUCT	

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Reduced Scale (A3) 1:1000

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 8 OF 14

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-00-CA-1008

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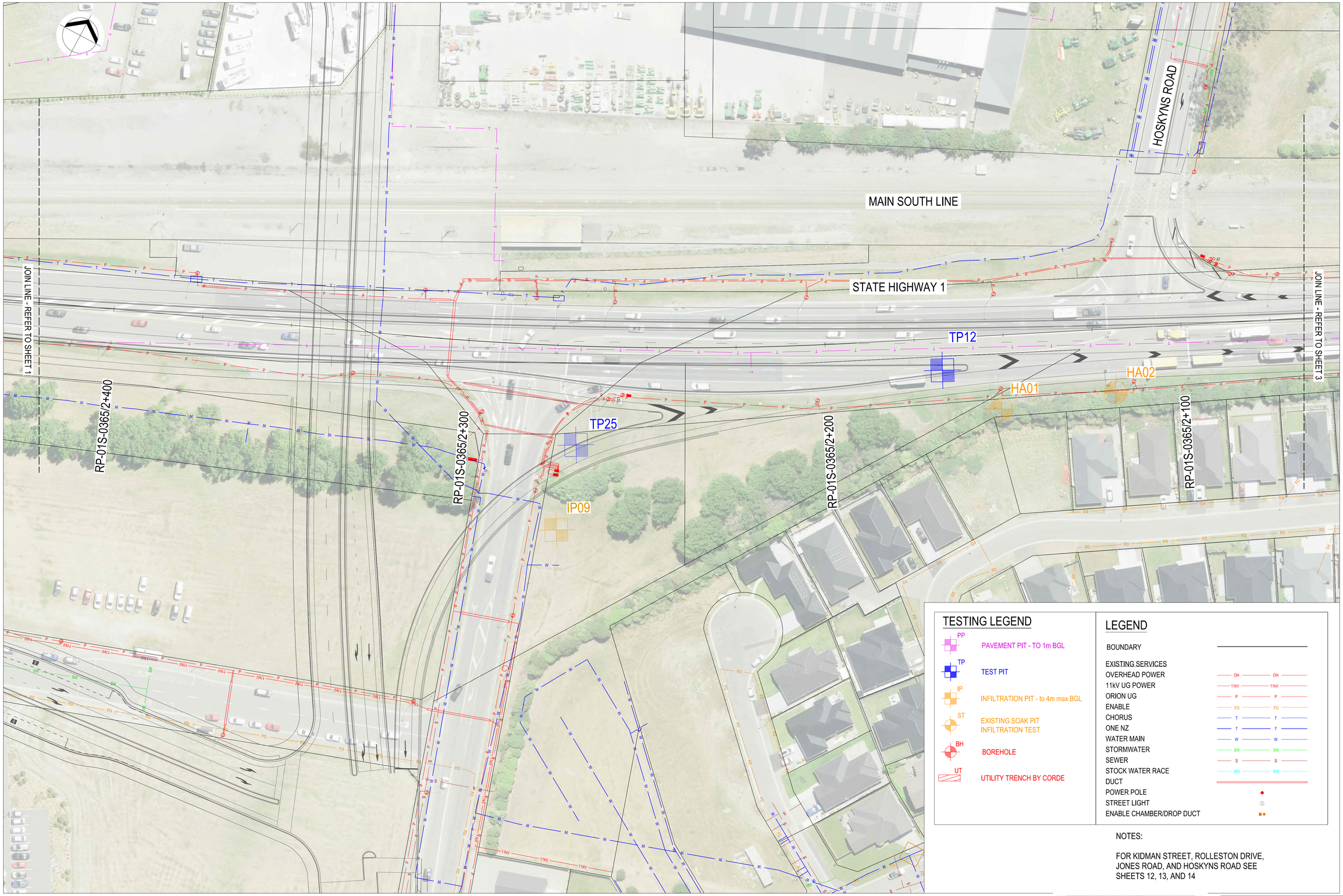
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TESTING LEGEND

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TP	TEST PIT
IP	INFILTRATION PIT - to 4m max BGL
ST	EXISTING SOAK PIT INFILTRATION TEST
BH	BOREHOLE
UT	UTILITY TRENCH BY CORDE

LEGEND

BOUNDARY	
EXISTING SERVICES	
OVERHEAD POWER	OH
11kV UG POWER	11kV
ORION UG	P
ENABLE	FO
CHORUS	T
ONE NZ	T
WATER MAIN	W
STORMWATER	SW
SEWER	S
STOCK WATER RACE	WR
DUCT	
POWER POLE	
STREET LIGHT	
ENABLE CHAMBER/DROP DUCT	

NOTES:

FOR KIDMAN STREET, ROLLESTON DRIVE, JONES ROAD, AND HOSKYNS ROAD SEE SHEETS 12, 13, AND 14

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 9 OF 14

Discipline: CIVIL ENGINEERING

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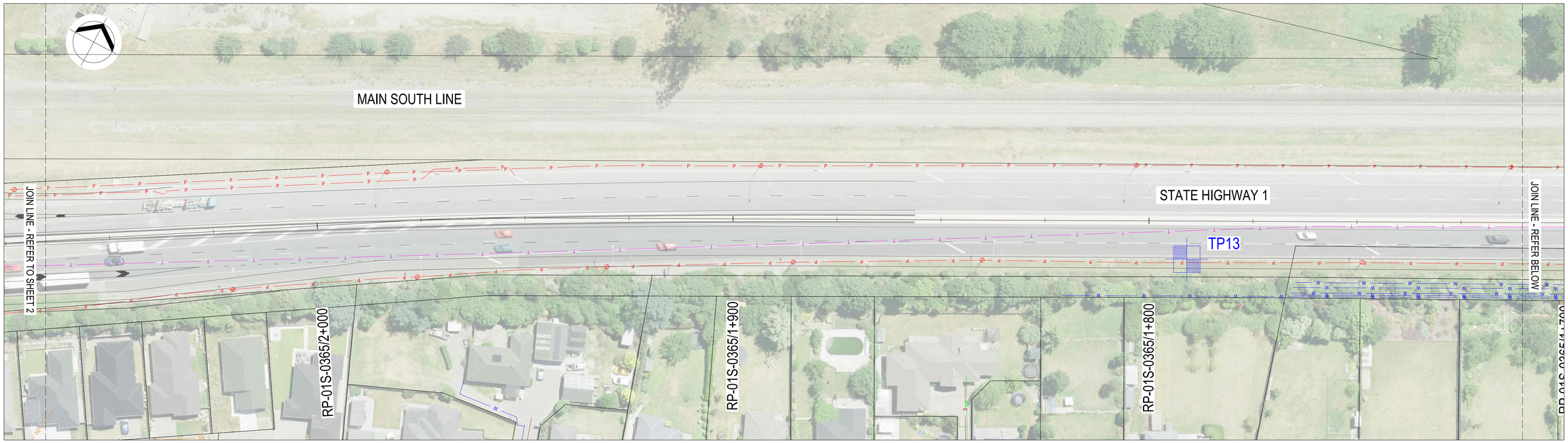
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- ST — EXISTING SOAK PIT INFILTRATION TEST
- BH — BOREHOLE
- UT — UTILITY TRENCH BY CORDE

LEGEND

BOUNDARY	
EXISTING SERVICES	
OVERHEAD POWER	OH
11kV UG POWER	11kV
ORION UG	P
ENABLE	FO
CHORUS	T
ONE NZ	T
WATER MAIN	W
STORMWATER	SW
SEWER	S
STOCK WATER RACE	WR
DUCT	
POWER POLE	
STREET LIGHT	
ENABLE CHAMBER/DROP DUCT	

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Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 10 OF 14

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-00-CA-1010

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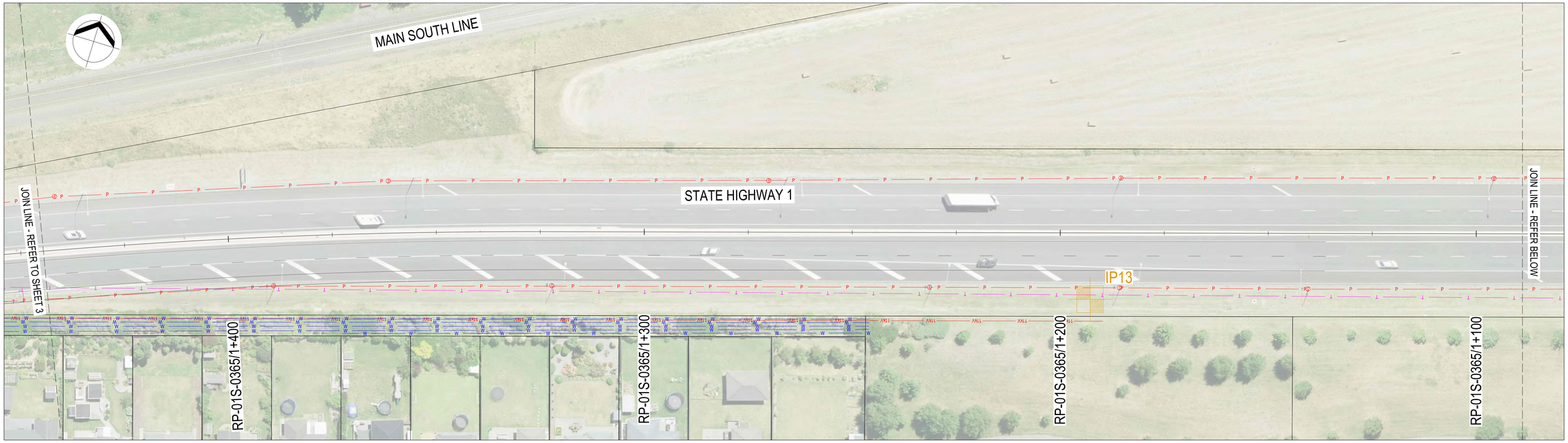
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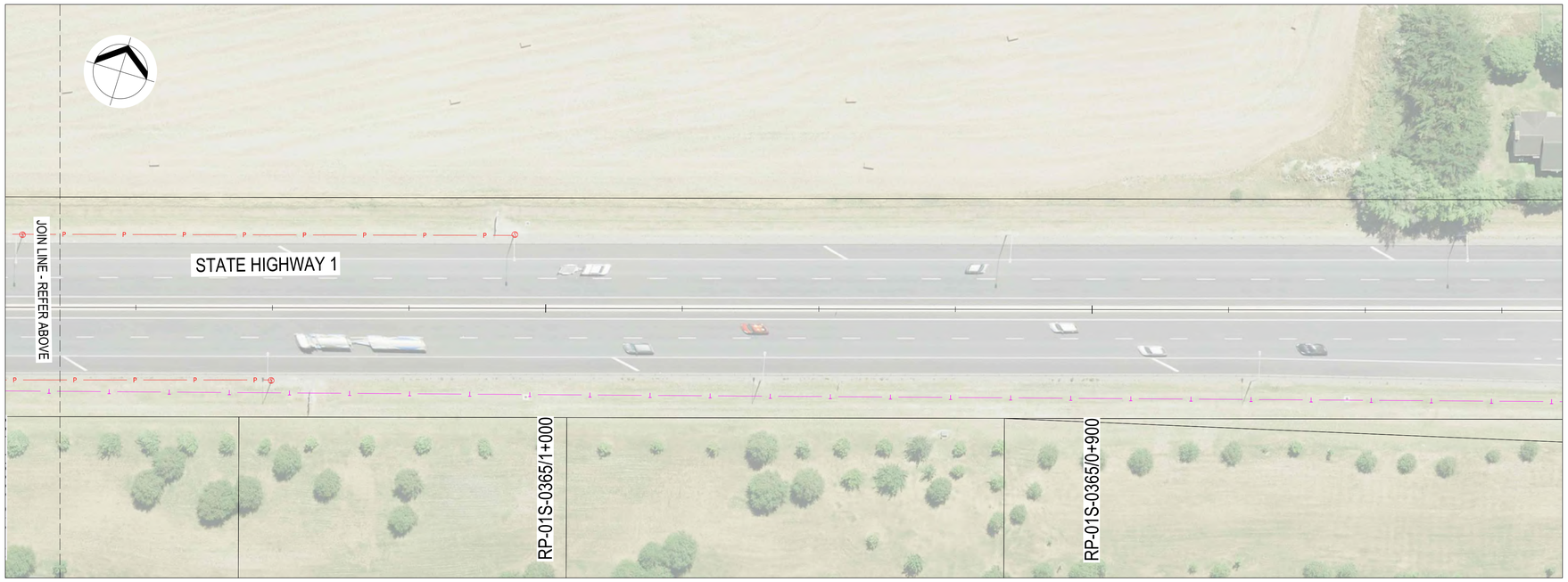
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TESTING LEGEND

- PP — PAVEMENT PIT - TO 1m BGL
- TP — TEST PIT
- IP — INFILTRATION PIT - to 4m max BGL
- ST — EXISTING SOAK PIT / INFILTRATION TEST
- BH — BOREHOLE
- UT — UTILITY TRENCH BY CORDE

LEGEND

- BOUNDARY
- EXISTING SERVICES
- OVERHEAD POWER (OH)
- 11kV UG POWER (11kV)
- ORION UG (P)
- ENABLE (FO)
- CHORUS (T)
- ONE NZ (T)
- WATER MAIN (W)
- STORMWATER (SW)
- SEWER (S)
- STOCK WATER RACE (WR)
- DUCT
- POWER POLE
- STREET LIGHT
- ENABLE CHAMBER/DROP DUCT

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A	FOR INFORMATION	BP	RY	DA	13.02.24
B	FINAL - FOR INVESTIGATION	BP	RY	DA	13.03.24
C	UPDATED PIT LOCATION - FOR INVESTIGATION	BP	RY	DA	19.06.24
D	UPDATED PIT LOCATION - POST INVESTIGATION	RA	NY	RY	02.10.24

Original Scale (A1) 1:500
Reduced Scale (A3) 1:1000

Design	B. PETERSON	12.03.24	Approved For Construction*
Drawn	R. ANDERSON	12.03.24	
Dsg Verifier	R. YOUNG	12.03.24	
Drg Check	M. HARRIS	12.03.24	Date

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 11 OF 14

Discipline: CIVIL ENGINEERING

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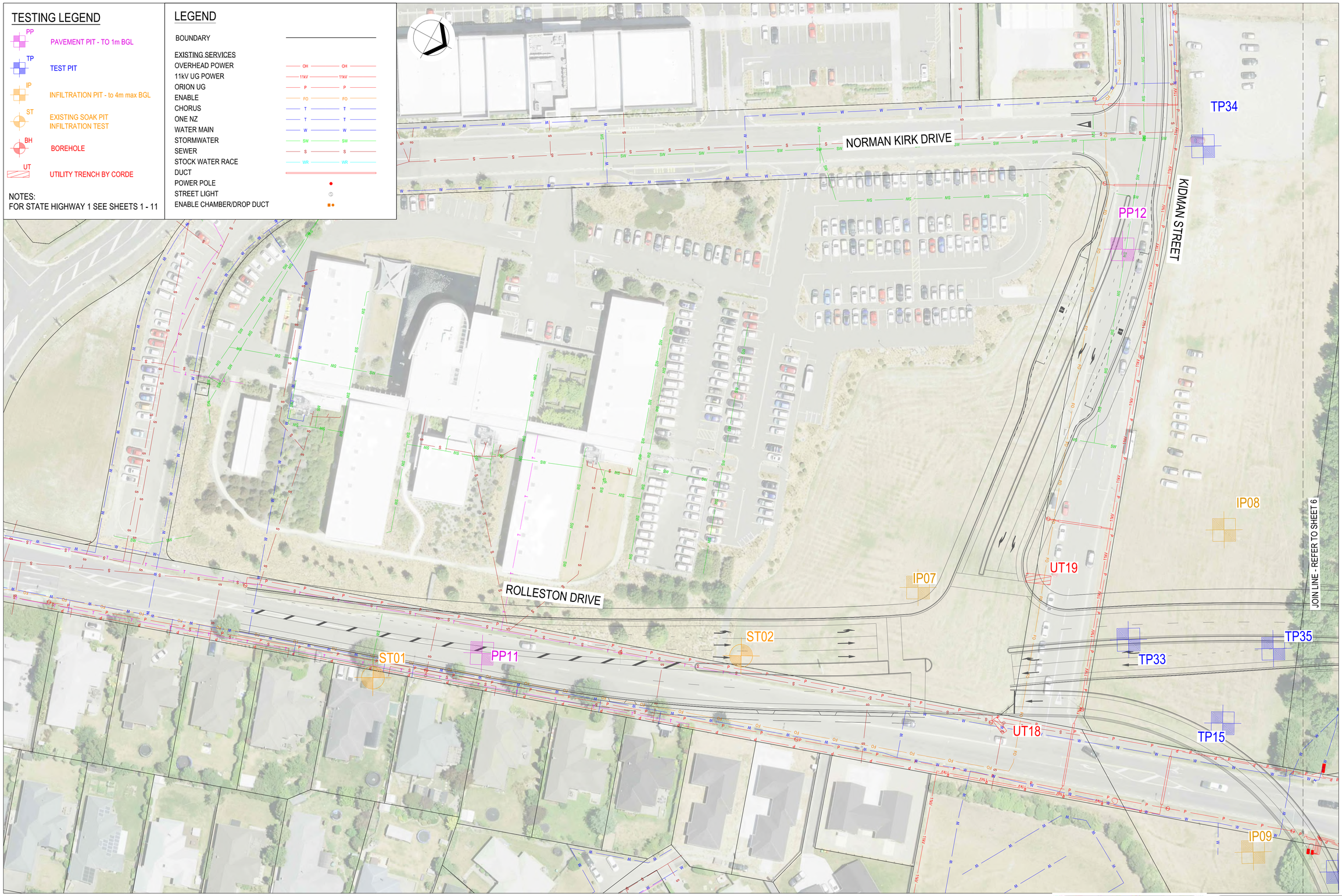
TESTING LEGEND

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- TP — TEST PIT
- IP — INFILTRATION PIT - to 4m max BGL
- ST — EXISTING SOAK PIT INFILTRATION TEST
- BH — BOREHOLE
- UT — UTILITY TRENCH BY CORDE

NOTES:
FOR STATE HIGHWAY 1 SEE SHEETS 1 - 11

LEGEND

BOUNDARY	
EXISTING SERVICES	
OVERHEAD POWER	OH
11kV UG POWER	11kV
ORION UG	P
ENABLE	FO
CHORUS	T
ONE NZ	T
WATER MAIN	W
STORMWATER	SW
SEWER	S
STOCK WATER RACE	WR
DUCT	
POWER POLE	
STREET LIGHT	
ENABLE CHAMBER/DROP DUCT	



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Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 12 OF 14

Discipline: CIVIL ENGINEERING

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TESTING LEGEND

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- TP — TEST PIT
- IP — INFILTRATION PIT - to 4m max BGL
- ST — EXISTING SOAK PIT INFILTRATION TEST
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- UT — UTILITY TRENCH BY CORDE

NOTES:
FOR STATE HIGHWAY 1 SEE SHEETS 1 - 11

LEGEND

- BOUNDARY
- EXISTING SERVICES
- OVERHEAD POWER (OH)
- 11kV UG POWER (11kV)
- ORION UG (P)
- ENABLE (FO)
- CHORUS (T)
- ONE NZ (T)
- WATER MAIN (W)
- STORMWATER (SW)
- SEWER (S)
- STOCK WATER RACE (WR)
- DUCT
- POWER POLE
- STREET LIGHT
- ENABLE CHAMBER/DROP DUCT

RP-01S-0365/2+400
RP-01S-0365/2+300
JOIN LINE - REFER TO SHEET 6
JOIN LINE - REFER TO SHEET 6
JONES ROAD
JONES ROAD
ROLLESTON DRIVE
PP14
PP13
ST06
ST04
TP16
IP10
BH02 + Downhole Shearwave
BH04 + Downhole Shearwave
BH03 + Piezo
TP35
TP22
UT21
TP17
TP18
TP19
BH05 + Piezo
IP09
TP25

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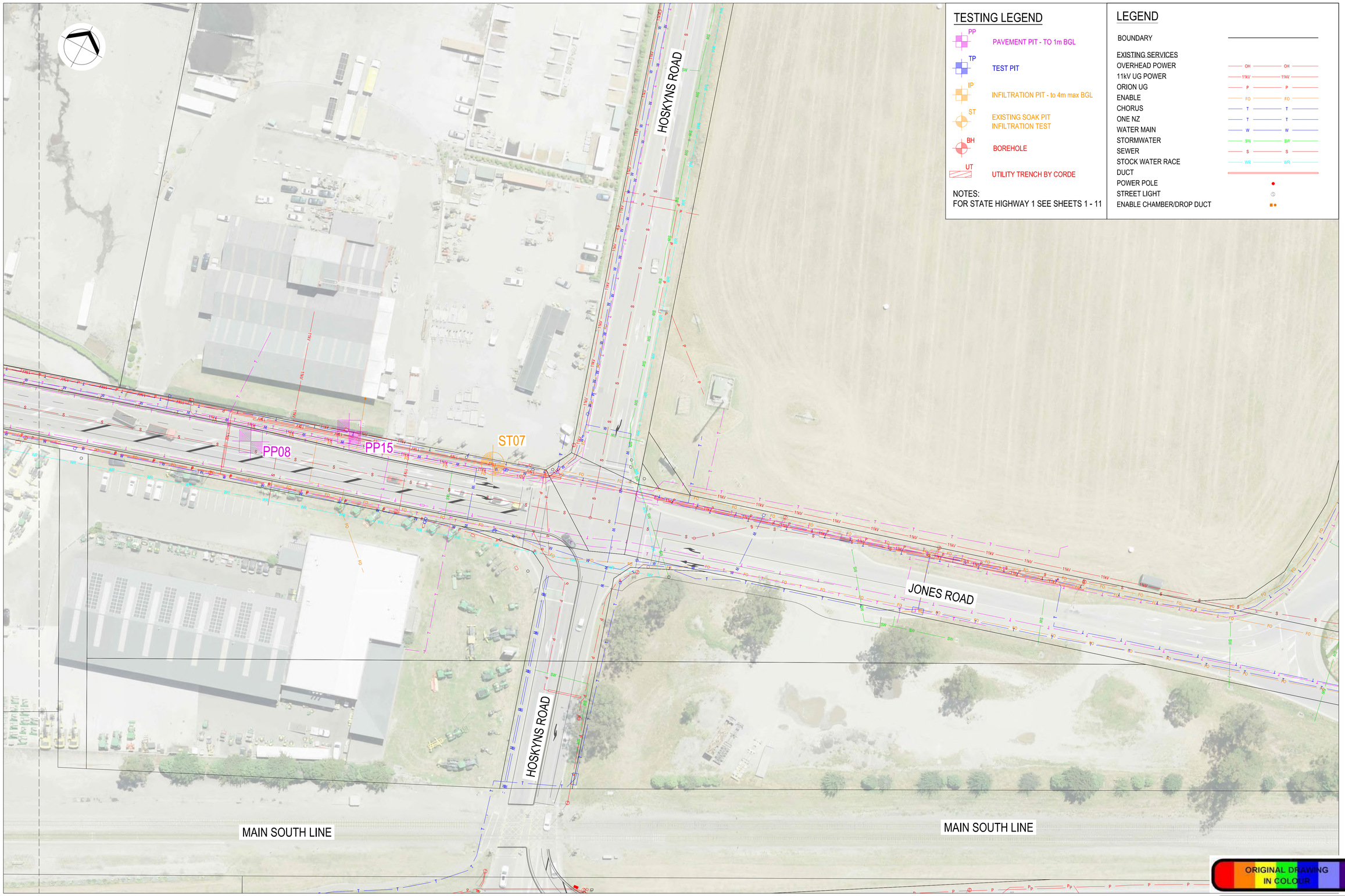
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NOTES:
FOR STATE HIGHWAY 1 SEE SHEETS 1 - 11

LEGEND

- BOUNDARY
- EXISTING SERVICES
- OVERHEAD POWER
- 11kV UG POWER
- ORION UG
- ENABLE
- CHORUS
- ONE NZ
- WATER MAIN
- STORMWATER
- SEWER
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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: SITE INVESTIGATIONS SHEET 14 OF 14

Discipline: CIVIL ENGINEERING

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B

Appendix B – Rolleston Access Improvements Infiltration Testing Memo

Memorandum

To:	Steve Harvey	**Date:**	16 August 2024
From:	Leeza Becroft	**Our Ref:**	3338703-691807897-6320
Copy:	Mike Thorley, Brad Peterson	**:**	
Subject:	Memorandum on Infiltration Testing for Rolleston Access Improvement Project		

1 Introduction

This memorandum summarises infiltration testing undertaken at a range of site across Rolleston for the Rolleston Access Improvement Project over the period 17 June to 1 August 2024. The New Zealand Transport Agency / Waka Kotahi (NZTA) has engaged Beca Ltd (Beca) to undertake design of a number of road improvements at Rolleston along State Highway 1 (SH1).

The main components of design are:

- Two-lane roundabout at intersection of State Highway 1 and Walkers Road / Dunns Crossing Road including stormwater infiltration devices and subway below SH1 for shared pathway.
- Flyover connecting Rolleston Drive North with Jones Road including stormwater infiltration device.
- Changes at additional intersections to remove right-turns across traffic.
- Various additional stormwater discharge via infiltration devices to accommodate additional apron.

This memo provides the measured infiltration rates measured on site, representative of the vertical minimum saturated infiltration rate for each of the tested locations and a factored design infiltration rate.

2 Site investigations

2.1 General

Beca has recently undertaken ground investigations at the site including a number of infiltration tests to investigation ground capacity for stormwater infiltration. Several piezometers were also installed to investigate groundwater levels. The physical works for the ground investigation was undertaken by Corde Ltd, and the full description of the investigations is reported in the Geotechnical Factual Report currently being prepared (Beca, 2024). The infiltration pit tests, and piezometer locations, and concept stormwater basin locations are shown in Attachment A.

2.2 Infiltration testing

Infiltration testing was carried out in accordance with the Ministry of Business, Innovation and Employment (MBIE) Acceptable Solutions and Verification Methods E1/VM1 (Surface Water), Section 9.0.2 (2017).

Testing was conducted using the falling head test method, in test pits, at depths ranging from 1.5 to 2.7m bgl within gravels with varying quantities of sand and silt (further details summarised in Table 2-1) and logs provided in the factual report (Beca, 2024).

Table 2-1: Infiltration pit details

Infiltration Pit ID	Test Date	Easting	Northing	Infiltration Test Depth (m bgl)	Tested soil description
IP01	18/06/2024	5172119	1547537	1.9	Cobbly GRAVEL, some sand.
IP02	1/07/2024	5172102	1547698	2.2	Sandy GRAVEL, some cobbles, trace silt.
IP03	1/08/2024	5172302	1547589	2.3	Sandy GRAVEL, some cobbles, trace silt.
IP04	24/06/2024	5172765	1548747	1.5	Sandy GRAVEL, some cobbles, minor silt.
IP07	25/06/2024	5173425	1550268	1.6	Sandy GRAVEL, some cobbles, minor silt.
IP08	25/06/2024	5173493	1550213	1.5	Sandy GRAVEL, some cobbles, minor silt.
IP09	25/06/2024	5173543	1550289	1.8	Cobbly sandy GRAVEL, trace silt.
IP10	24/07/2024	5173612	1550173	1.8	Sandy GRAVEL, trace cobbles, trace silt.
IP11	5/07/2024	5172484	1548207	2.2	Cobbly GRAVEL, some fine to coarse sand, trace silt.
IP12	15/07/2024	5173106	1549337	2.7	Sandy GRAVEL, trace cobbles, trace silt.
IP13	10/07/2024	5174046	1551239	2.2	Sandy GRAVEL, some cobbles, trace silt.

Notes:
Coordinates obtained using a handheld GPS are provided in NZTM2000, with an accuracy of +/- 3 m.
m bgl (metres below ground level)

Groundwater was not encountered in any of the infiltration pits (see Section 2.4 for nearby groundwater levels).

The water level change during testing was measured manually using a dip meter, and automatically using a Levelogger. The infiltration pits were pre-soaked for a period of 60 minutes prior to testing. This was achieved by filling the pits onsite using a 10,000L water tanker. In pits IP01, IP02, IP03 and IP11, the 60minute pre-soak was not able to be achieved due to initial high rates of infiltration and a limited water supply. In these pits, the minimum pre-soak was 20minutes.

Infiltration testing was conducted, and the test results are summarised in Table 2-2 and detailed infiltration testing results are presented in Attachment B. The infiltration rates reported here are the minimum stabilised rates observed on site without a factor of safety applied. Where required, the infiltration rates have been smoothed slightly to account for site and measurement error.

Table 2-2: Summary of infiltration testing

Infiltration Pit ID	Location	Pre-soak duration (min)	Test Duration (min)	Infiltration Test Depth (m bgl)	Water Level at Start (m above base)	Measured Infiltration Rate (mm/hr)
IP01	West of Roundabout	30	16	1.9	0.52	660
IP02	South of Roundabout	20	18	2.2	0.8	1,882
IP03	North of Roundabout	20	6	2.3	0.3	2,100
IP04	West end of Rolleston Dr	60	68	1.5	1.25	268
IP07	Kidman St – Rolleston Dr interception	60	57	1.6	0.72	389
IP08	Soth of SH1, west of Rolleston Dr	60	119	1.5	0.7	243
IP09	Soth of SH1, east of Rolleston Dr	60	10	1.8	0.73	2,325
IP10	North of SH1, west of Rolleston Dr	50	36	1.8	0.51	497
IP11	50m north of Breccia St	30	20	2.2	0.7	588
IP12	North-western end of Coleridge St	60	70	2.7	0.7	334
IP13	100m north of north end of Colebrook Dr	60	80	2.2	0.58	41

The range in observed infiltration rates reflects the heterogeneity of the alluvial soils in the area. Small changes in fines content in the soils can result in large changes in the infiltration performance. Land use can also locally increase compaction which also affects infiltration capacity of soils.

The average of the observed stabilised infiltration rate, which typically occurs towards the end of an infiltration test, are typically suitable for infiltration basin design sizing purposes and are summarised in Table 2-2 and will need an appropriate factor of safety to be applied to account for long term clogging, uncertainty and consequence of failure.

2.3 Piezometers

Single standpipe piezometers have been installed in several of the boreholes drilled on site. These piezometers were generally screened into alluvial gravels at 10-15m and are summarised in Table 2-3.

Table 2-3: Piezometers installation summary

BH ID	Location	Easting	Northing	Ground Level (m RL)	Total Depth (m bgl) [m RL]	Screen interval (m bgl) [mRL]
BH01	East of Roundabout	1547688	5172144	58.6	15.0 [43.6]	10-15 [48.6 – 43.6]
BH03	SH1 Rolleston Dr Interception	1550200	5173585	55.3	15.0 [40.3]	10-15 [45.3 – 40.3]
BH05	South-east of 801 Jones Road	1550179	5173655	56.0	15.0 [41.0]	10-15 [46.0 – 41.0]

Notes:
RL (Relative Level)
Ground levels sourced from Canterbury Maps with an accuracy of +/- 0.5 m.
Coordinates obtained using a handheld GPS are provided in NZTM2000, with an accuracy of +/- 3 m.
m bgl (metres below ground level)
Borehole inclination is 90º from horizontal.

2.4 Groundwater levels

The depth to groundwater was measured in the piezometers described in Section 2.3 on 12 July and 12 August 2024. The piezometers had been developed 2 days to 30 days prior to the water measurement. The groundwater levels are summarised in Table 2-4.

Automated groundwater level logging is proposed at the piezometers, and is due to be commenced shortly.

Table 2-4: Groundwater measurements

Borehole/ Piezometer ID	Date & Time of Measurement	Depth to Groundwater (m bgl)	Groundwater Level (m RL)	Type of Measurement (Borehole or Piezometer)
BH01	12/07/2024 9:00am	11.4	47.2	Piezometer
BH03	12/08/2024 10:20am	12.42	42.88	Piezometer
BH05	12/08/2024 9:30am	13.15	42.85	Piezometer

Notes:
RL (Relative Level)
m bgl (metres below ground level)

3 Mounding

The groundwater levels observed on site are sufficiently deep (>10m bgl at the site) that a mounding assessment is not required for the proposed stormwater discharge to land.

4 Factors of Safety (FoS)

The assessment of an appropriate design infiltration rate is based on the minimum stabilised measured rate, observed at each infiltration location during the testing. There is large uncertainty in the long-term performance of an infiltration device due to the extrapolation of a short-term (6 mins to 2 hours) infiltration test compared to actual performance during rainfall events which can result in multi-day infiltration events as stormwater is treated and discharged to land. Things that reduce infiltration capacity over longer time periods include, the uncertainty in whether the soils were fully saturated during site-testing, mounding that may occur, clogging of the system by siltation, compaction, and any reduction in basin performance due to poor quality assurance during construction.

For stormwater infiltration device design purposes, CIRIA SuDS Manual (2015) provides a range of factors of safety (FoS) that can be applied to the measured infiltration rates. These FoS are listed in Table 4-1.

The consequence of failure for the Rolleston Access Improvement project may include major inconvenience to road-users, i.e. flooding of a major highway (SH1) and/or local roads in Rolleston, depending on the secondary flow path from the infiltration devices. We therefore recommend that a FoS of 10 is applied to the measured rates on site, where possible. Where the civil designer considers that the risk of failure consequence can be appropriately managed, and the client has agreed to the proposed risk mitigations, a FoS of 5 can be applied.

Table 4-1: Suggested factors of safety for use in hydraulic design of infiltration systems (CIRIA, 2015).

TABLE 25.2 Suggested factors of safety, F, for use in hydraulic design of infiltration systems (designed using Bettess (1996). Note: not relevant for BRE method)

Size of area to be drained	Consequences of failure		
	No damage or inconvenience	Minor damage to external areas or inconvenience (eg surface water on car parking)	Damage to buildings or structures, or major inconvenience (eg flooding of roads)
< 100 m²	1.5	2	10
100–1000 m²	1.5	3	10
> 1000 m²	1.5	5	10

Considering the tested rates and factor of safety, the recommended design infiltration rate for each location is listed in Table 4-2.

Table 4-2: Design infiltration rates (FoS of 10 and 5, as per CIRIA, 2015)

Piezometer ID	Location	Measured Infiltration Rate (mm/hr)	Factored Infiltration Rate FoS 5 (mm/hr)	Factored Infiltration Rate FoS 10 (mm/hr)
IP01	Roundabout	660	132	66
IP02	Roundabout	1,882	376	188
IP03	Roundabout	2,100	420	210
IP04	SH1	268	54	27
IP07	SH1	389	78	39
IP08	SH1	243	49	24
IP09	SH1	2,325	465	232
IP10	SH1	497	100	50
IP11	SH1	588	118	59
IP12	SH1	334	67	33
IP13	SH1	41	8	4

The following design recommendations below are based our observations from the recent site investigations and testing, and from our previous experience with infiltration device design inputs:

- Infiltration devices should be installed approximately 0.5 m into the freer draining gravel strata (generally found at approximately 2 m depth) and avoid being founded in fill and/or lower permeability strata as this will compromise infiltration.
- Infiltration Devices inverts should be founded more than 3 m clear the water table as this may affect infiltration.
- We recommend that washed and suitably graded drainage aggregate (free of fines) be used in the infiltration devices.
- We recommend the base of the infiltration devices are unlined (i.e., no geotextile used).
- Refer to the DSI recommendations regarding the presence of fill materials and/or contaminated soils in the infiltration devices. Lining of the sides of the infiltration devices to prevent direct contact with side cut soils may be required.

5 Construction Recommendations

The following general construction recommendations are based on the site investigation, testing, and analysis, as well as our experience with similar construction:

- Excavation for the infiltration devices shall be undertaken in a manner to avoid direct compaction and potential clogging of the subgrade intended for water infiltration (i.e., sandy gravel alluvium).
- Excavation of the infiltration devices should extend into the freer draining sandy gravel strata to the depth specified by the Designer by approximately 0.5 m.
- The base of the infiltration device should be unlined (i.e., no geotextile used).
- The sides of infiltration devices should be graded and lined to prevent the mobilisation of fines and direct contact with the soils.
- Follow DSI findings regarding contaminated soils which may include lining the sidewalls of the infiltration devices with an impermeable liner to avoid risk of contaminant mobilisation.
- Clean and washed drainage aggregate free of fines should be utilised within the infiltration devices.

- Proof testing of infiltration rate of the soils at the time of construction should be undertaken to verify design assumptions.
- Infiltration devices should avoid being founded in silt layers, or in silty gravels as this may reduce actual infiltration rates.
- Drainage materials should be reviewed by the project geotechnical engineer.

The actual infiltration performance of the infiltration devices are expected to decrease over time due to clogging with fine sediment and silt. Actual performance will be subject to construction techniques and quality, ground conditions, actual groundwater levels and the water quality entering the infiltration devices.

6 Summary

Beca has undertaken infiltration testing in various locations across Rolleston to support the stormwater drainage design for additional road apron proposed as part of the Rolleston Access Improvement project.

Infiltration rates vary significantly across site, as is typical for alluvial soils like that encountered at site. Testing found infiltration rates were generally better in strata at approximately 2 m depth, although measured rates onsite ranged from 41 mm/hr to 2325 mm/hr with an average of 850 mm/hr across eleven tests.

Only the infiltration rate measured directly at the site of the proposed infiltration device should be used in design, and a suitable factor of safety of between 5-10 is adopted based on those set out in CIRIA (2015).

Construction recommendations are provided in this memo, and include avoiding compaction of the subgrade materials, using suitable drainage aggregate free of fines, addressing contamination issues should they be present and conduct proof testing of the infiltration devices at the time of construction.

Actual infiltration performance may vary and will be subject to construction techniques and quality, ground conditions, actual groundwater levels and the volume of sediment and water quality entering the infiltration devices.



Leeza Becroft

Senior Hydrogeologist

Phone Number: +64 3 374 3159

Email: Leeza.Becroft@beca.com

Attachments

Attachment A – Ground Investigation Locations Plans (Refer Appendix A of Geotechnical Interpretive Report)

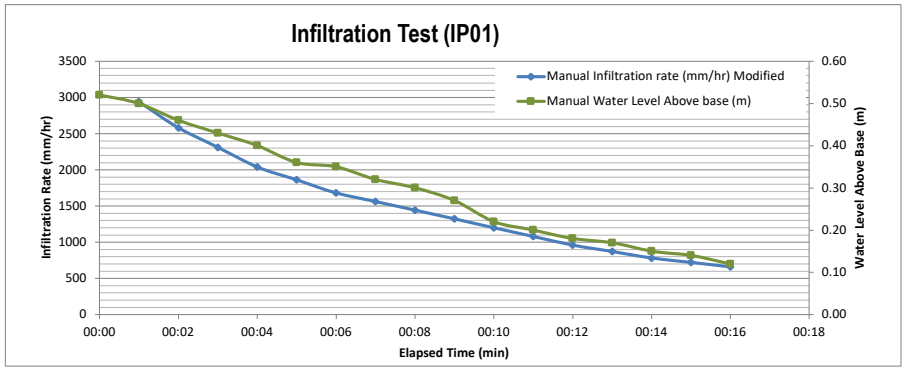
Attachment B – Infiltration Rate Calculation Sheets

Location ID: IP01 Rolleston Access Improvement
Project Number: 3338703

Name:	IP01
Date Testing:	18/06/2024
Field Rep:	RO
Author:	GT
Checked:	LB

Depth of test pit (m)	1.9
Length of test pit (m)	2.5
Width of test pit (m)	1.5
Test pit area (m2)	3.75

Infiltration (mm/hr)	
Minimum	660





Manual Test Readings

Date	Manual Test Time Interval	Manual Test measurement (m)	Manual Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Manual Infiltration rate (mm/hr)	Manual Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
18/06/2024	00:00:00	1.38	0.520	1.380	0.00	0	0	0.00				
18/06/2024	00:01:00	1.4	0.500	1.400	1.00	20	49	0.0167	1200.0	2940.0	20	
18/06/2024	00:02:00	1.44	0.460	1.440	2.00	40	43	0.0167	2400.0	2580.0	60	
18/06/2024	00:03:00	1.47	0.430	1.470	3.00	30	38.5	0.0167	1800.0	2310.0	90	
18/06/2024	00:04:00	1.5	0.400	1.500	4.00	30	34	0.0167	1800.0	2040.0	120	
18/06/2024	00:05:00	1.54	0.360	1.540	5.00	40	31	0.0167	2400.0	1860.0	160	
18/06/2024	00:06:00	1.55	0.350	1.550	6.00	10	28	0.0167	600.0	1680.0	170	
18/06/2024	00:07:00	1.58	0.320	1.580	7.00	30	26	0.0167	1800.0	1560.0	200	
18/06/2024	00:08:00	1.6	0.300	1.600	8.00	20	24	0.0167	1200.0	1440.0	220	
18/06/2024	00:09:00	1.63	0.270	1.630	9.00	30	22	0.0167	1800.0	1320.0	250	
18/06/2024	00:10:00	1.68	0.220	1.680	10.00	50	20	0.0167	3000.0	1200.0	300	
18/06/2024	00:11:00	1.7	0.200	1.700	11.00	20	18	0.0167	1200.0	1080.0	320	
18/06/2024	00:12:00	1.72	0.180	1.720	12.00	20	16	0.0167	1200.0	960.0	340	
18/06/2024	00:13:00	1.73	0.170	1.730	13.00	10	14.5	0.0167	600.0	870.0	350	
18/06/2024	00:14:00	1.75	0.150	1.750	14.00	20	13	0.0167	1200.0	780.0	370	
18/06/2024	00:15:00	1.76	0.140	1.760	15.00	10	12	0.0167	600.0	720.0	380	
18/06/2024	00:16:00	1.78	0.120	1.780	16.00	20	11	0.0167	1200.0	660.0	400	

Automatic Logger Test Readings

Date	AutoTest Time Interval	Manual Test measurement (m)	Auto Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Auto Infiltration rate (mm/hr)	Auto Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment

Testing Notes:

- The pit was soaked with one truck which was completely emptied without the water level reaching 0.75 m bgl. The truck went to refill and in that time pit emptied. Another 8000L of water was emptied into pit and the test was conducted upon emoyting the tanker into the pit.
- Water levels were monitored using only manual dipper
- Groundwater not encountered
- Silt accumulation on base of pit after water drained

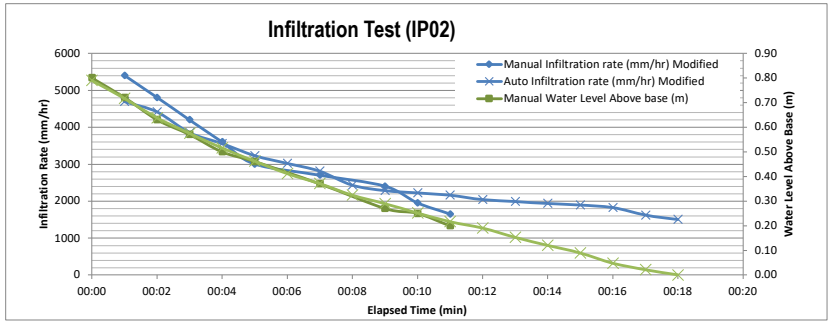
Sensitivity: General

Location ID: ITP02 Rolleston Access Improvement
Project Number: 3338703

Name:	IP02
Date Testing:	1/07/2024
Field Rep:	RO
Author:	GT
Checked:	LB

Depth of test pit (m)	2.2
Length of test pit (m)	2.6
Width of test pit (m)	1.6
Test pit area (m2)	4.16

Infiltration (mm/hr)	
Minimum	1,882





Manual Test Readings

Date	Manual Test Time Interval	Manual Test measurement (m)	Manual Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Manual Infiltration rate (mm/hr)	Manual Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
1/07/2024	00:00:00	1.4	0.800	1.400	0.00	0	0	0.00				
1/07/2024	00:01:00	1.48	0.720	1.480	1.00	80	90	0.0167	4800.0	5400.0	80	
1/07/2024	00:02:00	1.57	0.630	1.570	2.00	90	80	0.0167	5400.0	4800.0	170	
1/07/2024	00:03:00	1.63	0.570	1.630	3.00	60	70	0.0167	3600.0	4200.0	230	
1/07/2024	00:04:00	1.7	0.500	1.700	4.00	70	60	0.0167	4200.0	3600.0	300	
1/07/2024	00:05:00	1.74	0.460	1.740	5.00	40	50	0.0167	2400.0	3000.0	340	
1/07/2024	00:07:00	1.83	0.370	1.830	7.00	90	90	0.0333	2700.0	2700.0	430	
1/07/2024	00:09:00	1.93	0.270	1.930	9.00	100	80	0.0333	3000.0	2400.0	530	
1/07/2024	00:10:00	1.95	0.250	1.950	10.00	20	32.5	0.0167	1200.0	1950.0	550	
1/07/2024	00:11:00	2	0.200	2.000	11.00	50	27.5	0.0167	3000.0	1650.0	600	

Automatic Logger Test Readings

Date	AutoTest Time Interval	Manual Test measurement (m)	Auto Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Auto Infiltration rate (mm/hr)	Auto Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
1/07/2024	00:00:00	1.41	0.790	1.410	0.00	0	0	0.00				
1/07/2024	00:01:00	1.48	0.716	1.484	1.00	73.9	78.2	0.0167	4434.0	4692.0	73.9	
1/07/2024	00:02:00	1.56	0.638	1.562	2.00	78.2	73.5	0.0167	4692.0	4410.0	152.1	
1/07/2024	00:03:00	1.63	0.575	1.625	3.00	63.2	64.2	0.0167	3792.0	3852.0	215.3	
1/07/2024	00:04:00	1.68	0.515	1.685	4.00	59.3	59.3	0.0167	3558.0	3558.0	274.6	
1/07/2024	00:05:00	1.74	0.462	1.738	5.00	53.8	53.8	0.0167	3228.0	3228.0	328.4	
1/07/2024	00:06:00	1.79	0.411	1.789	6.00	50.3	50.3	0.0167	3018.0	3018.0	378.7	
1/07/2024	00:07:00	1.83	0.371	1.829	7.00	40.5	46.8	0.0167	2430.0	2808.0	419.2	
1/07/2024	00:08:00	1.88	0.324	1.876	8.00	46.8	40.5	0.0167	2808.0	2430.0	466	
1/07/2024	00:09:00	1.91	0.290	1.910	9.00	34.4	38	0.0167	2064.0	2280.0	500.4	
1/07/2024	00:10:00	1.95	0.252	1.948	10.00	37.7	37	0.0167	2262.0	2220.0	538.1	
1/07/2024	00:11:00	1.98	0.216	1.984	11.00	35.5	36	0.0167	2130.0	2160.0	573.6	
1/07/2024	00:12:00	2.01	0.190	2.010	12.00	26.1	34	0.0167	1566.0	2040.0	599.7	
1/07/2024	00:13:00	2.05	0.152	2.048	13.00	37.9	33.1	0.0167	2274.0	1986.0	637.6	
1/07/2024	00:14:00	2.08	0.121	2.079	14.00	31.8	32.2	0.0167	1908.0	1932.0	669.4	
1/07/2024	00:15:00	2.11	0.089	2.111	15.00	31.2	31.5	0.0167	1872.0	1890.0	700.6	
1/07/2024	00:16:00	2.15	0.048	2.152	16.00	41.6	30.4	0.0167	2496.0	1824.0	742.2	
1/07/2024	00:17:00	2.18	0.021	2.179	17.00	26.8	27	0.0167	1608.0	1620.0	769	
1/07/2024	00:18:00	2.20	0.000	2.200	18.00	21	25	0.0167	1260.0	1500.0	790	

Testing Notes:

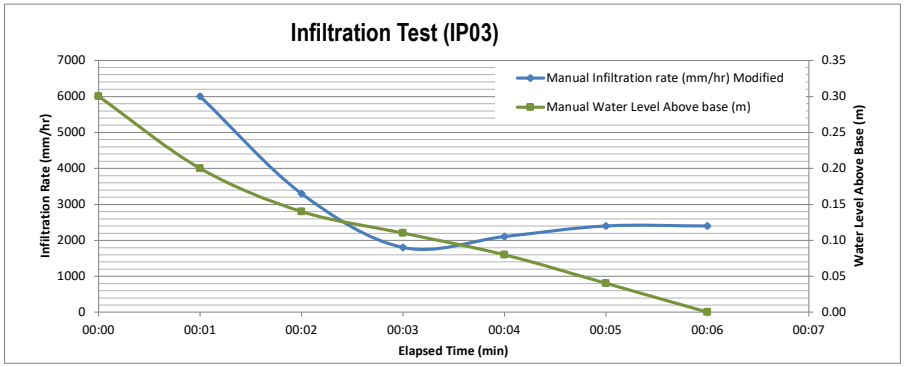
- Pre-soak conducted, level maintained at 0.5 metres above base of pit after 10,000 litre tanker was emptied approximately 20 minutes upon which the test was conducted
- Water levels were monitored using manual dipper and levelogger
- Pre-soak terminated after 20 mins (completion of 10,000L tanker) due to time constraints
- Bucket was placed at the bottom of the pit for water pour and remained in pit during test
- Groundwater not encountered

Location ID: IP03 Rolleston Access Improvement
Project Number: 3338703

Name:	IP03
Date Testing:	1/08/2024
Field Rep:	NY
Author:	GT
Checked:	LB

Depth of test pit (m)	2.4
Length of test pit (m)	3.0
Width of test pit (m)	2.2
Test pit area (m2)	6.60

Infiltration (mm/hr)	
Minimum	2,100





Manual Test Readings

Date	Manual Test Time Interval	Manual Test measurement (m)	Manual Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Manual Infiltration rate (mm/hr)	Manual Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
1/08/2024	00:00:00	2.1	0.300	2.100	0.00	0	0	0.00				
1/08/2024	00:01:00	2.2	0.200	2.200	1.00	100	100	0.0167	6000.0	6000.0	100	
1/08/2024	00:02:00	2.26	0.140	2.260	2.00	60	55	0.0167	3600.0	3300.0	160	
1/08/2024	00:03:00	2.29	0.110	2.290	3.00	30	30	0.0167	1800.0	1800.0	190	
1/08/2024	00:04:00	2.32	0.080	2.320	4.00	30	35	0.0167	1800.0	2100.0	220	
1/08/2024	00:05:00	2.36	0.040	2.360	5.00	40	40	0.0167	2400.0	2400.0	260	
1/08/2024	00:06:00	2.4	0.000	2.400	6.00	40	40	0.0167	2400.0	2400.0	300	

Automatic Logger Test Readings

Date	AutoTest Time Interval	Manual Test measurement (m)	Auto Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Auto Infiltration rate (mm/hr)	Auto Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment

No levelogger used

Testing Notes:

- Pre-soak conducted, level dropped below base of pit after 3,000 litres was poured approximately 1 hour before it was refilled for 15 minutes with 7,000 litres upon which the test was conducted
- Water levels were monitored using manual dipmeter
- Pre-soak terminated upon exhaustion of the water tank
- Groundwater not encountered

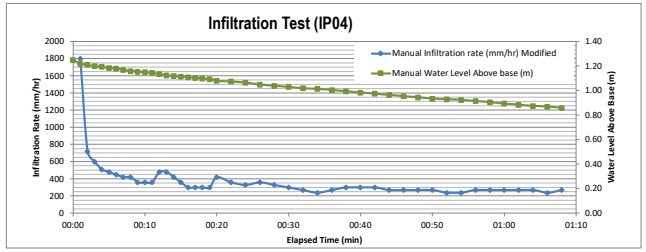
Sensitivity: General

Location ID: IP04 Rolleston Access Improvement
Project Number: 3338703

Name:	IP04
Date Testing:	24/06/2024
Field Rep:	NY
Author:	GT
Checked:	LB

Depth of test pit (m)	1.5
Length of test pit (m)	2.1
Width of test pit (m)	1.6
Test pit area (m2)	3.36

Infiltration (mm/hr)	
Minimum	268





Manual Test Readings

Date	Manual Test Time Interval	Manual Test measurement (m)	Manual Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Manual Infiltration rate (mm/hr)	Manual Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
24/06/2024	00:00:00	0.25	1.250	0.250	0.00	0	0	0.00				
24/06/2024	00:01:00	0.28	1.220	0.280	1.00	30	30	0.0167	1800.0	1800.0	30	
24/06/2024	00:02:00	0.29	1.210	0.290	2.00	10	12	0.0167	600.0	720.0	40	
24/06/2024	00:03:00	0.3	1.200	0.300	3.00	10	10	0.0167	600.0	600.0	50	
24/06/2024	00:04:00	0.305	1.195	0.305	4.00	5	8.5	0.0167	300.0	510.0	55	
24/06/2024	00:05:00	0.315	1.185	0.315	5.00	10	8	0.0167	600.0	480.0	65	
24/06/2024	00:06:00	0.32	1.180	0.320	6.00	5	7.5	0.0167	300.0	450.0	70	
24/06/2024	00:07:00	0.33	1.170	0.330	7.00	10	7	0.0167	600.0	420.0	80	
24/06/2024	00:08:00	0.34	1.160	0.340	8.00	10	7	0.0167	600.0	420.0	90	
24/06/2024	00:09:00	0.345	1.155	0.345	9.00	5	6	0.0167	300.0	360.0	95	
24/06/2024	00:10:00	0.35	1.150	0.350	10.00	5	6	0.0167	300.0	360.0	100	
24/06/2024	00:11:00	0.355	1.145	0.355	11.00	5	6	0.0167	300.0	360.0	105	
24/06/2024	00:12:00	0.365	1.135	0.365	12.00	10	8	0.0167	600.0	480.0	115	
24/06/2024	00:13:00	0.375	1.125	0.375	13.00	10	8	0.0167	600.0	480.0	125	
24/06/2024	00:14:00	0.38	1.120	0.380	14.00	5	7	0.0167	300.0	420.0	130	
24/06/2024	00:15:00	0.385	1.115	0.385	15.00	5	6	0.0167	300.0	360.0	135	
24/06/2024	00:16:00	0.39	1.110	0.390	16.00	5	5	0.0167	300.0	300.0	140	
24/06/2024	00:17:00	0.395	1.105	0.395	17.00	5	5	0.0167	300.0	300.0	145	
24/06/2024	00:18:00	0.4	1.100	0.400	18.00	5	5	0.0167	300.0	300.0	150	
24/06/2024	00:19:00	0.405	1.095	0.405	19.00	5	5	0.0167	300.0	300.0	155	
24/06/2024	00:20:00	0.42	1.080	0.420	20.00	15	7	0.0167	900.0	420.0	170	
24/06/2024	00:22:00	0.425	1.075	0.425	22.00	5	12	0.0333	150.0	360.0	175	
24/06/2024	00:24:00	0.435	1.065	0.435	24.00	10	11	0.0333	300.0	330.0	185	
24/06/2024	00:26:00	0.45	1.050	0.450	26.00	15	12	0.0333	450.0	360.0	200	
24/06/2024	00:28:00	0.46	1.040	0.460	28.00	10	11	0.0333	300.0	330.0	210	
24/06/2024	00:30:00	0.47	1.030	0.470	30.00	10	10	0.0333	300.0	300.0	220	
24/06/2024	00:32:00	0.48	1.020	0.480	32.00	10	9	0.0333	300.0	270.0	230	
24/06/2024	00:34:00	0.485	1.015	0.485	34.00	5	8	0.0333	150.0	240.0	235	
24/06/2024	00:36:00	0.495	1.005	0.495	36.00	10	9	0.0333	300.0	270.0	245	
24/06/2024	00:38:00	0.505	0.995	0.505	38.00	10	10	0.0333	300.0	300.0	255	
24/06/2024	00:40:00	0.515	0.985	0.515	40.00	10	10	0.0333	300.0	300.0	265	
24/06/2024	00:42:00	0.525	0.975	0.525	42.00	10	10	0.0333	300.0	300.0	275	
24/06/2024	00:44:00	0.535	0.965	0.535	44.00	10	9	0.0333	300.0	270.0	285	
24/06/2024	00:46:00	0.545	0.955	0.545	46.00	10	9	0.0333	300.0	270.0	295	
24/06/2024	00:48:00	0.555	0.945	0.555	48.00	10	9	0.0333	300.0	270.0	305	
24/06/2024	00:50:00	0.565	0.935	0.565	50.00	10	9	0.0333	300.0	270.0	315	
24/06/2024	00:52:00	0.57	0.930	0.570	52.00	5	8	0.0333	150.0	240.0	320	
24/06/2024	00:54:00	0.575	0.925	0.575	54.00	5	8	0.0333	150.0	240.0	325	
24/06/2024	00:56:00	0.585	0.915	0.585	56.00	10	9	0.0333	300.0	270.0	335	
24/06/2024	00:58:00	0.595	0.905	0.595	58.00	10	9	0.0333	300.0	270.0	345	
24/06/2024	01:00:00	0.605	0.895	0.605	60.00	10	9	0.0333	300.0	270.0	355	
24/06/2024	01:02:00	0.615	0.885	0.615	62.00	10	9	0.0333	300.0	270.0	365	
24/06/2024	01:04:00	0.625	0.875	0.625	64.00	10	9	0.0333	300.0	270.0	375	
24/06/2024	01:06:00	0.63	0.870	0.630	66.00	5	8	0.0333	150.0	240.0	380	
24/06/2024	01:08:00	0.64	0.860	0.640	68.00	10	9	0.0333	300.0	270.0	390	

Automatic Logger Test Readings

Date	AutoTest Time Interval	Manual Test measurement (m)	Auto Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Auto Infiltration rate (mm/hr)	Auto Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment

No levelogger used

Testing Notes:

- Pre-soak conducted, level dropped below base of pit after 10,000 litre tanker was emptied approximately 40 minutes before it was refilled for 20 minutes reaching a level of 1.25 metres above base of pit upon which the test was conducted

- The bucket was lowered into the bottom of the pit and water was poured at a fast rate. Potentially disturbed the pit walls and caused fines to settle to bottom.
- Water levels were monitored using only manual dipper
- Pre-soak terminated on reach of target time
- Test terminated due to time constraints
- Groundwater not encountered

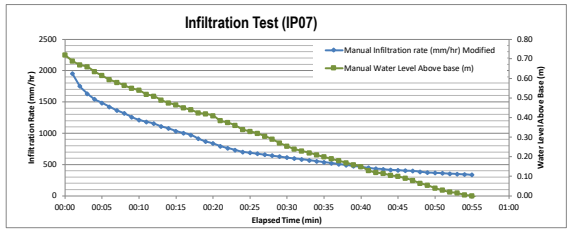
Sensitivity: General

Location ID: IP07 Rolleston Access Improvement
Project Number: 3338703

Name:	IP07
Date Testing:	25/06/2024
Field Rep:	RO
Author:	GT
Checked:	LB

Depth of test pit (m)	1.6
Length of test pit (m)	1.6
Width of test pit (m)	2.1
Test pit area (m2)	3.36

Infiltration (mm/hr)	
Minimum	389





Manual Test Readings

Date	Manual Test Time Interval	Manual Test measurement (m)	Manual Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Manual Infiltration rate (mm/hr)	Manual Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
25/06/2024	00:00:00	0.88	0.720	0.880	0.00	0	0	0.00				
25/06/2024	00:01:00	0.91	0.690	0.910	1.00	30	32.55	0.0167	1800.0	1953.0	30	
25/06/2024	00:02:00	0.93	0.670	0.930	2.00	20	29.25	0.0167	1200.0	1755.0	50	
25/06/2024	00:03:00	0.94	0.660	0.940	3.00	10	27.25	0.0167	600.0	1635.0	60	
25/06/2024	00:04:00	0.965	0.635	0.965	4.00	25	25.75	0.0167	1500.0	1545.0	85	
25/06/2024	00:05:00	0.985	0.615	0.985	5.00	20	24.75	0.0167	1200.0	1485.0	105	
25/06/2024	00:06:00	1.005	0.595	1.005	6.00	20	23.75	0.0167	1200.0	1425.0	125	
25/06/2024	00:07:00	1.02	0.580	1.020	7.00	15	22.75	0.0167	900.0	1365.0	140	
25/06/2024	00:08:00	1.035	0.565	1.035	8.00	15	22	0.0167	900.0	1320.0	155	
25/06/2024	00:09:00	1.05	0.550	1.050	9.00	15	21	0.0167	900.0	1260.0	170	
25/06/2024	00:10:00	1.06	0.540	1.060	10.00	10	20.25	0.0167	600.0	1215.0	180	
25/06/2024	00:11:00	1.08	0.520	1.080	11.00	20	19.75	0.0167	1200.0	1185.0	200	
25/06/2024	00:12:00	1.09	0.510	1.090	12.00	10	19.25	0.0167	600.0	1155.0	210	
25/06/2024	00:13:00	1.11	0.490	1.110	13.00	20	18.5	0.0167	1200.0	1110.0	230	
25/06/2024	00:14:00	1.125	0.475	1.125	14.00	15	18	0.0167	900.0	1080.0	245	
25/06/2024	00:15:00	1.135	0.465	1.135	15.00	10	17.25	0.0167	600.0	1035.0	255	
25/06/2024	00:16:00	1.15	0.450	1.150	16.00	15	16.75	0.0167	900.0	1005.0	270	
25/06/2024	00:17:00	1.16	0.440	1.160	17.00	10	16.25	0.0167	600.0	975.0	280	
25/06/2024	00:18:00	1.175	0.425	1.175	18.00	15	15.25	0.0167	900.0	915.0	295	
25/06/2024	00:19:00	1.18	0.420	1.180	19.00	5	14.5	0.0167	300.0	870.0	300	
25/06/2024	00:20:00	1.19	0.410	1.190	20.00	10	14	0.0167	600.0	840.0	310	
25/06/2024	00:21:00	1.215	0.385	1.215	21.00	25	13.25	0.0167	1500.0	795.0	335	
25/06/2024	00:22:00	1.225	0.375	1.225	22.00	10	12.75	0.0167	600.0	765.0	345	
25/06/2024	00:23:00	1.24	0.360	1.240	23.00	15	12.25	0.0167	900.0	735.0	360	
25/06/2024	00:24:00	1.26	0.340	1.260	24.00	20	11.75	0.0167	1200.0	705.0	380	
25/06/2024	00:25:00	1.27	0.330	1.270	25.00	10	11.5	0.0167	600.0	690.0	390	
25/06/2024	00:26:00	1.28	0.320	1.280	26.00	10	11.25	0.0167	600.0	675.0	400	
25/06/2024	00:27:00	1.295	0.305	1.295	27.00	15	11	0.0167	900.0	660.0	415	
25/06/2024	00:28:00	1.31	0.290	1.310	28.00	15	10.75	0.0167	900.0	645.0	430	
25/06/2024	00:29:00	1.33	0.270	1.330	29.00	20	10.5	0.0167	1200.0	630.0	450	
25/06/2024	00:30:00	1.345	0.255	1.345	30.00	15	10.25	0.0167	900.0	615.0	465	
25/06/2024	00:31:00	1.36	0.240	1.360	31.00	15	10	0.0167	900.0	600.0	480	
25/06/2024	00:32:00	1.37	0.230	1.370	32.00	10	9.75	0.0167	600.0	585.0	490	
25/06/2024	00:33:00	1.38	0.220	1.380	33.00	10	9.5	0.0167	600.0	570.0	500	
25/06/2024	00:34:00	1.39	0.210	1.390	34.00	10	9.25	0.0167	600.0	555.0	510	
25/06/2024	00:35:00	1.4	0.200	1.400	35.00	10	9	0.0167	600.0	540.0	520	
25/06/2024	00:36:00	1.41	0.190	1.410	36.00	10	8.75	0.0167	600.0	525.0	530	
25/06/2024	00:37:00	1.42	0.180	1.420	37.00	10	8.5	0.0167	600.0	510.0	540	
25/06/2024	00:38:00	1.43	0.170	1.430	38.00	10	8.25	0.0167	600.0	495.0	550	
25/06/2024	00:39:00	1.44	0.160	1.440	39.00	10	8	0.0167	600.0	480.0	560	
25/06/2024	00:40:00	1.45	0.150	1.450	40.00	10	7.75	0.0167	600.0	465.0	570	
25/06/2024	00:41:00	1.47	0.130	1.470	41.00	20	7.5	0.0167	1200.0	450.0	590	
25/06/2024	00:42:00	1.48	0.120	1.480	42.00	10	7.25	0.0167	600.0	435.0	600	
25/06/2024	00:43:00	1.485	0.115	1.485	43.00	5	7.15	0.0167	300.0	429.0	605	
25/06/2024	00:44:00	1.495	0.105	1.495	44.00	10	6.95	0.0167	600.0	417.0	615	
25/06/2024	00:45:00	1.5	0.100	1.500	45.00	5	6.85	0.0167	300.0	411.0	620	
25/06/2024	00:46:00	1.51	0.090	1.510	46.00	10	6.75	0.0167	600.0	405.0	630	
25/06/2024	00:47:00	1.52	0.080	1.520	47.00	10	6.65	0.0167	600.0	399.0	640	
25/06/2024	00:48:00	1.535	0.065	1.535	48.00	15	6.45	0.0167	900.0	387.0	655	
25/06/2024	00:49:00	1.545	0.055	1.545	49.00	10	6.25	0.0167	600.0	375.0	665	
25/06/2024	00:50:00	1.56	0.040	1.560	50.00	15	6.15	0.0167	900.0	369.0	680	
25/06/2024	00:51:00	1.57	0.030	1.570	51.00	10	6.05	0.0167	600.0	363.0	690	
25/06/2024	00:52:00	1.58	0.020	1.580	52.00	10	5.95	0.0167	600.0	357.0	700	
25/06/2024	00:53:00	1.585	0.015	1.585	53.00	5	5.85	0.0167	300.0	351.0	705	
25/06/2024	00:54:00	1.595	0.005	1.595	54.00	10	5.75	0.0167	600.0	345.0	715	
25/06/2024	00:55:00	1.6	0.000	1.600	55.00	5	5.65	0.0167	300.0	339.0	720	
25/06/2024	00:56:00	1.62	-0.020	1.620	56.00	20	20	0.0167	1200.0	1200.0	740	
25/06/2024	00:57:00	1.635	-0.035	1.635	57.00	15	15	0.0167	900.0	900.0	755	

Automatic Logger Test Readings

Date	AutoTest Time Interval	Manual Test measurement (m)	Auto Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Auto Infiltration rate (mm/hr)	Auto Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment

No levelogger used

Testing Notes:

- Pre-soak conducted, level maintained at 0.85 metres above base of pit for 1 hour upon which the test was conducted
- Water levels were monitored using only manual dipper
- Pre-soak terminated on reach of target time
- Bucket remained at bottom of pit during water pour
- Fines settled to bottom of pit upon completion of tes
- Groundwater not encountered

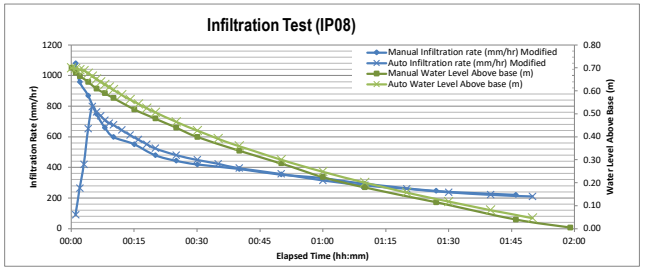
Sensitivity: General

Location ID: IP08 Rolleston Access Improvement
Project Number: 3338703

Name:	IP08
Date Testing:	25/06/2024
Field Rep:	RO
Author:	GT
Checked:	LB

Depth of test pit (m)	1.5
Length of test pit (m)	2.0
Width of test pit (m)	1.6
Test pit area (m2)	3.20

Infiltration (mm/hr)	
Minimum	243





Manual Test Readings

Date	Manual Test Time Interval	Manual Test measurement (m)	Manual Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Manual Infiltration rate (mm/hr)	Manual Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
25/06/2024	00:00:00	0.8	0.700	0.800	0.00	0	0	0.00				
25/06/2024	00:01:00	0.82	0.680	0.820	1.00	20	18	0.0167	1200.0	1080.0	20	
25/06/2024	00:02:00	0.835	0.665	0.835	2.00	15	16	0.0167	900.0	960.0	35	
25/06/2024	00:04:00	0.86	0.640	0.860	4.00	25	29	0.0333	750.0	870.0	60	
25/06/2024	00:06:00	0.89	0.610	0.890	6.00	30	25	0.0333	900.0	750.0	90	
25/06/2024	00:08:00	0.91	0.590	0.910	8.00	20	22	0.0333	600.0	660.0	110	
25/06/2024	00:10:00	0.93	0.570	0.930	10.00	20	20	0.0333	600.0	600.0	130	
25/06/2024	00:15:00	0.98	0.520	0.980	15.00	50	46	0.0833	600.0	552.0	180	
25/06/2024	00:20:00	1.02	0.480	1.020	20.00	40	40	0.0833	480.0	480.0	220	
25/06/2024	00:25:00	1.06	0.440	1.060	25.00	40	37	0.0833	480.0	444.0	260	
25/06/2024	00:30:00	1.1	0.400	1.100	30.00	40	35	0.0833	480.0	420.0	300	
25/06/2024	00:40:00	1.16	0.340	1.160	40.00	60	65	0.1667	360.0	390.0	360	
25/06/2024	00:50:00	1.215	0.285	1.215	50.00	55	59	0.1667	330.0	354.0	415	
25/06/2024	01:00:00	1.275	0.225	1.275	60.00	60	55	0.1667	360.0	330.0	475	
25/06/2024	01:10:00	1.32	0.180	1.320	70.00	45	49	0.1667	270.0	294.0	520	
25/06/2024	01:27:00	1.385	0.115	1.385	87.00	65	70	0.2833	229.4	247.1	585	
25/06/2024	01:46:00	1.46	0.040	1.460	106.00	75	70	0.3167	236.8	221.1	660	
25/06/2024	01:59:00	1.495	0.005	1.495	119.00	35	39	0.2167	161.5		695	
						695.000	695.000					

Automatic Logger Test Readings

Date	AutoTest Time Interval	Manual Test measurement (m)	Auto Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Auto Infiltration rate (mm/hr)	Auto Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
25/06/2024	00:00:00		0.700	0.800	0.00	0	0	0.00				
25/06/2024	00:01:00		0.699	0.802	1.00	1.5	1.5	0.0167	90.0	90.0	1.5	
25/06/2024	00:02:00		0.693	0.807	2.00	5.6	4.4	0.0167	336.0	264.0	7.1	
25/06/2024	00:03:00		0.689	0.812	3.00	4.4	7	0.0167	264.0	420.0	11.5	
25/06/2024	00:04:00		0.678	0.822	4.00	10.9	10.9	0.0167	654.0	654.0	22.4	
25/06/2024	00:05:00		0.664	0.836	5.00	13.3	13.3	0.0167	798.0	798.0	35.7	
25/06/2024	00:06:00		0.652	0.848	6.00	12.7	12.7	0.0167	762.0	762.0	48.4	
25/06/2024	00:07:00		0.640	0.860	7.00	11.8	12.3	0.0167	708.0	738.0	60.2	
25/06/2024	00:08:00		0.628	0.872	8.00	11.7	11.8	0.0167	702.0	708.0	71.9	
25/06/2024	00:09:00		0.617	0.883	9.00	11.5	11.5	0.0167	690.0	690.0	83.4	
25/06/2024	00:10:00		0.605	0.895	10.00	11.3	11.3	0.0167	678.0	678.0	94.7	
25/06/2024	00:12:00		0.583	0.917	12.00	21.9	21.5	0.0333	657.0	645.0	116.6	
25/06/2024	00:14:00		0.5627	0.937	14.00	20.7	20.4	0.0333	621.0	612.0	137.3	
25/06/2024	00:16:00		0.5433	0.957	16.00	19.4	19.4	0.0333	582.0	582.0	156.7	
25/06/2024	00:18:00		0.5246	0.975	18.00	18.7	18.4	0.0333	561.0	552.0	175.4	
25/06/2024	00:20:00		0.507	0.993	20.00	17.6	17.5	0.0333	528.0	525.0	193	
25/06/2024	00:25:00		0.4652	1.035	25.00	41.8	40	0.0833	501.6	480.0	234.8	
25/06/2024	00:30:00		0.4277	1.072	30.00	37.5	37.5	0.0833	450.0	450.0	272.3	
25/06/2024	00:35:00		0.3924	1.108	35.00	35.3	35.3	0.0833	423.6	423.6	307.6	
25/06/2024	00:40:00		0.3603	1.140	40.00	32.1	33	0.0833	385.2	396.0	339.7	
25/06/2024	00:50:00		0.3007	1.199	50.00	59.6	59.6	0.1667	357.6	357.6	399.3	
25/06/2024	01:00:00		0.2482	1.252	60.00	52.5	52.5	0.1667	315.0	315.0	451.8	
25/06/2024	01:10:00		0.2011	1.299	70.00	47.1	47.1	0.1667	282.6	282.6	498.9	
25/06/2024	01:20:00		0.1577	1.342	80.00	43.4	43.4	0.1667	260.4	260.4	542.3	
25/06/2024	01:30:00		0.1181	1.382	90.00	39.6	39.6	0.1667	237.6	237.6	581.9	
25/06/2024	01:40:00		0.0811	1.419	100.00	37	37	0.1667	222.0	222.0	618.9	
25/06/2024	01:50:00		0.0461	1.454	110.00	35	35	0.1667	210.0	210.0	653.9	

Testing Notes:

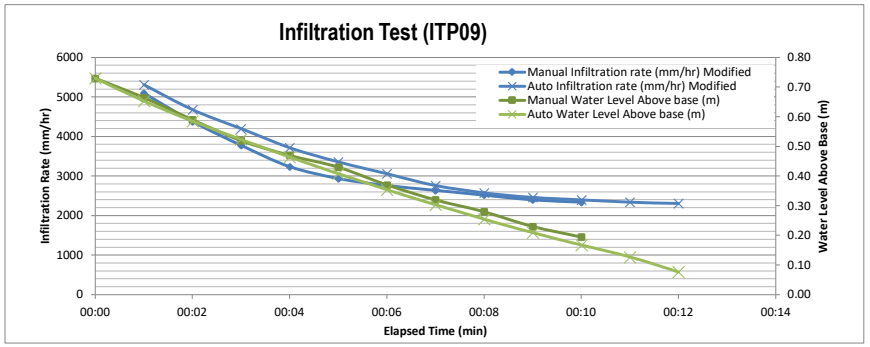
- Pre-soak conducted for 1 hour, level maintained at 0.75 metres above base of pit
- Water levels were monitored using manual dipper and levelogge
- Pre-soak terminated on reach of target time
- Bucket was initially placed at bottom of pit for water pour. Removed after 20 mins due to time constraints and the water was directly poured into the pit - potentially disturbing the pit walls and causing fines to settle to bottom.
- Fines settled to bottom of pit upon completion of tes
- Groundwater not encounterec

Location ID: IP09 Rolleston Access Improvement
Project Number: 3338703

Name:	IP09
Date Testing:	25/06/2024
Field Rep:	RO
Author:	GT
Checked:	LB

Depth of test pit (m)	1.8
Length of test pit (m)	2.1
Width of test pit (m)	1.6
Test pit area (m2)	3.36

Infiltration (mm/hr)	
Minimum	2325





Manual Test Readings

Date	Manual Test Time Interval	Manual Test measurement (m)	Manual Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Manual Infiltration rate (mm/hr)	Manual Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
25/06/2024	00:00:00	1.07	0.730	1.070	0.00	0	0	0.00				
25/06/2024	00:01:00	1.135	0.665	1.135	1.00	65	85	0.0167	3900.0	5100.0	65	
25/06/2024	00:02:00	1.21	0.590	1.210	2.00	75	73	0.0167	4500.0	4380.0	140	
25/06/2024	00:03:00	1.28	0.520	1.280	3.00	70	63	0.0167	4200.0	3780.0	210	
25/06/2024	00:04:00	1.33	0.470	1.330	4.00	50	54	0.0167	3000.0	3240.0	260	
25/06/2024	00:05:00	1.37	0.430	1.370	5.00	40	49	0.0167	2400.0	2940.0	300	
25/06/2024	00:06:00	1.43	0.370	1.430	6.00	60	46	0.0167	3600.0	2760.0	360	
25/06/2024	00:07:00	1.48	0.320	1.480	7.00	50	44	0.0167	3000.0	2640.0	410	
25/06/2024	00:08:00	1.52	0.280	1.520	8.00	40	42	0.0167	2400.0	2520.0	450	
25/06/2024	00:09:00	1.57	0.230	1.570	9.00	50	40	0.0167	3000.0	2400.0	500	
25/06/2024	00:10:00	1.605	0.195	1.605	10.00	35	39	0.0167	2100.0	2340.0	535	

Automatic Logger Test Readings

Date	AutoTest Time Interval	Manual Test measurement (m)	Auto Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Auto Infiltration rate (mm/hr)	Auto Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
25/06/2024	00:00:00		0.730	1.070	0.00	0	0	0.00				
25/06/2024	00:01:00		0.654	1.146	1.00	76.2	88.5	0.0167	4572.0	5310.0	76.2	
25/06/2024	00:02:00		0.586	1.214	2.00	68.1	78	0.0167	4086.0	4680.0	144.3	
25/06/2024	00:03:00		0.524	1.276	3.00	62	70	0.0167	3720.0	4200.0	206.3	
25/06/2024	00:04:00		0.465	1.336	4.00	59.2	62	0.0167	3552.0	3720.0	265.5	
25/06/2024	00:05:00		0.409	1.391	5.00	55.8	56	0.0167	3348.0	3360.0	321.3	
25/06/2024	00:06:00		0.355	1.445	6.00	54	51	0.0167	3240.0	3060.0	375.3	
25/06/2024	00:07:00		0.304	1.496	7.00	51.1	46	0.0167	3066.0	2760.0	426.4	
25/06/2024	00:08:00		0.255	1.545	8.00	48.7	43	0.0167	2922.0	2580.0	475.1	
25/06/2024	00:09:00		0.209	1.591	9.00	45.8	41	0.0167	2748.0	2460.0	520.9	
25/06/2024	00:10:00		0.168	1.632	10.00	41.4	40	0.0167	2484.0	2400.0	562.3	
25/06/2024	00:11:00		0.127	1.673	11.00	40.7	39	0.0167	2442.0	2340.0	603	
25/06/2024	00:12:00		0.077	1.723	12.00	50	38.5	0.0167	3000.0	2310.0	653	

Testing Notes:

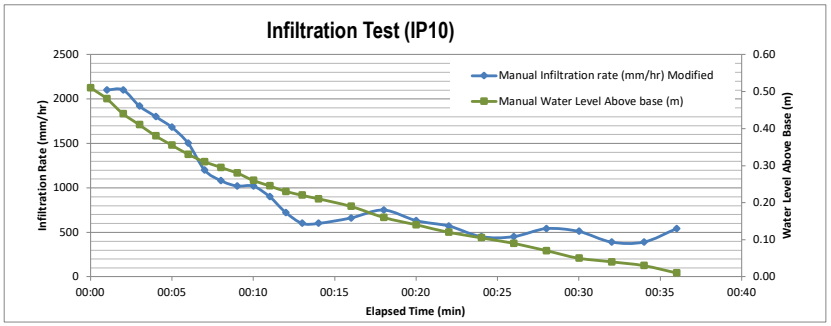
- Pre-soak conducted, level dropped below base of pit after 10,000 litre tanker was emptied approximately 25 minutes before it was refilled for 25 minutes reaching a level of 0.75 metres above base of pit upon which the test was conducted
- Water levels were monitored using manual dipper and levelogger
- Pre-soak terminated on reach of target time
- Bucket was placed at the bottom of pit for water pour
- Groundwater not encountered

Location ID: IP10 Rolleston Access Improvement
Project Number: 3338703

Name:	IP10
Date Testing:	24/07/2024
Field Rep:	RO
Author:	GT
Checked:	LB

Depth of test pit (m)	2.1
Length of test pit (m)	2.8
Width of test pit (m)	2.1
Test pit area (m2)	5.88

Infiltration (mm/hr)	
Minimum	497





Manual Test Readings

Date	Manual Test Time Interval	Manual Test measurement (m)	Manual Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Manual Infiltration rate (mm/hr)	Manual Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
24/07/2024	00:00:00	1.59	0.510	1.590	0.00	0	0	0.00				
24/07/2024	00:01:00	1.62	0.480	1.620	1.00	30	35	0.0167	1800.0	2100.0	30	
24/07/2024	00:02:00	1.66	0.440	1.660	2.00	40	35	0.0167	2400.0	2100.0	70	
24/07/2024	00:03:00	1.69	0.410	1.690	3.00	30	32	0.0167	1800.0	1920.0	100	
24/07/2024	00:04:00	1.72	0.380	1.720	4.00	30	30	0.0167	1800.0	1800.0	130	
24/07/2024	00:05:00	1.745	0.355	1.745	5.00	25	28	0.0167	1500.0	1680.0	155	
24/07/2024	00:06:00	1.77	0.330	1.770	6.00	25	25	0.0167	1500.0	1500.0	180	
24/07/2024	00:07:00	1.79	0.310	1.790	7.00	20	20	0.0167	1200.0	1200.0	200	
24/07/2024	00:08:00	1.805	0.295	1.805	8.00	15	18	0.0167	900.0	1080.0	215	
24/07/2024	00:09:00	1.82	0.280	1.820	9.00	15	17	0.0167	900.0	1020.0	230	
24/07/2024	00:10:00	1.84	0.260	1.840	10.00	20	17	0.0167	1200.0	1020.0	250	
24/07/2024	00:11:00	1.855	0.245	1.855	11.00	15	15	0.0167	900.0	900.0	265	
24/07/2024	00:12:00	1.87	0.230	1.870	12.00	15	12	0.0167	900.0	720.0	280	
24/07/2024	00:13:00	1.88	0.220	1.880	13.00	10	10	0.0167	600.0	600.0	290	
24/07/2024	00:14:00	1.89	0.210	1.890	14.00	10	10	0.0167	600.0	600.0	300	
24/07/2024	00:16:00	1.91	0.190	1.910	16.00	20	22	0.0333	600.0	660.0	320	
24/07/2024	00:18:00	1.94	0.160	1.940	18.00	30	25	0.0333	900.0	750.0	350	
24/07/2024	00:20:00	1.96	0.140	1.960	20.00	20	21	0.0333	600.0	630.0	370	
24/07/2024	00:22:00	1.98	0.120	1.980	22.00	20	19	0.0333	600.0	570.0	390	
24/07/2024	00:24:00	1.995	0.105	1.995	24.00	15	15	0.0333	450.0	450.0	405	
24/07/2024	00:26:00	2.01	0.090	2.010	26.00	15	15	0.0333	450.0	450.0	420	
24/07/2024	00:28:00	2.03	0.070	2.030	28.00	20	18	0.0333	600.0	540.0	440	
24/07/2024	00:30:00	2.05	0.050	2.050	30.00	20	17	0.0333	600.0	510.0	460	
24/07/2024	00:32:00	2.06	0.040	2.060	32.00	10	13	0.0333	300.0	390.0	470	
24/07/2024	00:34:00	2.07	0.030	2.070	34.00	10	13	0.0333	300.0	390.0	480	
24/07/2024	00:36:00	2.09	0.010	2.090	36.00	20	18	0.0333	600.0	540.0	500	

Automatic Logger Test Readings

Date	AutoTest Time Interval	Manual Test measurement (m)	Auto Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Auto Infiltration rate (mm/hr)	Auto Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment

No levelogger used

Testing Notes:

- Pre-soak conducted, level dropped below base of pit after 10,000 litre tanker was emptied approximately 25 minutes before it was refilled for 25 minutes emptying 20,000 L total before test began
- Water levels were monitored using manual dipper
- Pre-soak terminated on reach of target time
- Bucket was placed at the bottom of pit for water pour
- Groundwater not encountered

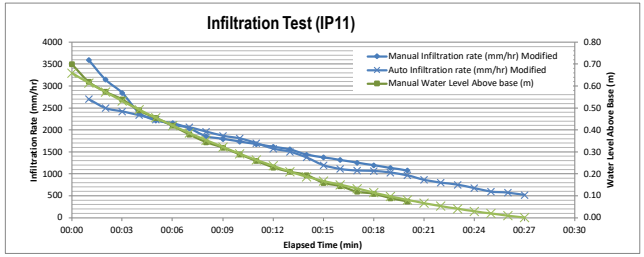
Sensitivity: General

Location ID: IP11 Rolleston Access Improvement
Project Number: 3338703

Name:	IP11
Date Testing:	5/07/2024
Field Rep:	NY
Author:	GT
Checked:	LB

Depth of test pit (m)	2.2
Length of test pit (m)	2.2
Width of test pit (m)	1.7
Test pit area (m2)	3.74

Infiltration (mm/hr)	
Minimum	588





Manual Test Readings

Date	Manual Test Time Interval	Manual Test measurement (m)	Manual Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Manual Infiltration rate (mm/hr)	Manual Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
5/07/2024	00:00:00	1.500	0.700	1.500	0.00	0	0	0.00				
5/07/2024	00:01:00	1.580	0.620	1.580	1.00	80	60	0.0167	4800.0	3600.0	80	
5/07/2024	00:02:00	1.625	0.575	1.625	2.00	45	52.5	0.0167	2700.0	3150.0	125	
5/07/2024	00:03:00	1.660	0.540	1.660	3.00	35	47.5	0.0167	2100.0	2850.0	160	
5/07/2024	00:04:00	1.710	0.490	1.710	4.00	50	40	0.0167	3000.0	2400.0	210	
5/07/2024	00:05:00	1.745	0.455	1.745	5.00	35	37	0.0167	2100.0	2220.0	245	
5/07/2024	00:06:00	1.780	0.420	1.780	6.00	35	36	0.0167	2100.0	2160.0	280	
5/07/2024	00:07:00	1.820	0.380	1.820	7.00	40	34	0.0167	2400.0	2040.0	320	
5/07/2024	00:08:00	1.855	0.345	1.855	8.00	35	31	0.0167	2100.0	1860.0	355	
5/07/2024	00:09:00	1.880	0.320	1.880	9.00	25	30	0.0167	1500.0	1800.0	380	
5/07/2024	00:10:00	1.910	0.290	1.910	10.00	30	29	0.0167	1800.0	1740.0	410	
5/07/2024	00:11:00	1.940	0.260	1.940	11.00	30	28	0.0167	1800.0	1680.0	440	
5/07/2024	00:12:00	1.970	0.230	1.970	12.00	30	27	0.0167	1800.0	1620.0	470	
5/07/2024	00:13:00	1.990	0.210	1.990	13.00	20	26	0.0167	1200.0	1560.0	490	
5/07/2024	00:14:00	2.005	0.195	2.005	14.00	15	24	0.0167	900.0	1440.0	505	
5/07/2024	00:15:00	2.040	0.160	2.040	15.00	35	23	0.0167	2100.0	1380.0	540	
5/07/2024	00:16:00	2.055	0.145	2.055	16.00	15	22	0.0167	900.0	1320.0	555	
5/07/2024	00:17:00	2.080	0.120	2.080	17.00	25	21	0.0167	1500.0	1260.0	580	
5/07/2024	00:18:00	2.090	0.110	2.090	18.00	10	20	0.0167	600.0	1200.0	590	
5/07/2024	00:19:00	2.110	0.090	2.110	19.00	20	19	0.0167	1200.0	1140.0	610	
5/07/2024	00:20:00	2.125	0.075	2.125	20.00	15	18	0.0167	900.0	1080.0	625	

Automatic Logger Test Readings

Date	AutoTest Time Interval	Manual Test measurement (m)	Auto Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Auto Infiltration rate (mm/hr)	Auto Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
5/07/2024	00:00:00	1.54	0.660	1.540	0.00	0	0	0.00				
5/07/2024	00:01:00	1.5851	0.615	1.585	1.00	45.1	45.1	0.0167	2706.0	2706.0	85.1	
5/07/2024	00:02:00	1.6268	0.573	1.627	2.00	41.7	41.7	0.0167	2502.0	2502.0	126.8	
5/07/2024	00:03:00	1.6672	0.533	1.667	3.00	40.4	40.4	0.0167	2424.0	2424.0	167.2	
5/07/2024	00:04:00	1.7062	0.494	1.706	4.00	39	39	0.0167	2340.0	2340.0	206.2	
5/07/2024	00:05:00	1.7436	0.456	1.744	5.00	37.4	37.4	0.0167	2244.0	2244.0	243.6	
5/07/2024	00:06:00	1.7787	0.421	1.779	6.00	35.1	35.3	0.0167	2106.0	2118.0	278.7	
5/07/2024	00:07:00	1.8131	0.387	1.813	7.00	34.4	34.4	0.0167	2064.0	2064.0	313.1	
5/07/2024	00:08:00	1.8459	0.354	1.846	8.00	32.8	32.8	0.0167	1968.0	1968.0	345.9	
5/07/2024	00:09:00	1.8771	0.323	1.877	9.00	31.2	31.2	0.0167	1872.0	1872.0	377.1	
5/07/2024	00:10:00	1.9075	0.293	1.908	10.00	30.4	30.2	0.0167	1824.0	1812.0	407.5	
5/07/2024	00:11:00	1.9359	0.264	1.936	11.00	28.4	28.4	0.0167	1704.0	1704.0	435.9	
5/07/2024	00:12:00	1.962	0.238	1.962	12.00	26.1	26.3	0.0167	1566.0	1578.0	462	
5/07/2024	00:13:00	1.9894	0.211	1.989	13.00	27.4	25.1	0.0167	1644.0	1506.0	489.4	
5/07/2024	00:14:00	2.0126	0.187	2.013	14.00	23.2	23	0.0167	1392.0	1380.0	512.6	
5/07/2024	00:15:00	2.0319	0.168	2.032	15.00	19.3	20	0.0167	1158.0	1200.0	531.9	
5/07/2024	00:16:00	2.0487	0.151	2.049	16.00	16.8	18.6	0.0167	1008.0	1116.0	548.7	
5/07/2024	00:17:00	2.0665	0.134	2.067	17.00	17.8	18	0.0167	1068.0	1080.0	566.5	
5/07/2024	00:18:00	2.0843	0.116	2.084	18.00	17.8	17.8	0.0167	1068.0	1068.0	584.3	
5/07/2024	00:19:00	2.1019	0.098	2.102	19.00	17.6	17.2	0.0167	1056.0	1032.0	601.9	
5/07/2024	00:20:00	2.1183	0.082	2.118	20.00	16.4	16.2	0.0167	984.0	972.0	618.3	
5/07/2024	00:21:00	2.1325	0.068	2.133	21.00	14.2	14.5	0.0167	852.0	870.0	632.5	
5/07/2024	00:22:00	2.1459	0.054	2.146	22.00	13.4	13.4	0.0167	804.0	804.0	645.9	
5/07/2024	00:23:00	2.1585	0.042	2.159	23.00	12.6	12.6	0.0167	756.0	756.0	658.5	
5/07/2024	00:24:00	2.1698	0.030	2.170	24.00	11.3	11.3	0.0167	678.0	678.0	669.8	
5/07/2024	00:25:00	2.1796	0.020	2.180	25.00	9.8	10	0.0167	588.0	600.0	679.6	
5/07/2024	00:26:00	2.1895	0.011	2.190	26.00	9.9	9.6	0.0167	594.0	576.0	689.5	
5/07/2024	00:27:00	2.1982	0.002	2.198	27.00	8.7	8.7	0.0167	522.0	522.0	698.2	

Testing Notes:

- Pre-soak conducted, level maintained at 0.7 metres above base of pit for 30 mins upon which the test was conducted
- Water levels were monitored using manual dipper and logge
- Pre-soak terminated after 30 mins due to time constraints
- Bucket remained at bottom of pit during water pou
- Bucket remained in pit during tes
- Groundwater not encounterec

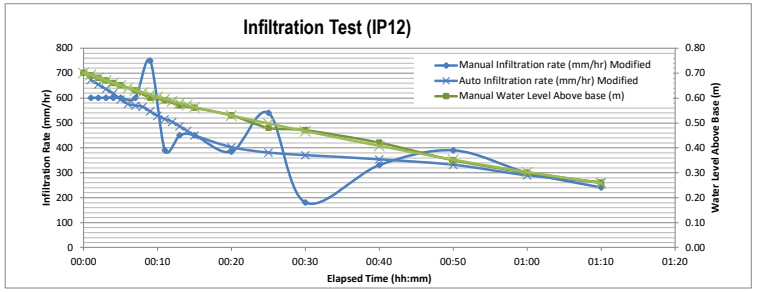
Sensitivity: General

Location ID: IP12 Rolleston Access Improvement
Project Number: 3338703

Name:	IP12
Date Testing:	15/07/2024
Field Rep:	NY
Author:	GT
Checked:	LB

Depth of test pit (m)	2.7
Length of test pit (m)	1.7
Width of test pit (m)	2.2
Test pit area (m2)	3.74

Infiltration (mm/hr)	
Minimum	334





Manual Test Readings

Date	Manual Test Time Interval	Manual Test measurement (m)	Manual Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Manual Infiltration rate (mm/hr)	Manual Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
15/07/2024	00:00:00	2.000	0.700	2.000	0.00	0	0	0.00				
15/07/2024	00:01:00	2.010	0.690	2.010	1.00	10	10	0.0167	600.0	600.0	10	
15/07/2024	00:02:00	2.020	0.680	2.020	2.00	10	10	0.0167	600.0	600.0	20	
15/07/2024	00:03:00	2.030	0.670	2.030	3.00	10	10	0.0167	600.0	600.0	30	
15/07/2024	00:04:00	2.040	0.660	2.040	4.00	10	10	0.0167	600.0	600.0	40	
15/07/2024	00:05:00	2.050	0.650	2.050	5.00	10	10	0.0167	600.0	600.0	50	
15/07/2024	00:07:00	2.070	0.630	2.070	7.00	20	20	0.0333	600.0	600.0	70	
15/07/2024	00:09:00	2.100	0.600	2.100	9.00	30	25	0.0333	900.0	750.0	100	
15/07/2024	00:11:00	2.110	0.590	2.110	11.00	10	13	0.0333	300.0	390.0	110	
15/07/2024	00:13:00	2.130	0.570	2.130	13.00	20	15	0.0333	600.0	450.0	130	
15/07/2024	00:15:00	2.140	0.560	2.140	15.00	10	15	0.0333	300.0	450.0	140	
15/07/2024	00:20:00	2.170	0.530	2.170	20.00	30	32	0.0833	360.0	384.0	170	
15/07/2024	00:25:00	2.220	0.480	2.220	25.00	50	45	0.0833	600.0	540.0	220	
15/07/2024	00:30:00	2.230	0.470	2.230	30.00	10	15	0.0833	120.0	180.0	230	
15/07/2024	00:40:00	2.280	0.420	2.280	40.00	50	55	0.1667	300.0	330.0	280	
15/07/2024	00:50:00	2.350	0.350	2.350	50.00	70	65	0.1667	420.0	390.0	350	
15/07/2024	01:00:00	2.400	0.300	2.400	60.00	50	50	0.1667	300.0	300.0	400	
15/07/2024	01:10:00	2.440	0.260	2.440	70.00	40	40	0.1667	240.0	240.0	440	

Automatic Logger Test Readings

Date	AutoTest Time Interval	Manual Test measurement (m)	Auto Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Auto Infiltration rate (mm/hr)	Auto Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
15/07/2024	00:00:00	2	0.700	2.000	0.00	0	0	0.00				
15/07/2024	00:01:00	2.0076	0.692	2.008	1.00	7.6	11.2	0.0167	456.0	672.0	7.6	
15/07/2024	00:02:00	2.0187	0.681	2.019	2.00	11.1	10.9	0.0167	666.0	654.0	18.7	
15/07/2024	00:03:00	2.0296	0.670	2.030	3.00	10.9	10.6	0.0167	654.0	636.0	29.6	
15/07/2024	00:04:00	2.0399	0.660	2.040	4.00	10.3	10.3	0.0167	618.0	618.0	39.9	
15/07/2024	00:05:00	2.0498	0.650	2.050	5.00	9.9	9.9	0.0167	594.0	594.0	49.8	
15/07/2024	00:06:00	2.0593	0.641	2.059	6.00	9.5	9.6	0.0167	570.0	576.0	59.3	
15/07/2024	00:07:00	2.0688	0.631	2.069	7.00	9.5	9.5	0.0167	570.0	570.0	68.8	
15/07/2024	00:08:00	2.0782	0.622	2.078	8.00	9.4	9.4	0.0167	564.0	564.0	78.2	
15/07/2024	00:09:00	2.0873	0.613	2.087	9.00	9.1	9.1	0.0167	546.0	546.0	87.3	
15/07/2024	00:10:00	2.0955	0.605	2.096	10.00	8.2	8.8	0.0167	492.0	528.0	95.5	
15/07/2024	00:11:00	2.1043	0.596	2.104	11.00	8.8	8.6	0.0167	528.0	516.0	104.3	
15/07/2024	00:12:00	2.1123	0.588	2.112	12.00	8	8.4	0.0167	480.0	504.0	112.3	
15/07/2024	00:13:00	2.1207	0.579	2.121	13.00	8.4	8.1	0.0167	504.0	486.0	120.7	
15/07/2024	00:14:00	2.1282	0.572	2.128	14.00	7.5	7.8	0.0167	450.0	468.0	128.2	
15/07/2024	00:15:00	2.1363	0.564	2.136	15.00	8.1	7.5	0.0167	486.0	450.0	136.3	
15/07/2024	00:20:00	2.1708	0.529	2.171	20.00	34.5	33.5	0.0833	414.0	402.0	170.8	
15/07/2024	00:25:00	2.2026	0.497	2.203	25.00	31.8	31.7	0.0833	381.6	380.4	202.6	
15/07/2024	00:30:00	2.2335	0.467	2.234	30.00	30.9	30.9	0.0833	370.8	370.8	233.5	
15/07/2024	00:40:00	2.2928	0.407	2.293	40.00	59.3	59	0.1667	355.8	354.0	292.8	
15/07/2024	00:50:00	2.3481	0.352	2.348	50.00	55.3	55.3	0.1667	331.8	331.8	348.1	
15/07/2024	01:00:00	2.3974	0.303	2.397	60.00	49.3	48.3	0.1667	295.8	289.8	397.4	
15/07/2024	01:10:00	2.4419	0.258	2.442	70.00	44.5	43.5	0.1667	267.0	261.0	441.9	

Testing Notes:

- Pre-soak conducted, level maintained at 1.0 metre above base of pit
- Water levels were monitored using manual dipper and logger
- Pre-soak terminated after 1 hour
- Bucket remained at bottom of pit during water pour
- Test terminated due to time constraints
- Groundwater not encountered

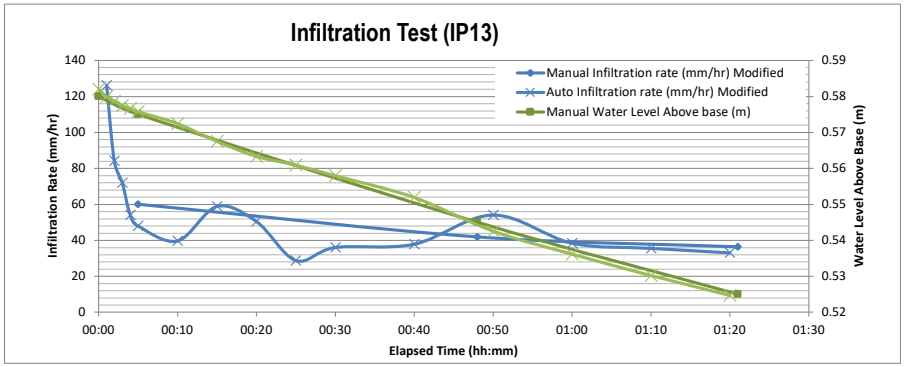
Sensitivity: General

Location ID: IP13 Rolleston Access Improvement
Project Number: 3338703

Name:	IP13
Date Testing:	10/07/2024
Field Rep:	NY
Author:	GT
Checked:	LB

Depth of test pit (m)	2.2
Length of test pit (m)	1.0
Width of test pit (m)	2.0
Test pit area (m2)	2.00

Infiltration (mm/hr)	
Minimum	41





Manual Test Readings

Date	Manual Test Time Interval	Manual Test measurement (m)	Manual Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Manual Infiltration rate (mm/hr)	Manual Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
10/07/2024	00:00:00	1.62	0.580	1.620	0.00	0	0	0.00				
10/07/2024	00:05:00	1.625	0.575	1.625	5.00	5	33.5	0.0833	60.0	60.0	5	
10/07/2024	00:48:00	1.655	0.545	1.655	48.00	30	34.5	0.7167	41.9	41.9	35	
10/07/2024	01:21:00	1.675	0.525	1.675	81.00	20	32.5	0.5500	36.4	36.4	55	

Automatic Logger Test Readings

Date	AutoTest Time Interval	Manual Test measurement (m)	Auto Water Level Above base (m)	WL bgl (m)	Lapsed Time (min)	Change level (mm)	Change level (mm) Modified	Change time (hr)	Auto Infiltration rate (mm/hr)	Auto Infiltration rate (mm/hr) Modified	Cumulative infiltration (mm)	Comment
10/07/2024	00:00:00	1.618	0.582	1.618	0.00	0	0	0.00				
10/07/2024	00:01:00	1.6201	0.580	1.620	1.00	2.1	2.1	0.0167	126.0	126.0	0.1	
10/07/2024	00:02:00	1.6213	0.579	1.621	2.00	1.2	1.4	0.0167	72.0	84.0	1.3	
10/07/2024	00:03:00	1.6226	0.577	1.623	3.00	1.3	1.2	0.0167	78.0	72.0	2.6	
10/07/2024	00:04:00	1.6234	0.577	1.623	4.00	0.8	0.9	0.0167	48.0	54.0	3.4	
10/07/2024	00:05:00	1.6243	0.576	1.624	5.00	0.9	0.8	0.0167	54.0	48.0	4.3	
10/07/2024	00:10:00	1.6276	0.572	1.628	10.00	3.3	3.3	0.0833	39.6	39.6	7.6	
10/07/2024	00:15:00	1.6325	0.568	1.633	15.00	4.9	4.9	0.0833	58.8	58.8	12.5	
10/07/2024	00:20:00	1.6367	0.563	1.637	20.00	4.2	4.2	0.0833	50.4	50.4	16.7	
10/07/2024	00:25:00	1.6391	0.561	1.639	25.00	2.4	2.4	0.0833	28.8	28.8	19.1	
10/07/2024	00:30:00	1.6421	0.558	1.642	30.00	3	3	0.0833	36.0	36.0	22.1	
10/07/2024	00:40:00	1.6481	0.552	1.648	40.00	6	6.3	0.1667	36.0	37.8	28.1	
10/07/2024	00:50:00	1.6575	0.543	1.658	50.00	9.4	9	0.1667	56.4	54.0	37.5	
10/07/2024	01:00:00	1.6639	0.536	1.664	60.00	6.4	6.4	0.1667	38.4	38.4	43.9	
10/07/2024	01:10:00	1.6698	0.530	1.670	70.00	5.9	5.9	0.1667	35.4	35.4	49.8	
10/07/2024	01:20:00	1.6753	0.525	1.675	80.00	5.5	5.5	0.1667	33.0	33.0	55.3	

Testing Notes:

- Pre-soak conducted, level maintained at 0.7 metres above base of pit after 1,500 litre tanker was emptied
- Water levels were monitored using manual dipper and levelogger
- Pre-soak terminated after 1 hour
- Bucket was placed at the bottom of the pit for water pour
- Groundwater not encountered

Sensitivity: General

C

Appendix C – Slope Stability Analysis Results

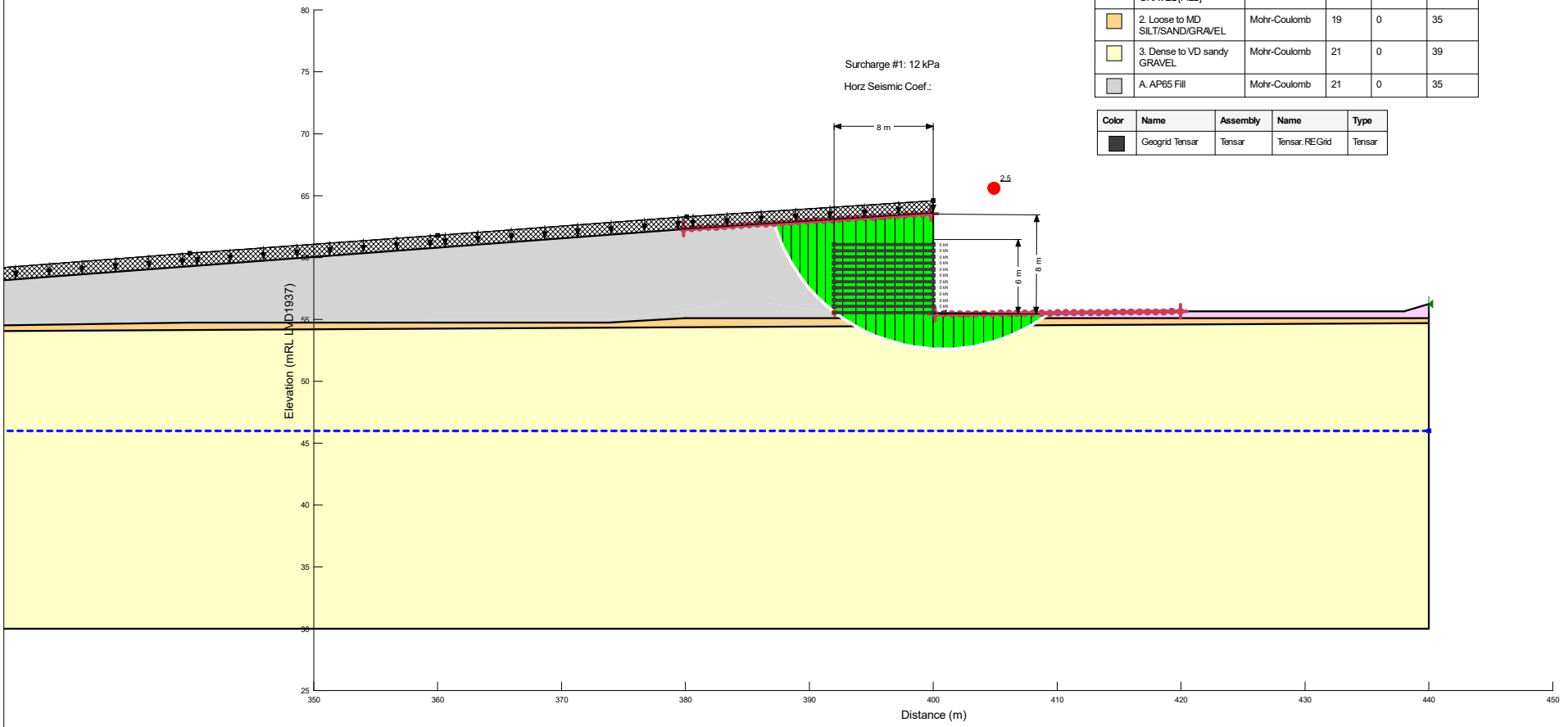
Horz Seismic Coef.:

Method: Morgenstern-Price

Longitudinal Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 1.1 Static - HN (8m length)	3338703	Date: 02/10/2024
			Scale: 1:500	

DO NOT SCALE

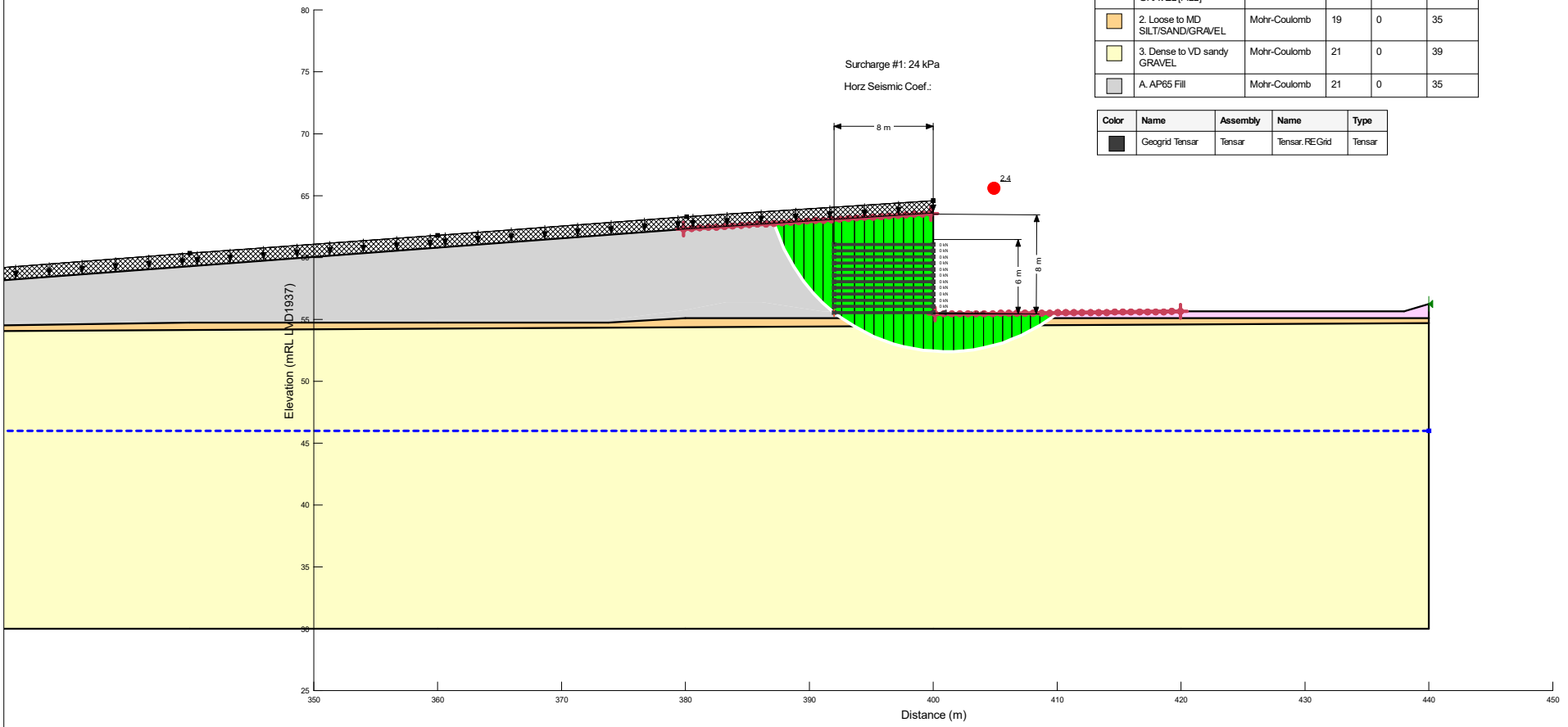
Horz Seismic Coef.:

Method: Morgenstern-Price

Longitudinal Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 1.2 Static - HO (8m length)	3338703	Date: 02/10/2024
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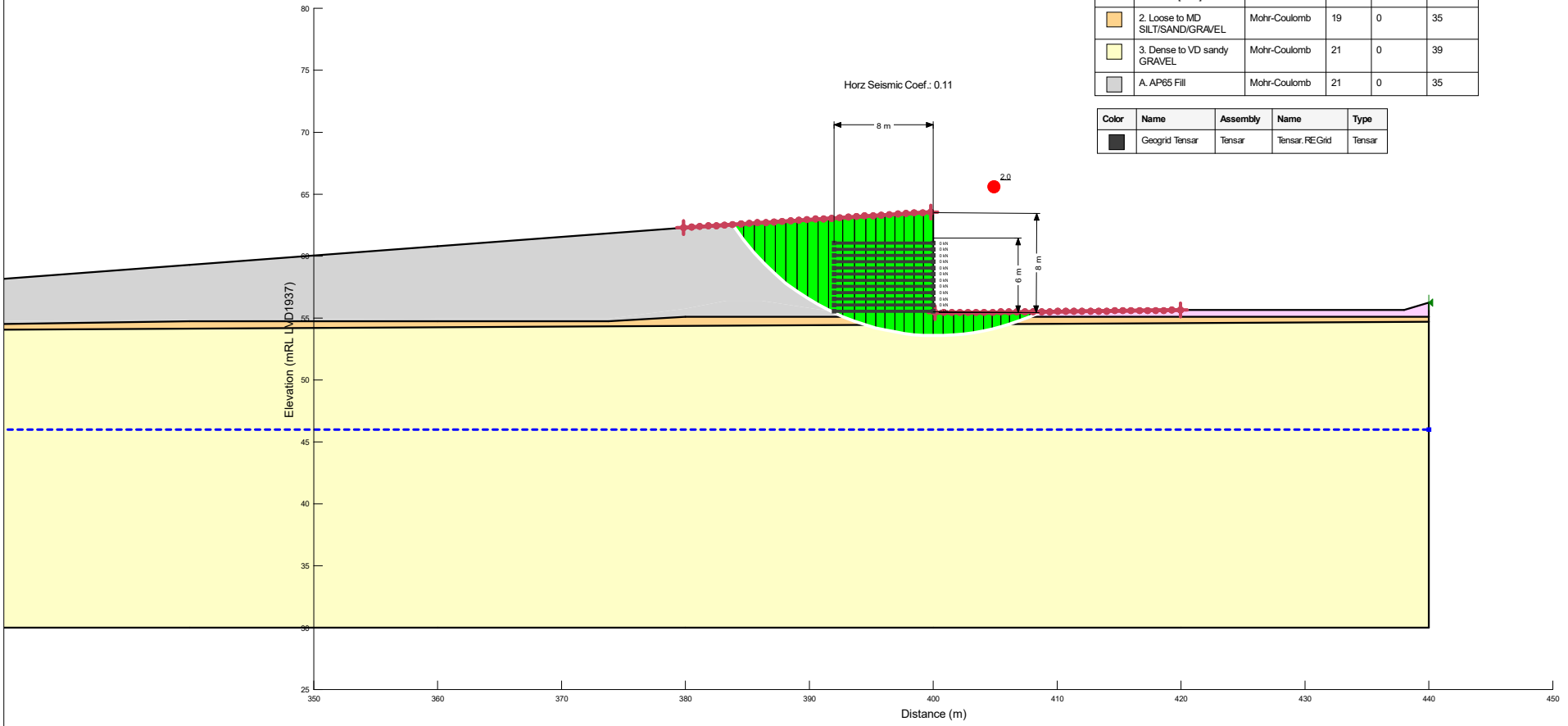
Horz Seismic Coef.: 0.11

Method: Morgenstern-Price

Longitudinal Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 2.1 Seismic - SLS 0.11g (8m length)	3338703	Date: 02/10/2024
			Scale: 1:500	

DO NOT SCALE

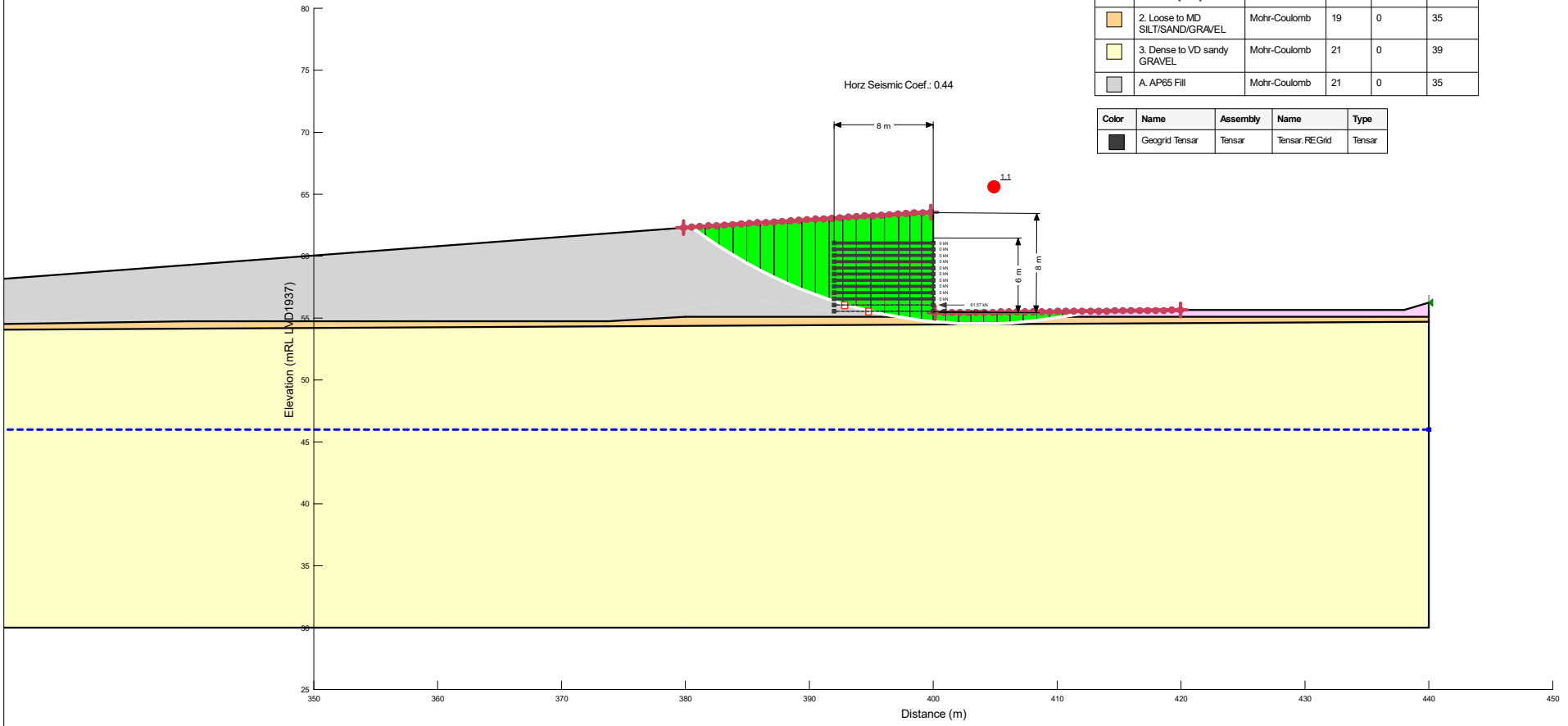
Horz Seismic Coef.: 0.44

Method: Morgenstern-Price

Longitudinal Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 2.2 Seismic - DCLS 0.44g (8m length)	3338703	Date: 02/10/2024
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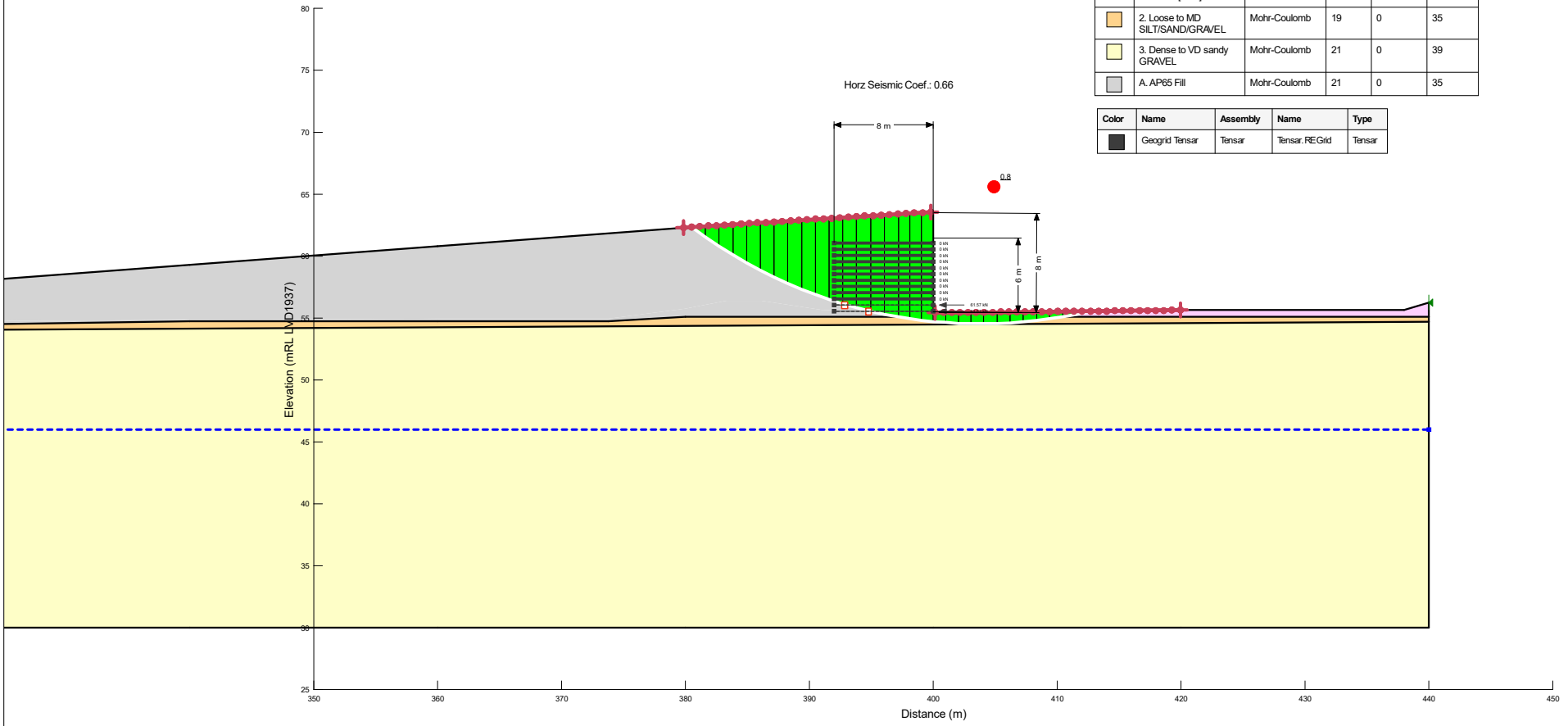
Horz Seismic Coef.: 0.66

Method: Morgenstern-Price

Longitudinal Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 2.3 Seismic - CALS 0.66g (8m length)	3338703	Date: 02/10/2024
			Scale: 1:500	

DO NOT SCALE

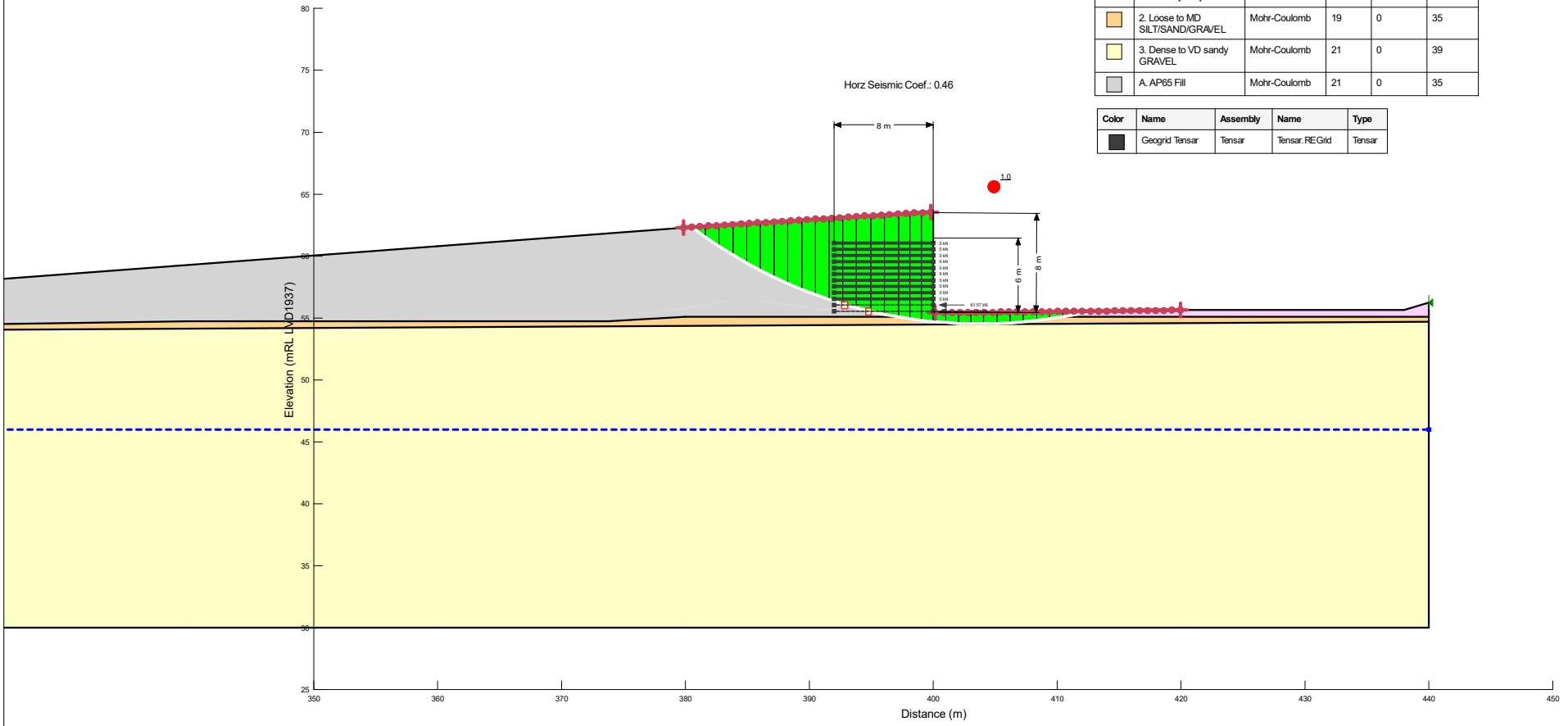
Horz Seismic Coef.: 0.46

Method: Morgenstern-Price

Longitudinal Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 2.4 Seismic - Yield PGA 0.43g (8m length)	3338703	Date: 02/10/2024
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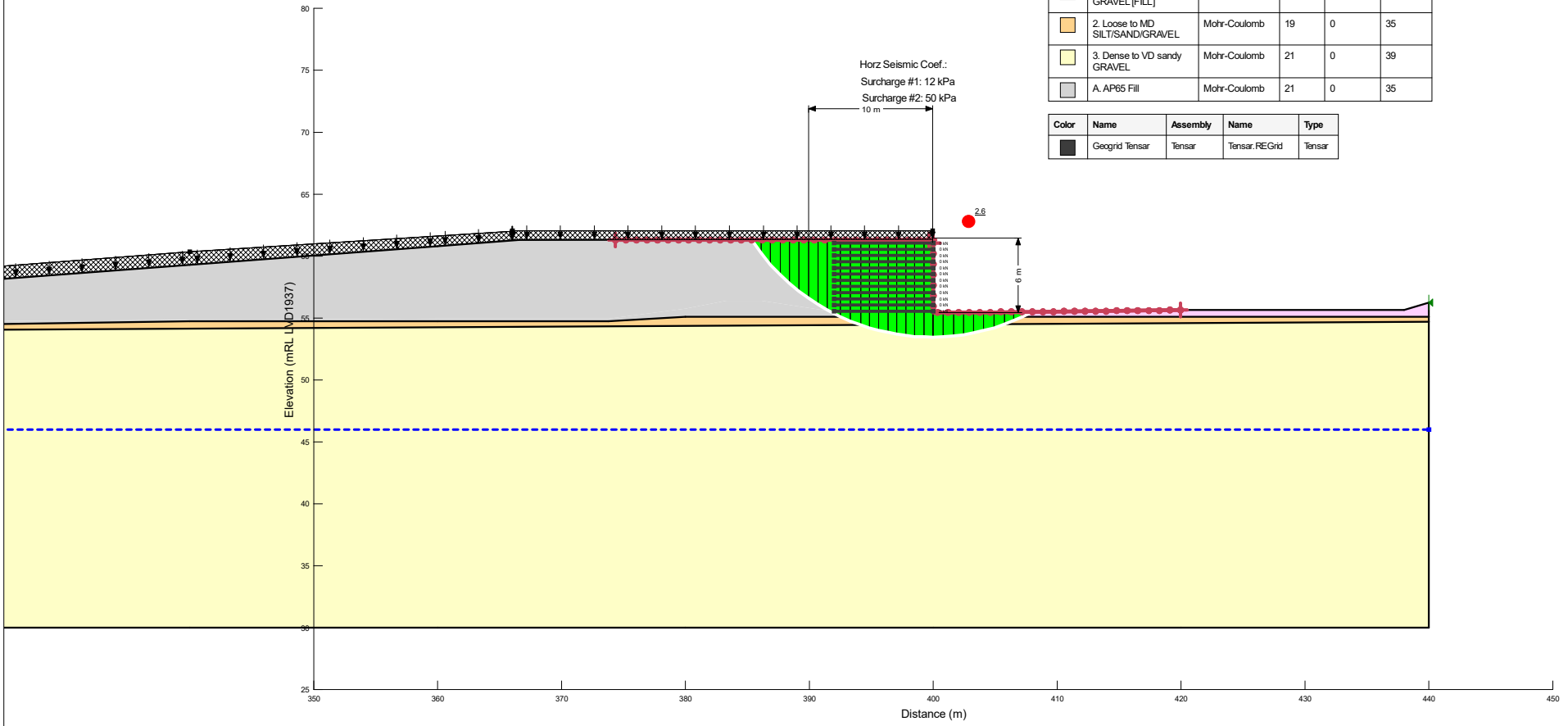
Horz Seismic Coef.:

Method: Morgenstern-Price

Longitudinal Local Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 1.1 Static - HN (Local)	3338703	Date: 02/10/2024
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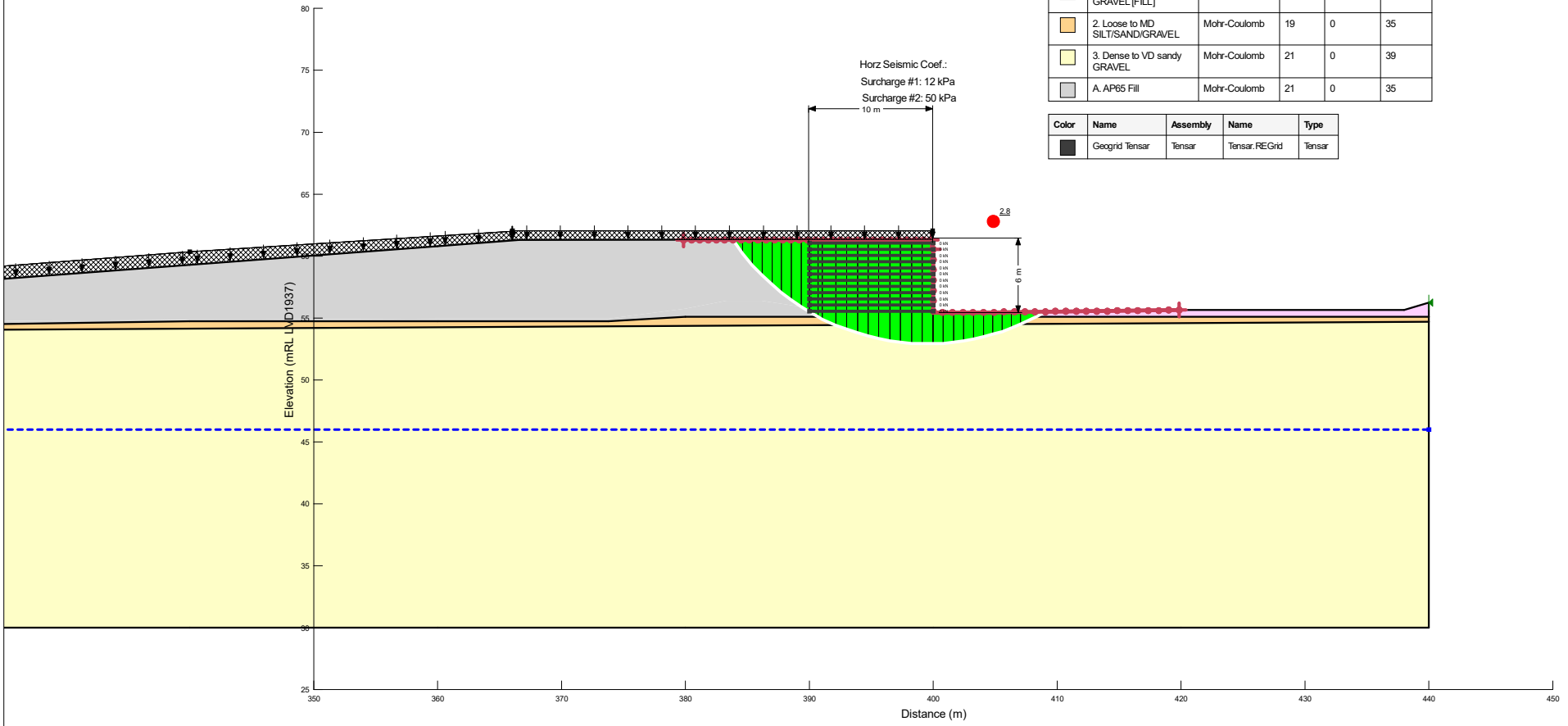
Horz Seismic Coef.:

Method: Morgenstern-Price

Longitudinal Local Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 1.2 Static - HO (Local)	3338703	Date: 02/10/2024
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DO NOT SCALE

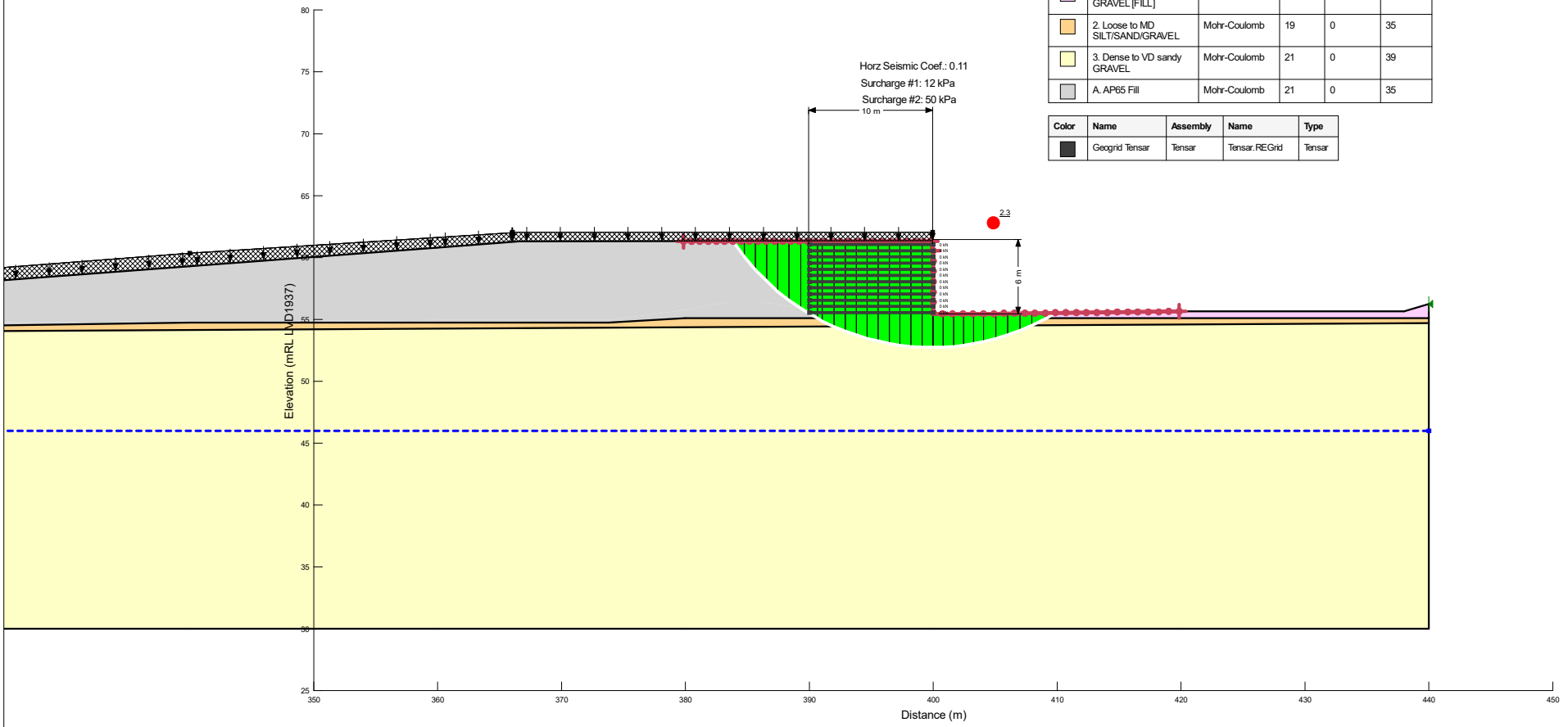
Horz Seismic Coef.: 0.11

Method: Morgenstern-Price

Longitudinal Local Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 2.1 Seismic - SLS 0.11g (Local)	3338703	Date: 02/10/2024
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DO NOT SCALE

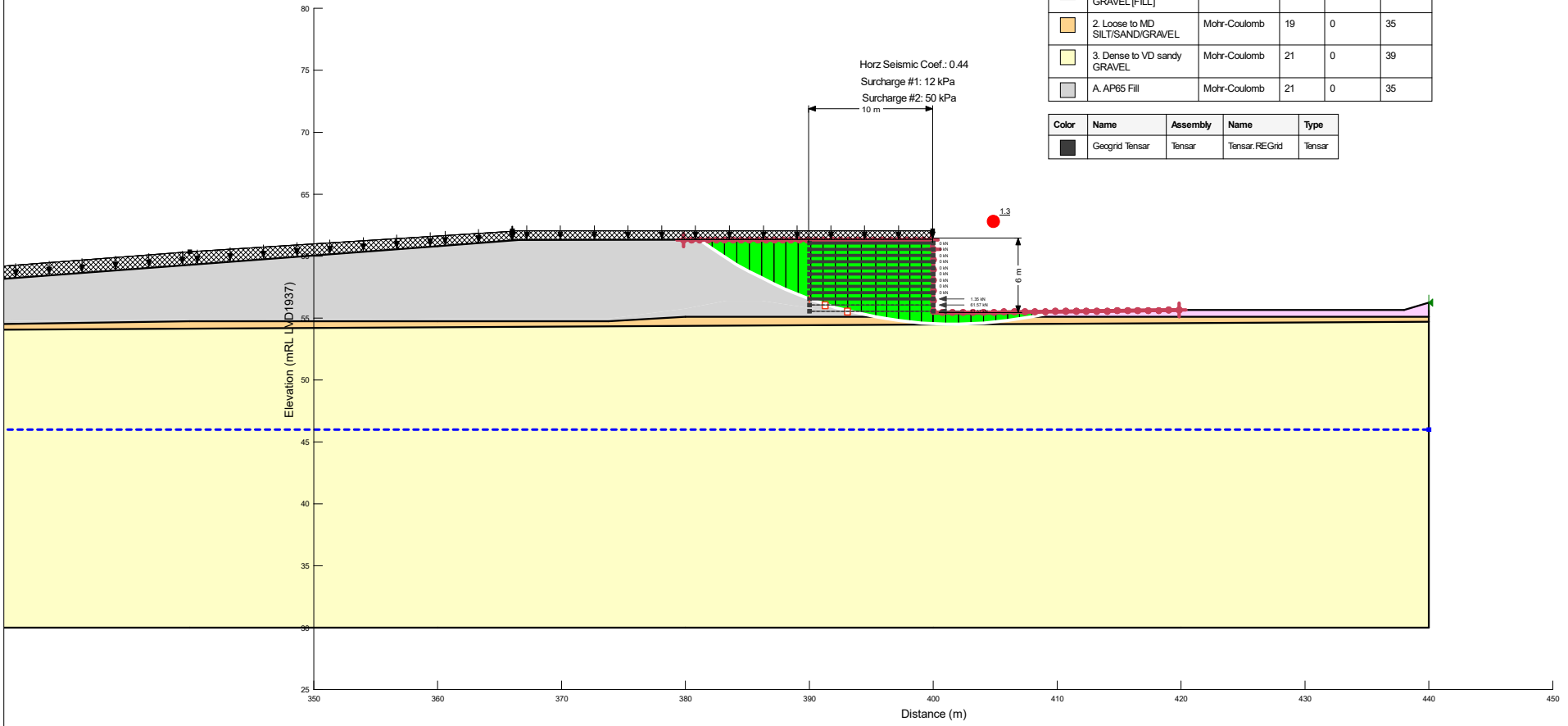
Horz Seismic Coef.: 0.44

Method: Morgenstern-Price

Longitudinal Local Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 2.2 Seismic - DCLS 0.44g (Local)	3338703	Date: 02/10/2024
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DO NOT SCALE

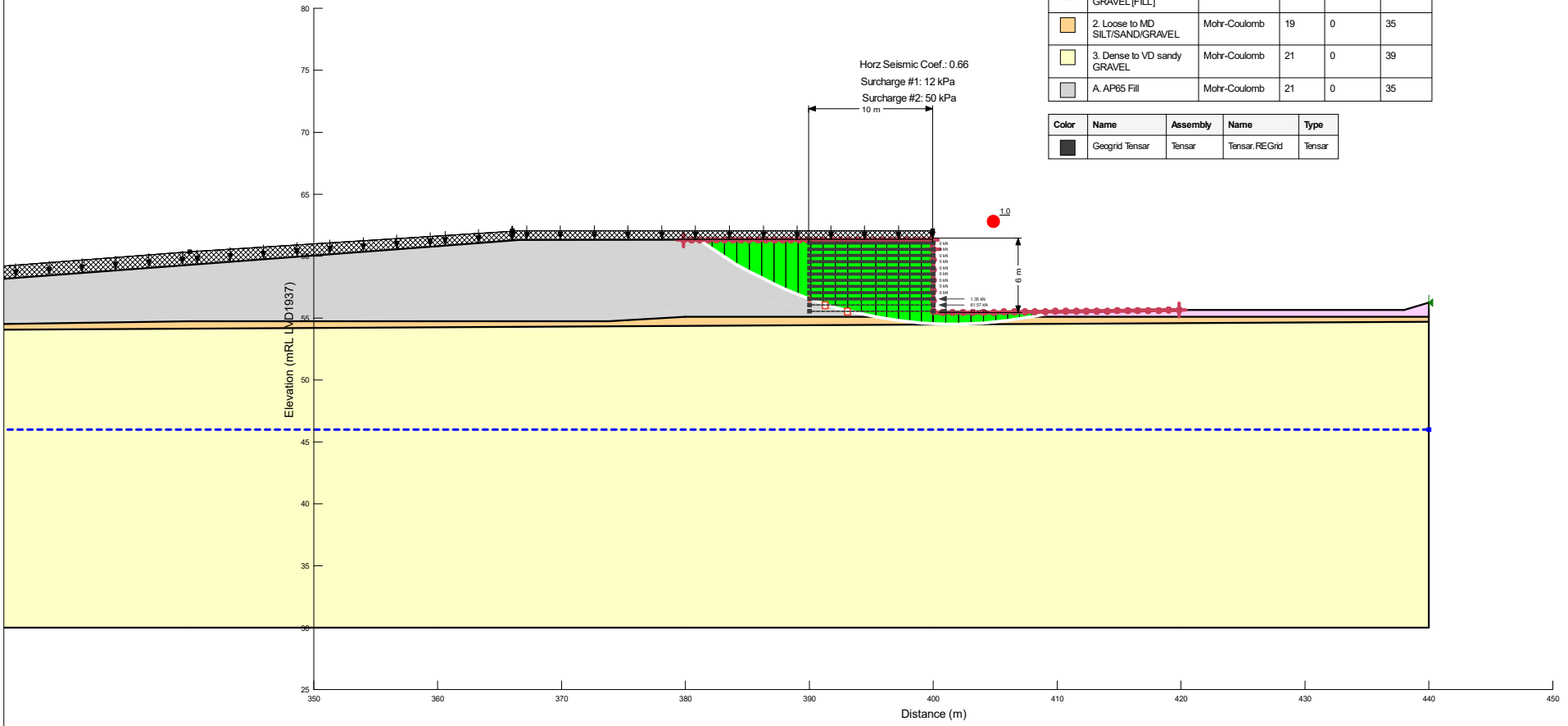
Horz Seismic Coef.: 0.66

Method: Morgenstern-Price

Longitudinal Local Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 2.3 Seismic - CALS 0.66g (Local)	3338703	Date: 02/10/2024
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DO NOT SCALE

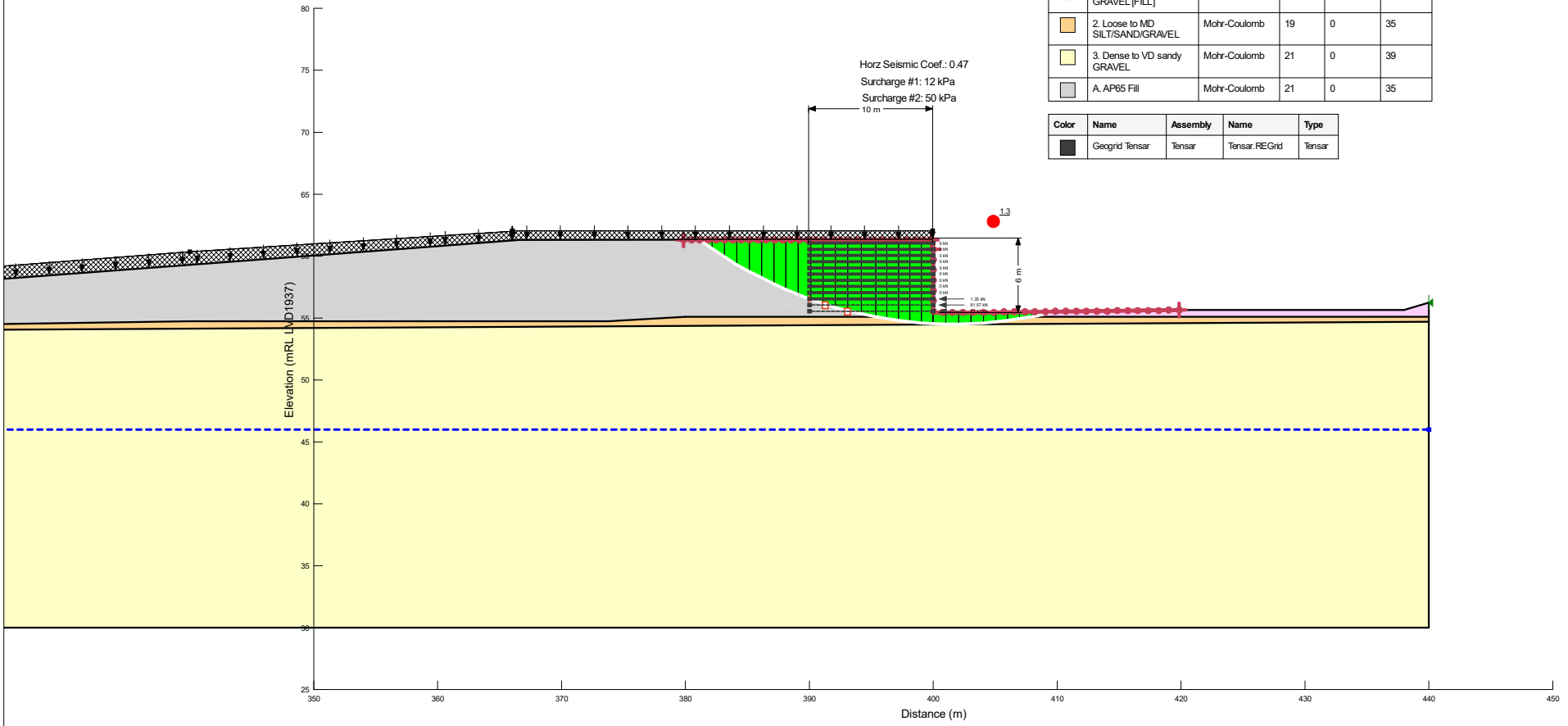
Horz Seismic Coef.: 0.47

Method: Morgenstern-Price

Longitudinal Local Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	1b. Loose sandy GRAVEL [FILL]	Mohr-Coulomb	17	0	30
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39
	A. AP65 Fill	Mohr-Coulomb	21	0	35

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 2.4 Seismic - Yield PGA 0.47g (Local)	3338703	Date: 02/10/2024
			Scale: 1:500	

DO NOT SCALE

Horz Seismic Coef.:

Method: Morgenstern-Price

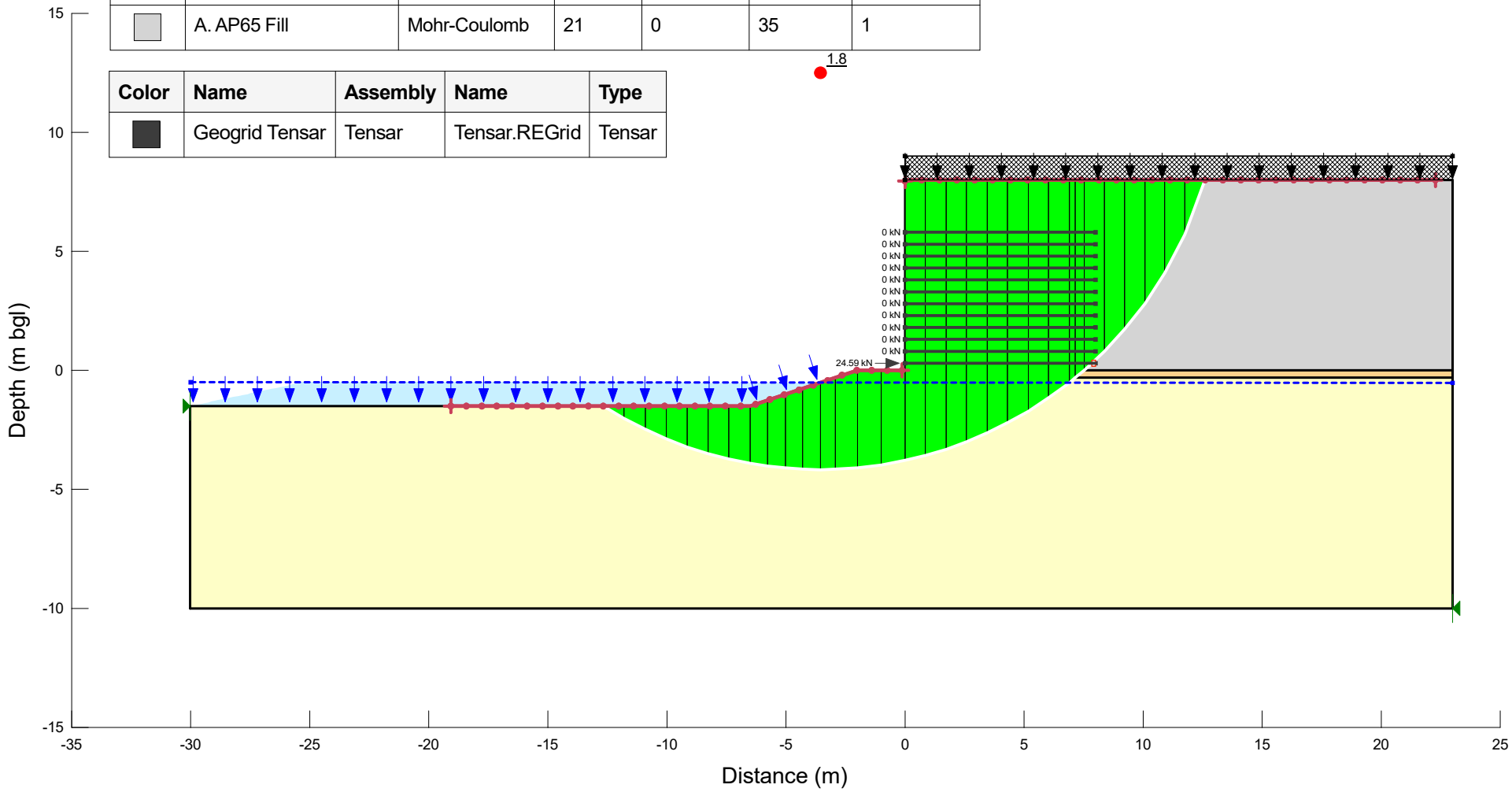
Transverse Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Piezometric Surface
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35	1
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39	1
	A. AP65 Fill	Mohr-Coulomb	21	0	35	1

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar

Surcharge #1: 12 kPa

Horz Seismic Coef.:



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 1.1.1 Static - HN (Transverse)	3338703	Date: 02/10/2024
			Scale: 1:250	

DO NOT SCALE

Horz Seismic Coef.:

Method: Morgenstern-Price

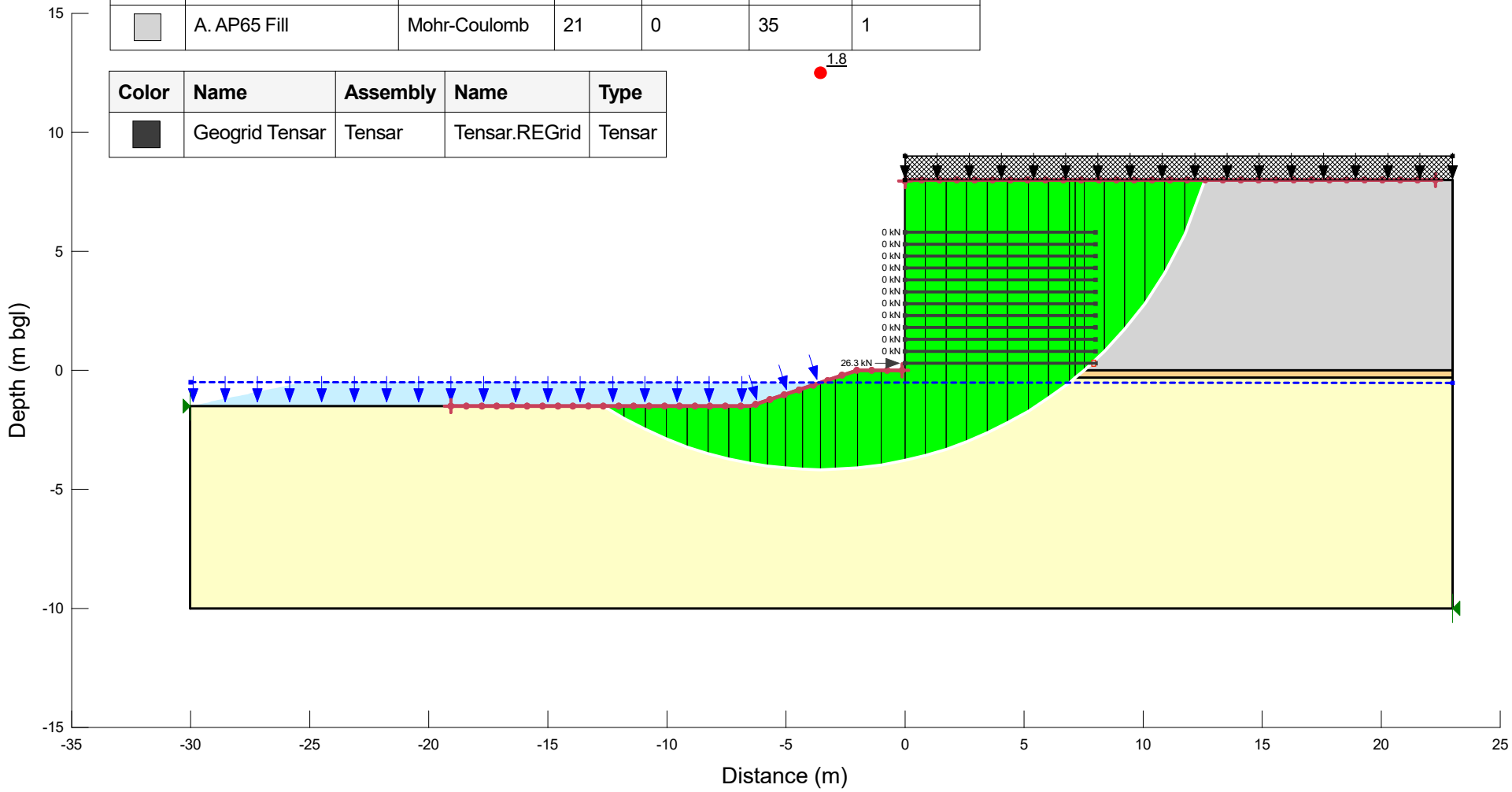
Transverse Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Piezometric Surface
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35	1
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39	1
	A. AP65 Fill	Mohr-Coulomb	21	0	35	1

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar

Surcharge #1: 24 kPa

Horz Seismic Coef.:



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 1.1.2 Static - HO (Transverse)	3338703	Date: 02/10/2024
			Scale: 1:250	

DO NOT SCALE

Horz Seismic Coef.:

Method: Morgenstern-Price

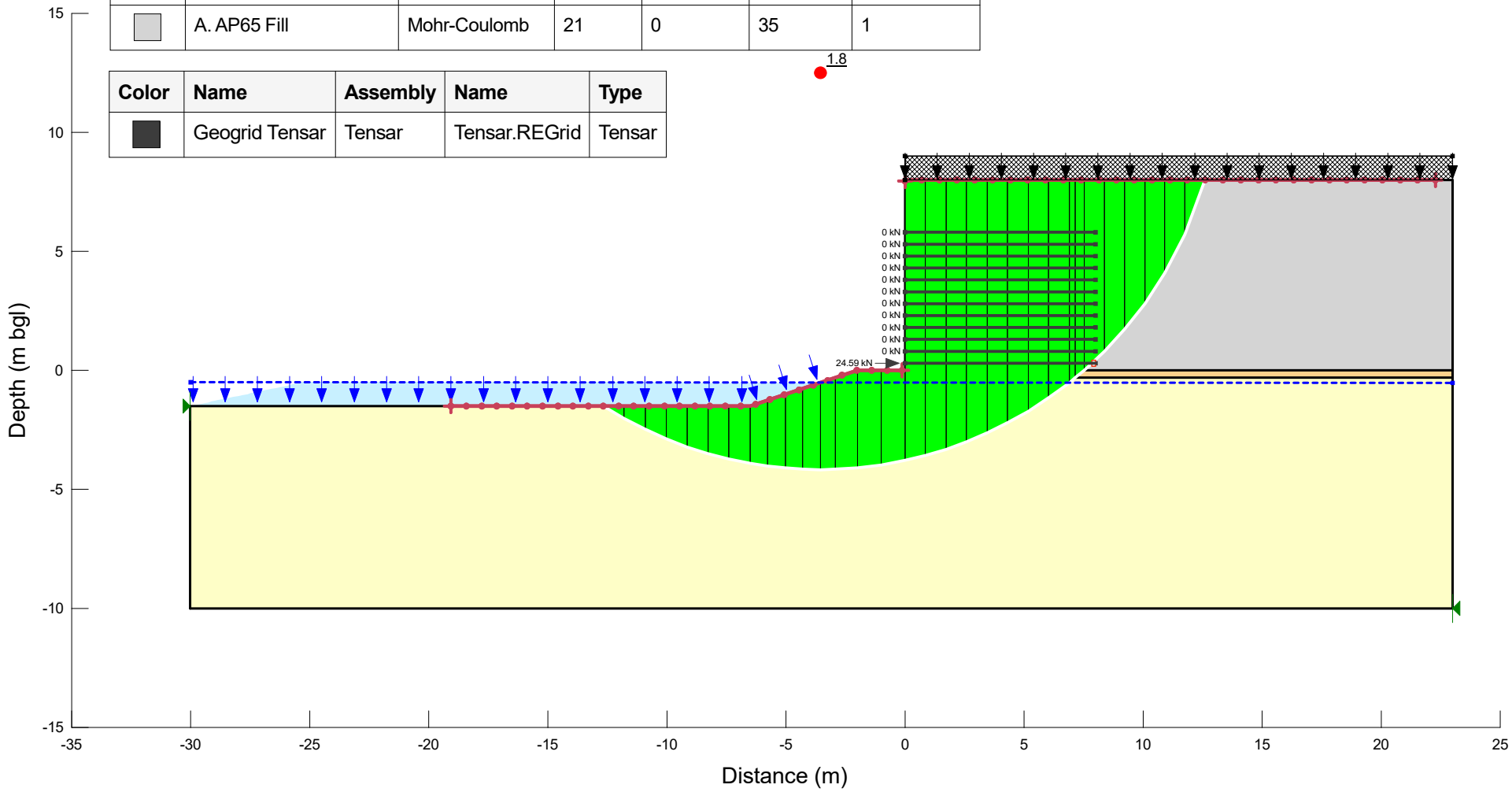
Transverse Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Piezometric Surface
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35	1
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39	1
	A. AP65 Fill	Mohr-Coulomb	21	0	35	1

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar

Surcharge #1: 12 kPa

Horz Seismic Coef.:



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 1.1.3 Static - Flood (Transverse)	3338703	Date: 02/10/2024
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DO NOT SCALE

Horz Seismic Coef.: 0.11

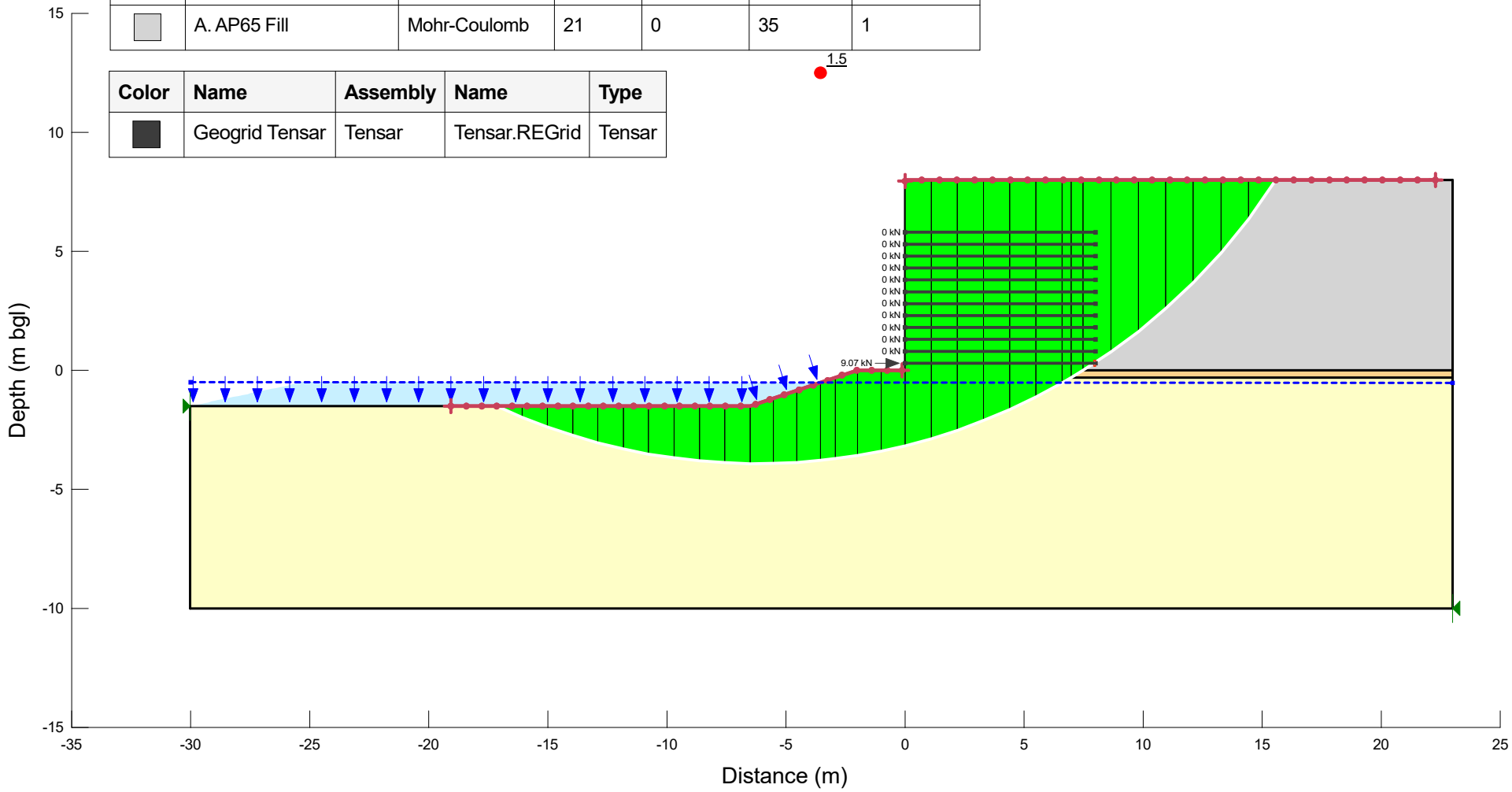
Method: Morgenstern-Price

Transverse Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Piezometric Surface
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35	1
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39	1
	A. AP65 Fill	Mohr-Coulomb	21	0	35	1

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar

Horz Seismic Coef.: 0.11



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 1.2.1 Static - SLS 0.11g (Transverse)	3338703	Date: 02/10/2024
			Scale: 1:250	

DO NOT SCALE

Horz Seismic Coef.: 0.44

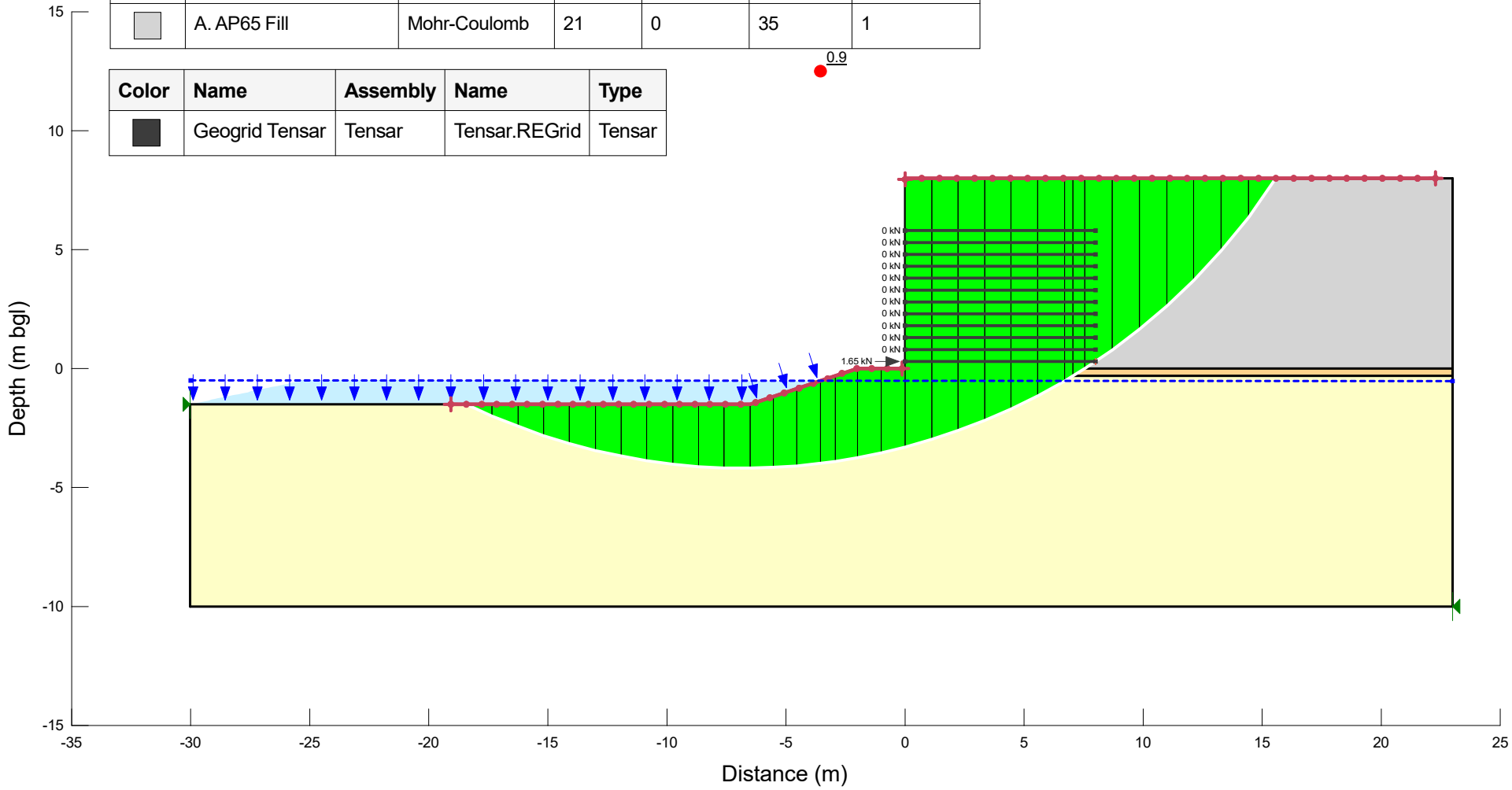
Method: Morgenstern-Price

Transverse Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Piezometric Surface
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35	1
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39	1
	A. AP65 Fill	Mohr-Coulomb	21	0	35	1

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar

Horz Seismic Coef.: 0.44



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 1.2.2 Static - DCLS 0.44g (Transverse)	3338703	Date: 02/10/2024
			Scale: 1:250	

DO NOT SCALE

Horz Seismic Coef.: 0.66

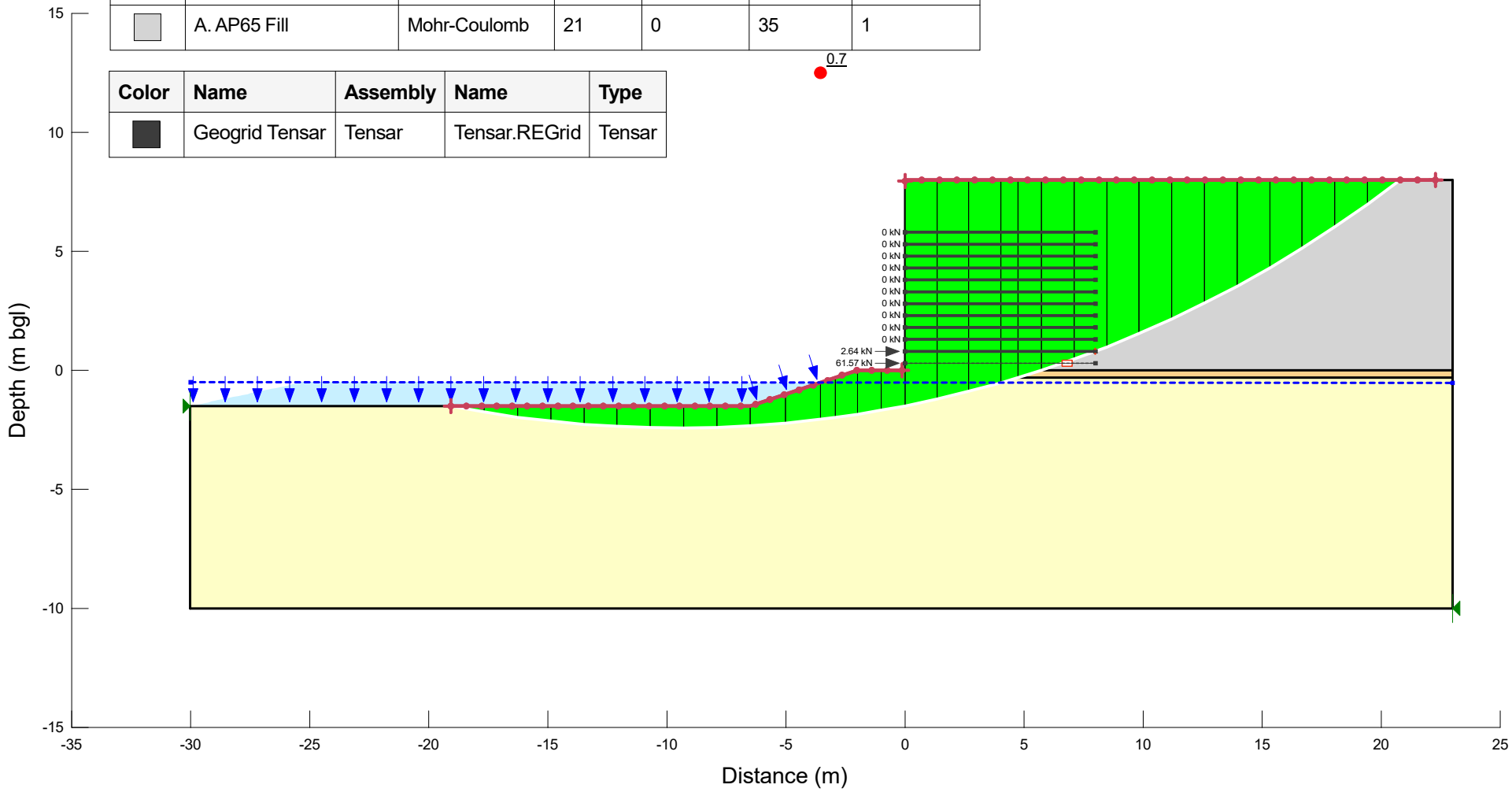
Method: Morgenstern-Price

Transverse Global Stability

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Piezometric Surface
	2. Loose to MD SILT/SAND/GRAVEL	Mohr-Coulomb	19	0	35	1
	3. Dense to VD sandy GRAVEL	Mohr-Coulomb	21	0	39	1
	A. AP65 Fill	Mohr-Coulomb	21	0	35	1

Color	Name	Assembly	Name	Type
	Geogrid Tensar	Tensar	Tensar.REGrid	Tensar

Horz Seismic Coef.: 0.66



Beca	Rolleston Access Improvements	Rolleston Access - MSE Wall Global Stability REV1.gsz 1.2.3 Static - CALS 0.66g (Transverse)	3338703	Date: 02/10/2024
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DO NOT SCALE

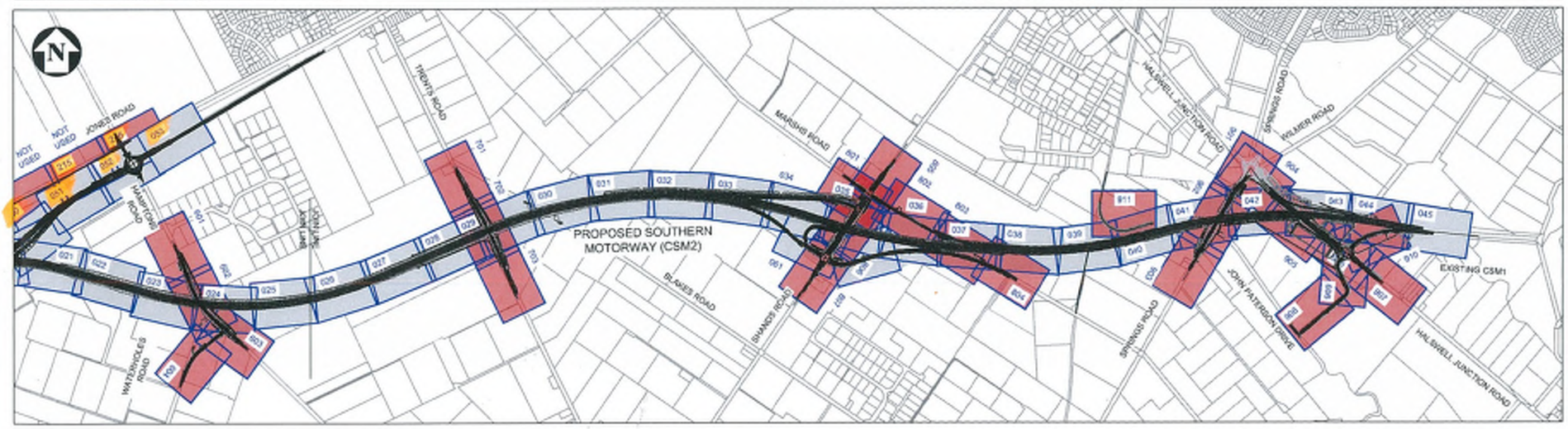
C

Appendix C – Select CSM2 As-Built Drawings

This design is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made. It is prepared in accordance with the scope of work and for the purpose outlined in the Contract dated 05 July 2013. No responsibility is accepted for use of any part of this design in any other context or for any other purpose.

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LEGEND:

DRAINAGE LAYOUT PLANS SHEETS

001 — CSM2 & MAIN SOUTH ROAD DRAWING SHEET WITH ABBREVIATED DRAWING NO.

101 — LOCAL ROADS DRAWING SHEET WITH ABBREVIATED DRAWING NO.

DRAWING LIST PER ROAD LOCATION:

MAIN SOUTH ROAD & CSM2 - CSM2-C-08-001 TO CSM2-C-08-062

WEEDONS ROAD - CSM2-C-08-102 TO CSM2-C-08-111

WESTERN ACCESS ROAD - CSM2-C-08-201 TO CSM2-C-08-212

JONES ROAD - CSM2-C-08-212 TO CSM2-C-08-216

LARCOMBS ROAD - CSM2-C-08-301

BERKETTS ROAD - CSM2-C-08-313, CSM2-C-08-507, CSM2-C-08-501

LARCOMBS ROAD/BERKETTS ROAD JUNCTION - CSM2-C-08-401

EASTERN ACCESS ROAD - CSM2-C-08-501 TO CSM2-C-08-506

HAMPTONS ROAD/WATERHOLES ROAD - CSM2-C-08-601 TO CSM2-C-08-604

TRENTS ROAD - CSM2-C-08-701 TO CSM2-C-08-703

MARSHS ROAD/ISHANDS ROAD - CSM2-C-08-801 TO CSM2-C-08-807

SPRINGS ROAD/HALSWELL JUNCTION ROAD - CSM2-C-08-901 TO CSM2-C-08-910

RAIL SIDING - CSM2-C-08-911

C-08

SP1

+

DETAILS

FOR SP1 + SP2

FOR CONSTRUCTION

250 0 250 500 750 1000 1250 1:12500 (A1)

DIMENSIONS ARE IN METRES

Rev	Revision Description	Designed	Drawn	Checked	Approved	Date
0	FOR CONSTRUCTION	KC/SG	GK	MM/AW	KF	25.05.2016

Tab 0

Scales 1:12500 (A1) 1:25000 (A3)

Original Size A1

DO NOT SCALE

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CSM2 TEAM

URS AECOM GHD

NZ TRANSPORT AGENCY WAKA KOTAHI

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)

DRAINAGE LAYOUT PLANS
SHEET LAYOUT

Status FOR CONSTRUCTION

Drawing Number CSM2-C-00-080

Revision 0

J:\Jobs\42192660\5 Works\A - Design Teams\CAD\01 Drawings\C-00 Cover Sheet And Index\CSM2-C-00-080.dwg Printed by: Gunn, Sloan 28-Jul-16

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DRAINAGE LAYOUT PLANS DRAWING LIST

DRAWING No.	TITLE
CSM2-C-08-080	DRAINAGE LAYOUT PLANS SHEET LAYOUT
CSM2-C-08-081	DRAINAGE DRAWING LIST
CSM2-C-08-001	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 0 - 240
CSM2-C-08-002	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 240 - 540
CSM2-C-08-003	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 540 - 840
CSM2-C-08-004	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 840 - 1140
CSM2-C-08-005	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 1140 - 1440
CSM2-C-08-006	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 1440 - 1740
CSM2-C-08-007	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 1740 - 2040
CSM2-C-08-008	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 2040 - 2340
CSM2-C-08-009	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 2340 - 2640
CSM2-C-08-010	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 2640 - 2940
CSM2-C-08-011	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 2940 - 3240
CSM2-C-08-012	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 3240 - 3540
CSM2-C-08-013	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 3540 - 3840
CSM2-C-08-014	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 3840 - 4140
CSM2-C-08-015	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 4140 - 4440
CSM2-C-08-016	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 4440 - 4740
CSM2-C-08-017	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 4740 - 5040
CSM2-C-08-018	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 5040 - 5340
CSM2-C-08-019	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 5340 - 5640
CSM2-C-08-020	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 5640 - 5940
CSM2-C-08-021	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 5940 - 6240
CSM2-C-08-022	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 6240 - 6540
CSM2-C-08-023	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 6540 - 6840
CSM2-C-08-024	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 6840 - 7140
CSM2-C-08-025	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 7140 - 7440
CSM2-C-08-026	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 7440 - 7740
CSM2-C-08-027	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 7740 - 8040
CSM2-C-08-028	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 8040 - 8340
CSM2-C-08-029	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 8340 - 8640
CSM2-C-08-030	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 8640 - 8940
CSM2-C-08-031	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 8940 - 9240
CSM2-C-08-032	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 9240 - 9540
CSM2-C-08-033	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 9540 - 9840
CSM2-C-08-034	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 9840 - 10140
CSM2-C-08-035	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 10140 - 10440
CSM2-C-08-036	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 10440 - 10740
CSM2-C-08-037	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 10740 - 11040
CSM2-C-08-038	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 11040 - 11340
CSM2-C-08-039	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 11340 - 11640
CSM2-C-08-040	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 11640 - 11940
CSM2-C-08-041	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 11940 - 12240
CSM2-C-08-042	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 12240 - 12540
CSM2-C-08-043	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 12540 - 12840
CSM2-C-08-044	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 12840 - 13140
CSM2-C-08-045	DRAINAGE LAYOUT PLANS CHRISTCHURCH SOUTHERN MOTORWAY 2 CHAINAGE 13140 - 13440
CSM2-C-08-046	NOT USED
CSM2-C-08-047	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1/WEEDONS ROSS ROAD CHAINAGE 280 - 480/160 - 0
CSM2-C-08-048	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1/WEEDONS ROAD CHAINAGE 240 - 0
CSM2-C-08-049	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1/ROBINSONS ROAD CHAINAGE 260 - 420
CSM2-C-08-050	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 440 - 740/1080 - 780
CSM2-C-08-051	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 740 - 1040/780 - 480
CSM2-C-08-052	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1/WATERHOLES ROAD CHAINAGE 480 - 340/0 - 100/100 - 260
CSM2-C-08-053	DRAINAGE LAYOUT PLANS MAIN SOUTH ROAD SH1 CHAINAGE 120 - 380
CSM2-C-08-061	DRAINAGE LAYOUT PLANS CSM2 SHANDS ROAD INTERCHANGE CHAINAGE 220 - 0
CSM2-C-08-062	DRAINAGE LAYOUT PLANS CSM2 SHANDS ROAD INTERCHANGE CHAINAGE 60 - 320
CSM2-C-08-331	DRAINAGE LAYOUT PLANS WEEDONS ROSS ROAD CHAINAGE 0 - 280
CSM2-C-08-332	DRAINAGE LAYOUT PLANS WEEDONS ROSS ROAD CHAINAGE 280 - 580
CSM2-C-08-333	DRAINAGE LAYOUT PLANS WEEDONS ROAD CHAINAGE 580 - 880
CSM2-C-08-104	DRAINAGE LAYOUT PLANS WEEDONS ROAD CHAINAGE 880 - 1140
CSM2-C-08-105	DRAINAGE LAYOUT PLANS WEEDONS ROAD CHAINAGE 1140 - 1420
CSM2-C-08-106	DRAINAGE LAYOUT PLANS LEVI ROAD/WEEDONS ROAD CHAINAGE 1420 - 1720
CSM2-C-08-107	DRAINAGE LAYOUT PLANS JONES ROAD CHAINAGE 0 - 200
CSM2-C-08-108	DRAINAGE LAYOUT PLANS JONES ROAD CHAINAGE 300 - 420
CSM2-C-08-202	DRAINAGE LAYOUT PLANS WESTERN ACCESS ROAD CHAINAGE 240 - 540
CSM2-C-08-203	DRAINAGE LAYOUT PLANS WESTERN ACCESS ROAD CHAINAGE 540 - 840
CSM2-C-08-204	DRAINAGE LAYOUT PLANS WESTERN ACCESS ROAD CHAINAGE 840 - 1140
CSM2-C-08-205	DRAINAGE LAYOUT PLANS WESTERN ACCESS ROAD CHAINAGE 1140 - 1440
CSM2-C-08-206	DRAINAGE LAYOUT PLANS WESTERN ACCESS ROAD CHAINAGE 1440 - 1740
CSM2-C-08-207	DRAINAGE LAYOUT PLANS WESTERN ACCESS ROAD CHAINAGE 1740 - 2040
CSM2-C-08-208	DRAINAGE LAYOUT PLANS WESTERN ACCESS ROAD CHAINAGE 2040 - 2320
CSM2-C-08-209	DRAINAGE LAYOUT PLANS WESTERN ACCESS ROAD CHAINAGE 2320 - 2620
CSM2-C-08-210	DRAINAGE LAYOUT PLANS WESTERN ACCESS ROAD CHAINAGE 2620 - 2920
CSM2-C-08-211	DRAINAGE LAYOUT PLANS WESTERN ACCESS ROAD/JONES ROAD CHAINAGE 2920 - 3160
CSM2-C-08-216	DRAINAGE LAYOUT PLANS JONES ROAD CHAINAGE 1260 - 1320
CSM2-C-08-401	DRAINAGE LAYOUT PLANS BERKETTS ROAD/LARCOMBS ROAD JUNCTION
CSM2-C-08-501	DRAINAGE LAYOUT PLANS EASTERN ACCESS ROAD CHAINAGE 0 - 200
CSM2-C-08-502	DRAINAGE LAYOUT PLANS EASTERN ACCESS ROAD CHAINAGE 200 - 500
CSM2-C-08-503	DRAINAGE LAYOUT PLANS EASTERN ACCESS ROAD CHAINAGE 500 - 820
CSM2-C-08-504	DRAINAGE LAYOUT PLANS EASTERN ACCESS ROAD CHAINAGE 820 - 1100
CSM2-C-08-505	DRAINAGE LAYOUT PLANS EASTERN ACCESS ROAD CHAINAGE 1100 - 1360
CSM2-C-08-506	DRAINAGE LAYOUT PLANS EASTERN ACCESS ROAD CHAINAGE 1360 - 1480
CSM2-C-08-601	DRAINAGE LAYOUT PLANS WATERHOLES ROAD CHAINAGE 0 - 160
CSM2-C-08-602	DRAINAGE LAYOUT PLANS WATERHOLES ROAD CHAINAGE 160 - 440
CSM2-C-08-603	DRAINAGE LAYOUT PLANS HAMPTONS ROAD/WATERHOLES ROAD CHAINAGE 440 - 640
CSM2-C-08-604	DRAINAGE LAYOUT PLANS WATERHOLES ROAD CHAINAGE 100 - 380
CSM2-C-08-701	DRAINAGE LAYOUT PLANS TRENTS ROAD CHAINAGE 0 - 220
CSM2-C-08-702	DRAINAGE LAYOUT PLANS TRENTS ROAD CHAINAGE 220 - 520
CSM2-C-08-703	DRAINAGE LAYOUT PLANS TRENTS ROAD CHAINAGE 520 - 740
CSM2-C-08-801	DRAINAGE LAYOUT PLANS MARSHS ROAD CHAINAGE 40 - 320
CSM2-C-08-802	DRAINAGE LAYOUT PLANS MARSHS ROAD CHAINAGE 320 - 620
CSM2-C-08-803	DRAINAGE LAYOUT PLANS MARSHS ROAD CHAINAGE 620 - 920
CSM2-C-08-804	DRAINAGE LAYOUT PLANS MARSHS ROAD CHAINAGE 920 - 1220
CSM2-C-08-805	DRAINAGE LAYOUT PLANS SHANDS ROAD CHAINAGE 0 - 260
CSM2-C-08-806	DRAINAGE LAYOUT PLANS SHANDS ROAD CHAINAGE 260 - 560
CSM2-C-08-807	DRAINAGE LAYOUT PLANS SHANDS ROAD CHAINAGE 560 - 860
CSM2-C-08-901	DRAINAGE LAYOUT PLANS SPRINGS ROAD CHAINAGE 0 - 160
CSM2-C-08-902	DRAINAGE LAYOUT PLANS SPRINGS ROAD CHAINAGE 160 - 440
CSM2-C-08-903	DRAINAGE LAYOUT PLANS SPRINGS ROAD CHAINAGE 440 - 640
CSM2-C-08-904	DRAINAGE LAYOUT PLANS HALSWELL JUNCTION ROAD CHAINAGE 0 - 220
CSM2-C-08-905	DRAINAGE LAYOUT PLANS HALSWELL JUNCTION ROAD CHAINAGE 220 - 520
CSM2-C-08-906	DRAINAGE LAYOUT PLANS HALSWELL JUNCTION ROAD CHAINAGE 520 - 780
CSM2-C-08-907	DRAINAGE LAYOUT PLANS HALSWELL JUNCTION ROAD CHAINAGE 780 - 880
CSM2-C-08-908	DRAINAGE LAYOUT PLANS JOHN PATERSON DRIVE CHAINAGE 0 - 320
CSM2-C-08-909	DRAINAGE LAYOUT PLANS JOHN PATERSON DRIVE CHAINAGE 320 - 600
CSM2-C-08-910	DRAINAGE LAYOUT PLANS HALSWELL JUNCTION SOUTHBOUND OFF RAMP CHAINAGE 0 - 300
CSM2-C-08-911	DRAINAGE LAYOUT PLANS RAIL SIDING CHAINAGE 0 - 400
CSM2-C-08-920	HALSWELL JUNCTION INFILTRATION BASINS PLAN
CSM2-C-08-921	MAIZE MAZE BASIN DETAILS
CSM2-C-08-922	MUSHROOM BASIN DETAILS
CSM2-C-08-923	OWAKA BASIN DETAILS
CSM2-C-08-924	RAMP BASIN DETAILS
CSM2-C-08-925	LEE BASIN DETAILS
CSM2-C-08-926	BERKETTS BASIN DETAILS
CSM2-C-08-927	DRAINAGE DETAILS BASIN DETAILS
CSM2-C-08-928	DRAINAGE DETAILS BASINS OVERFLOW CHAMBER
CSM2-C-08-929	DRAINAGE DETAILS FLOW SPLIT CHAMBER
CSM2-C-08-930	DRAINAGE DETAILS OWAKA BASIN OUTLET CHAMBER
CSM2-C-08-931	DRAINAGE DETAILS OWAKA BASIN OUTLET REINFORCING DETAILS
CSM2-C-08-932	DRAINAGE DETAILS SWALES
CSM2-C-08-933	DRAINAGE DETAILS SWALE BUBBLE UP SUMPS
CSM2-C-08-934	DRAINAGE DETAILS SWALE SOAKHOLE TYPE 1
CSM2-C-08-935	DRAINAGE DETAILS SWALE SOAKHOLE TYPE 2
CSM2-C-08-936	DRAINAGE DETAILS SWALE SOAKHOLE TYPE 3
CSM2-C-08-937	DRAINAGE DETAILS SWALE SOAKHOLE TYPE 4
CSM2-C-08-938	DRAINAGE DETAILS SUBSOIL LAND DRAIN DISCHARGE MANHOLE
CSM2-C-08-939	DRAINAGE DETAILS OVERLAND FLOW SIPHON INLET AND OUTLET DETAILS
CSM2-C-08-940	DRAINAGE DETAILS OVERLAND FLOW SIPHON SOAKHOLE AND WEIR DETAILS
CSM2-C-08-941	DRAINAGE DETAILS ROBINSON RD STORAGE CHAMBERS
CSM2-C-08-942	DRAINAGE DETAILS ROBINSON RD ATTENUATION CHAMBERS SECTIONS
CSM2-C-08-943	DRAINAGE DETAILS ROBINSON RD ATTENUATION CHAMBERS DETAILS
CSM2-C-08-944	DRAINAGE DETAILS DROP STRUCTURE IN MANHOLE
CSM2-C-08-945	DRAINAGE DETAILS CCC STANDARD DETAILS SHEET 1 OF 3
CSM2-C-08-946	DRAINAGE DETAILS CCC STANDARD DETAILS SHEET 2 OF 3
CSM2-C-08-947	DRAINAGE DETAILS CCC STANDARD DETAILS SHEET 3 OF 3
CSM2-C-08-950	DRAINAGE LONG SECTIONS SHEET 1 OF 30
CSM2-C-08-951	DRAINAGE LONG SECTIONS SHEET 2 OF 30
CSM2-C-08-952	DRAINAGE LONG SECTIONS SHEET 3 OF 30
CSM2-C-08-953	DRAINAGE LONG SECTIONS SHEET 4 OF 30
CSM2-C-08-954	DRAINAGE LONG SECTIONS SHEET 5 OF 30
CSM2-C-08-955	DRAINAGE LONG SECTIONS SHEET 6 OF 30
CSM2-C-08-956	DRAINAGE LONG SECTIONS SHEET 7 OF 30
CSM2-C-08-957	DRAINAGE LONG SECTIONS SHEET 8 OF 30
CSM2-C-08-958	DRAINAGE LONG SECTIONS SHEET 9 OF 30
CSM2-C-08-959	DRAINAGE LONG SECTIONS SHEET 10 OF 30
CSM2-C-08-960	DRAINAGE LONG SECTIONS SHEET 11 OF 30
CSM2-C-08-961	DRAINAGE LONG SECTIONS SHEET 12 OF 30
CSM2-C-08-962	DRAINAGE LONG SECTIONS SHEET 13 OF 30
CSM2-C-08-963	DRAINAGE LONG SECTIONS SHEET 14 OF 30
CSM2-C-08-964	DRAINAGE LONG SECTIONS SHEET 15 OF 30
CSM2-C-08-965	DRAINAGE LONG SECTIONS SHEET 16 OF 30
CSM2-C-08-966	DRAINAGE LONG SECTIONS SHEET 17 OF 30
CSM2-C-08-967	DRAINAGE LONG SECTIONS SHEET 18 OF 30
CSM2-C-08-968	DRAINAGE LONG SECTIONS SHEET 19 OF 30
CSM2-C-08-969	DRAINAGE LONG SECTIONS SHEET 20 OF 30
CSM2-C-08-970	DRAINAGE LONG SECTIONS SHEET 21 OF 30
CSM2-C-08-971	DRAINAGE LONG SECTIONS SHEET 22 OF 30
CSM2-C-08-972	DRAINAGE LONG SECTIONS SHEET 23 OF 30
CSM2-C-08-973	DRAINAGE LONG SECTIONS SHEET 24 OF 30
CSM2-C-08-974	DRAINAGE LONG SECTIONS SHEET 25 OF 30
CSM2-C-08-975	DRAINAGE LONG SECTIONS SHEET 26 OF 30
CSM2-C-08-976	DRAINAGE LONG SECTIONS SHEET 27 OF 30
CSM2-C-08-977	DRAINAGE LONG SECTIONS SHEET 28 OF 30
CSM2-C-08-978	DRAINAGE LONG SECTIONS SHEET 29 OF 30
CSM2-C-08-979	DRAINAGE LONG SECTIONS SHEET 30 OF 30
CSM2-C-08-981	OVERLAND FLOW SIPHON LONG SECTIONS SHEET 1 OF 3
CSM2-C-08-982	OVERLAND FLOW SIPHON LONG SECTIONS SHEET 2 OF 3
CSM2-C-08-983	OVERLAND FLOW SIPHON LONG SECTIONS SHEET 3 OF 3

C-08-949 →

C-08-990
C-08-991

RE-SUBMISSION
- ADDITIONAL CHANGES

NEW SUBMISSION

PREVIOUSLY SUBMITTED
- 06/10/20

FOR CONSTRUCTION

Rev	Revision Description	Designed	Drawn	Checked	Approved	Date
0	FOR CONSTRUCTION	KC/SC	GK	MM/AW	KF	25.08.2016

Tab 0
Scales N/A
Original Size A1

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CSM2 TEAM
URS AECOM GHD

NZ TRANSPORT AGENCY WAKA KOTAHI

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)

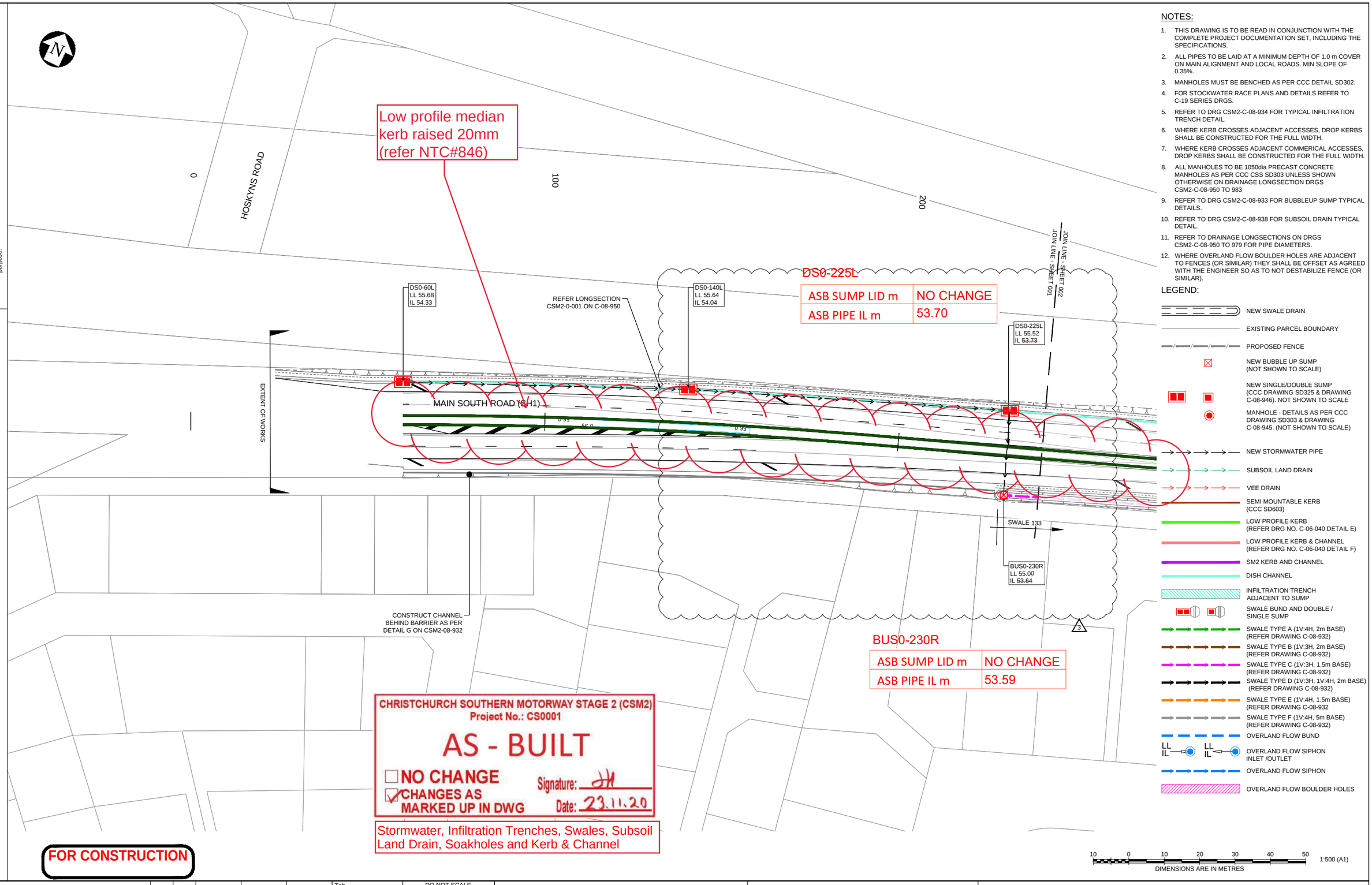
DRAINAGE DRAWING LIST

Status FOR CONSTRUCTION
Drawing Number CSM2-C-00-081
Revision 0

J:\Jobs\42192660\5 Works\A - Design Teams\CAD\01 Drawings\C-00 Cover Sheet And Index\CSM2-C-00-081.dwg Printed by: Gunn, Sloan 28-Jul-16

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CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)
Project No.: CS0001

AS - BUILT

☐ NO CHANGE
☑ CHANGES AS MARKED UP IN DWG

Signature: JH
Date: 23.11.20

Stormwater, Infiltration Trenches, Swales, Subsoil Land Drain, Soakholes and Kerb & Channel

FOR CONSTRUCTION

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE COMPLETE PROJECT DOCUMENTATION SET, INCLUDING THE SPECIFICATIONS.
2. ALL PIPES TO BE LAID AT A MINIMUM DEPTH OF 1.0 m COVER ON MAIN ALIGNMENT AND LOCAL ROADS. MIN SLOPE OF 0.35%.
3. MANHOLES MUST BE BENCHED AS PER CCC DETAIL SD302.
4. FOR STOCKWATER RACE PLANS AND DETAILS REFER TO C-19 SERIES DRGS.
5. REFER TO DRG CSM2-C-08-934 FOR TYPICAL INFILTRATION TRENCH DETAIL.
6. WHERE KERB CROSSES ADJACENT ACCESSES, DROP KERBS SHALL BE CONSTRUCTED FOR THE FULL WIDTH.
7. WHERE KERB CROSSES ADJACENT COMMERICAL ACCESSES, DROP KERBS SHALL BE CONSTRUCTED FOR THE FULL WIDTH.
8. ALL MANHOLES TO BE 1050dia PRECAST CONCRETE MANHOLES AS PER CCC CSS SD303 UNLESS SHOWN OTHERWISE ON DRAINAGE LONGSECTION DRGS CSM2-C-08-950 TO 983
9. REFER TO DRG CSM2-C-08-933 FOR BUBBLEUP SUMP TYPICAL DETAILS.
10. REFER TO DRG CSM2-C-08-938 FOR SUBSOIL DRAIN TYPICAL DETAIL.
11. REFER TO DRAINAGE LONGSECTIONS ON DRGS CSM2-C-08-950 TO 979 FOR PIPE DIAMETERS.
12. WHERE OVERLAND FLOW BOULDER HOLES ARE ADJACENT TO FENCES (OR SIMILAR) THEY SHALL BE OFFSET AS AGREED WITH THE ENGINEER SO AS TO NOT DESTABILIZE FENCE (OR SIMILAR).

LEGEND:

- NEW SWALE DRAIN
- EXISTING PARCEL BOUNDARY
- PROPOSED FENCE
- NEW BUBBLE UP SUMP (NOT SHOWN TO SCALE)
- NEW SINGLE/DOUBLE SUMP (CCC DRAWING SD325 & DRAWING C-08-946). NOT SHOWN TO SCALE
- MANHOLE - DETAILS AS PER CCC DRAWING SD303 & DRAWING C-08-945. (NOT SHOWN TO SCALE)
- NEW STORMWATER PIPE
- SUBSOIL LAND DRAIN
- VEE DRAIN
- SEMI MOUNTABLE KERB (CCC SD603)
- LOW PROFILE KERB (REFER DRG NO. C-06-040 DETAIL E)
- LOW PROFILE KERB & CHANNEL (REFER DRG NO. C-06-040 DETAIL F)
- SM2 KERB AND CHANNEL
- DISH CHANNEL
- INFILTRATION TRENCH ADJACENT TO SUMP
- SWALE BUND AND DOUBLE / SINGLE SUMP
- SWALE TYPE A (1V:4H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE B (1V:3H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE C (1V:3H, 1.5m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE D (1V:3H, 1V:4H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE E (1V:4H, 1.5m BASE) (REFER DRAWING C-08-932
- SWALE TYPE F (1V:4H, 5m BASE) (REFER DRAWING C-08-932)
- OVERLAND FLOW BUND
- OVERLAND FLOW SIPHON INLET /OUTLET
- OVERLAND FLOW SIPHON
- OVERLAND FLOW BOULDER HOLES

10 0 10 20 30 40 50
DIMENSIONS ARE IN METRES
1:500 (A1)

Rev	Revision Description	Designed	Drawn	Checked	Approved	Date
3	PIPED NETWORK REVISED	SS	SS	DA	DA	1.03.2019
2	SWALE TYPE AMENDED	KC	KC	SS	DA	20.04.2017
1	SUMPS REMOVED, CHANNEL ADDED	DH	DH	KC	DA	3.2.2017
0	FOR CONSTRUCTION	KC/SG	GK	MM/AW	KF	28.06.2016

Tab 3

Scales
1:500 (A1)
1:1000 (A3)

Original Size A1

DO NOT SCALE

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CSM2 TEAM
URS AECOM GHD

NZ TRANSPORT AGENCY
WAKA KOTAHI

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)

DRAINAGE LAYOUT PLANS
MAIN SOUTH ROAD SH1
CHAINAGE 0 - 240

Status FOR CONSTRUCTION
Drawing Number CSM2-C-08-001
Revision ~~3~~ X02

\\nzchc1fp001.au.aecomnet.com\jobs\Jobs\42192660\5 Works\A – Design Teams\CAD\01 Drawings\C-08 Drainage Layout\CSM2-C-08-001.dwg Printed by: Stern, Stephen 1-Mar-19

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Low profile median kerb raised 20mm (refer NTC#846)

300 400 500

JOIN LINE - SHEET 001
JOIN LINE - SHEET 002
JOIN LINE - SHEET 002
JOIN LINE - SHEET 003

DS0-320L
LL 55.43
IL 54.11

MH0-360L
LL 55.39
IL 53.97

DS0-420L
LL 55.32
IL 53.97

DS0-500L

MH0-520L

S0-530

CSM2-0-005
REFER TO DRG. C-08-950
FOR LONG SECTION

MAIN SOUTH ROAD (SH1)

55.5

2m x 51m LENGTH

SWALE 132

2m x 62m LENGTH

2m x 23m LENGTH

SWALE 131

BUS0-360R
LL 54.90
IL 53.89

BUS0-420R
LL 54.83
IL 53.89

BUS0-520R

4

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)
Project No.: CS0001

AS - BUILT

☐ NO CHANGE
☑ CHANGES AS MARKED UP IN DWG

Signature: JH
Date: 23.11.20

Stormwater, Infiltration Trenches, Swales, Subsoil Land Drain, Soakholes and Kerb & Channel

FOR CONSTRUCTION

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE COMPLETE PROJECT DOCUMENTATION SET, INCLUDING THE SPECIFICATIONS.
2. ALL PIPES TO BE LAID AT A MINIMUM DEPTH OF 1.0 m COVER ON MAIN ALIGNMENT AND LOCAL ROADS. MIN SLOPE OF 0.35%.
3. MANHOLES MUST BE BENCHED AS PER CCC DETAIL SD302.
4. FOR STOCKWATER RACE PLANS AND DETAILS REFER TO C-19 SERIES DRGS.
5. REFER TO DRG CSM2-C-08-934 FOR TYPICAL INFILTRATION TRENCH DETAIL.
6. WHERE KERB CROSSES ADJACENT ACCESSES, DROP KERBS SHALL BE CONSTRUCTED FOR THE FULL WIDTH.
7. WHERE KERB CROSSES ADJACENT COMMERICAL ACCESSES, DROP KERBS SHALL BE CONSTRUCTED FOR THE FULL WIDTH.
8. ALL MANHOLES TO BE 1050dia PRECAST CONCRETE MANHOLES AS PER CCC CSS SD303 UNLESS SHOWN OTHERWISE ON DRAINAGE LONGSECTION DRGS CSM2-C-08-950 TO 983
9. REFER TO DRG CSM2-C-08-933 FOR BUBBLEUP SUMP TYPICAL DETAILS.
10. REFER TO DRG CSM2-C-08-938 FOR SUBSOIL DRAIN TYPICAL DETAIL.
11. REFER TO DRAINAGE LONGSECTIONS ON DRGS CSM2-C-08-950 TO 979 FOR PIPE DIAMETERS.
12. WHERE OVERLAND FLOW BOULDER HOLES ARE ADJACENT TO FENCES (OR SIMILAR) THEY SHALL BE OFFSET AS AGREED WITH THE ENGINEER SO AS TO NOT DESTABILIZE FENCE (OR SIMILAR).

LEGEND:

- NEW SWALE DRAIN
- EXISTING PARCEL BOUNDARY
- PROPOSED FENCE
- NEW BUBBLE UP SUMP (NOT SHOWN TO SCALE)
- NEW SINGLE/DOUBLE SUMP (CCC DRAWING SD325 & DRAWING C-08-946). NOT SHOWN TO SCALE
- MANHOLE - DETAILS AS PER CCC DRAWING SD303 & DRAWING C-08-945. (NOT SHOWN TO SCALE)
- NEW STORMWATER PIPE
- SUBSOIL LAND DRAIN
- VEE DRAIN
- SEMI MOUNTABLE KERB (CCC SD603)
- LOW PROFILE KERB (REFER DRG NO. C-06-040 DETAIL E)
- LOW PROFILE KERB & CHANNEL (REFER DRG NO. C-06-040 DETAIL F)
- SM2 KERB AND CHANNEL
- DISH CHANNEL
- INFILTRATION TRENCH ADJACENT TO SUMP
- SWALE BUND AND DOUBLE / SINGLE SUMP
- SWALE TYPE A (1V:4H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE B (1V:3H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE C (1V:3H, 1.5m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE D (1V:3H, 1V:4H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE E (1V:4H, 1.5m BASE) (REFER DRAWING C-08-932
- SWALE TYPE F (1V:4H, 5m BASE) (REFER DRAWING C-08-932)
- OVERLAND FLOW BUND
- OVERLAND FLOW SIPHON INLET /OUTLET (LL / IL)
- OVERLAND FLOW SIPHON
- OVERLAND FLOW BOULDER HOLES

10 0 10 20 30 40 50
DIMENSIONS ARE IN METRES

1:500 (A1)

Rev	Revision Description	Designed	Drawn	Checked	Approved	Date
4	PIPED NETWORK REVISED	SS	SS	DA	DA	1.03.2019
3	SWALE TYPE AMENDED	KC	KC	SS	DA	20.04.2017
2	SUMP RELOCATED	SS	BG	KC	DA	24.03.2017
1	SUMP RELOCATED AND ADDED	DH	BG	KC	DA	3.2.2017
0	FOR CONSTRUCTION	KC/SG	GK	MM/AW	KF	28.06.2016

Tab 4

Scales 1:500 (A1) 1:1000 (A3)

Original Size A1

DO NOT SCALE

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CSM2 TEAM
URS AECOM GHD

NZ TRANSPORT AGENCY WAKA KOTAHI

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)

DRAINAGE LAYOUT PLANS
MAIN SOUTH ROAD SH1
CHAINAGE 240 - 540

Status FOR CONSTRUCTION

Drawing Number CSM2-C-08-002

Revision ~~4~~

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X02

Low profile median kerb raised 20mm (refer NTC#846)

Sumps moved to be perpendicular to new sump and manhole positions.

Single Sump

MHO-710R

ASB SUMP LID m	55.26
ASB PIPE IL m U/S	55.23
ASB PIPE IL m U/S	53.64
ASB PIPE IL m D/S	53.23
EASTING	373062.89
NORTHING	800508.52

Gravel raft 500mm thick installed under drainage due to poor ground conditions.

BUSO-710

ASB SUMP LID m	NO CHANGE
ASB PIPE IL m U/S	NO CHANGE
ASB PIPE IL m U/S	53.22
ASB PIPE IL m D/S	NO CHANGE
EASTING	373064.37
NORTHING	800504.62

BUSO-850R

ASB SUMP LID m	NO CHANGE
ASB PIPE IL m	53.56

Sumps and manhole built to original design.

DSO-660R

ASB SUMP LID m	NO CHANGE
ASB PIPE IL m U/S	NO CHANGE
ASB PIPE IL m U/S	53.95
ASB PIPE IL m D/S	NO CHANGE
EASTING	373025.34
NORTHING	800495.74

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)
Project No.: CS0001

AS - BUILT

☐ NO CHANGE
☑ CHANGES AS MARKED UP IN DWG

Signature: JH
Date: 23.11.20

Stormwater, Infiltration Trenches, Swales, Subsoil Land Drain, Soakholes and Kerb & Channel

FOR CONSTRUCTION

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE COMPLETE PROJECT DOCUMENTATION SET, INCLUDING THE SPECIFICATIONS.
2. ALL PIPES TO BE LAID AT A MINIMUM DEPTH OF 1.0 m COVER ON MAIN ALIGNMENT AND LOCAL ROADS. MIN SLOPE OF 0.35%.
3. MANHOLES MUST BE BENCHED AS PER CCC DETAIL SD302.
4. FOR STOCKWATER RACE PLANS AND DETAILS REFER TO C-19 SERIES DRGS.
5. REFER TO DRG CSM2-C-08-934 FOR TYPICAL INFILTRATION TRENCH DETAIL.
6. WHERE KERB CROSSES ADJACENT ACCESSES, DROP KERBS SHALL BE CONSTRUCTED FOR THE FULL WIDTH.
7. WHERE KERB CROSSES ADJACENT COMMERICAL ACCESSES, DROP KERBS SHALL BE CONSTRUCTED FOR THE FULL WIDTH.
8. ALL MANHOLES TO BE 1050dia PRECAST CONCRETE MANHOLES AS PER CCC GSS SD303 UNLESS SHOWN OTHERWISE ON DRAINAGE LONGSECTION DRGS CSM2-C-08-950 TO 983
9. REFER TO DRG CSM2-C-08-933 FOR BUBBLEUP SUMP TYPICAL DETAILS.
10. REFER TO DRG CSM2-C-08-936 FOR SUBSOIL DRAIN TYPICAL DETAIL.
11. REFER TO DRAINAGE LONGSECTIONS ON DRGS CSM2-C-08-950 TO 979 FOR PIPE DIAMETERS.
12. WHERE OVERLAND FLOW BOULDER HOLES ARE ADJACENT TO FENCES (OR SIMILAR) THEY SHALL BE OFFSET AS AGREED WITH THE ENGINEER SO AS TO NOT DESTABILIZE FENCE (OR SIMILAR).

LEGEND:

- NEW SWALE DRAIN
- EXISTING PARCEL BOUNDARY
- PROPOSED FENCE
- NEW BUBBLE UP SUMP (NOT SHOWN TO SCALE)
- NEW SINGLE/DOUBLE SUMP (CCC DRAWING SD325 & DRAWING C-08-945). NOT SHOWN TO SCALE
- MANHOLE - DETAILS AS PER CCC DRAWING SD303 & DRAWING C-08-945. (NOT SHOWN TO SCALE)
- NEW STORMWATER PIPE
- SUBSOIL LAND DRAIN
- VEE DRAIN
- SEMI MOUNTABLE KERB (CCC SD603)
- LOW PROFILE KERB (REFER DRG NO. C-06-040 DETAIL E)
- LOW PROFILE KERB & CHANNEL (REFER DRG NO. C-06-040 DETAIL F)
- SM2 KERB AND CHANNEL
- DISH CHANNEL
- INFILTRATION TRENCH ADJACENT TO SUMP
- SWALE BUND AND DOUBLE / SINGLE SUMP
- SWALE TYPE A (1V:4H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE B (1V:3H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE C (1V:3H, 1.5m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE D (1V:3H, 1V:4H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE E (1V:4H, 1.5m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE F (1V:4H, 5m BASE) (REFER DRAWING C-08-932)
- OVERLAND FLOW BUND
- OVERLAND FLOW SIPHON INLET /OUTLET
- OVERLAND FLOW SIPHON
- OVERLAND FLOW BOULDER HOLES

10 0 10 20 30 40 50 1:500 (A1)
DIMENSIONS ARE IN METRES

Rev	Revision Description	Designed	Drawn	Checked	Approved	Date
3	SUMP MOVED	SS	SS	DA	DA	5.05.2017
2	SUMPS ADDED AND RENAMED	SS	BG	KC	DA	24.03.2017
1	SUMPS ADDED TO NETWORK	DH	BG	KC	DA	3.2.2017
0	FOR CONSTRUCTION	KC/SG	GK	MM/AW	KF	28.06.2016

Tab D1
Scales 1:500 (A1) 1:1000 (A3)
Original Size A1

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CSM2 TEAM
URS AECOM GHD

NZ TRANSPORT AGENCY WAKA KOTAHI

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)

DRAINAGE LAYOUT PLANS
MAIN SOUTH ROAD SH1
CHAINAGE 540 - 840

Status FOR CONSTRUCTION
Drawing Number CSM2-C-08-003
Revision 3

J:\42192860\5 Works\A - Design Teams\CAD\01 Drawings\C-08 Drainage Layout\CSM2-C-08-003.dwg Printed by: Stern, Stephen 5-May-17

X02
X03

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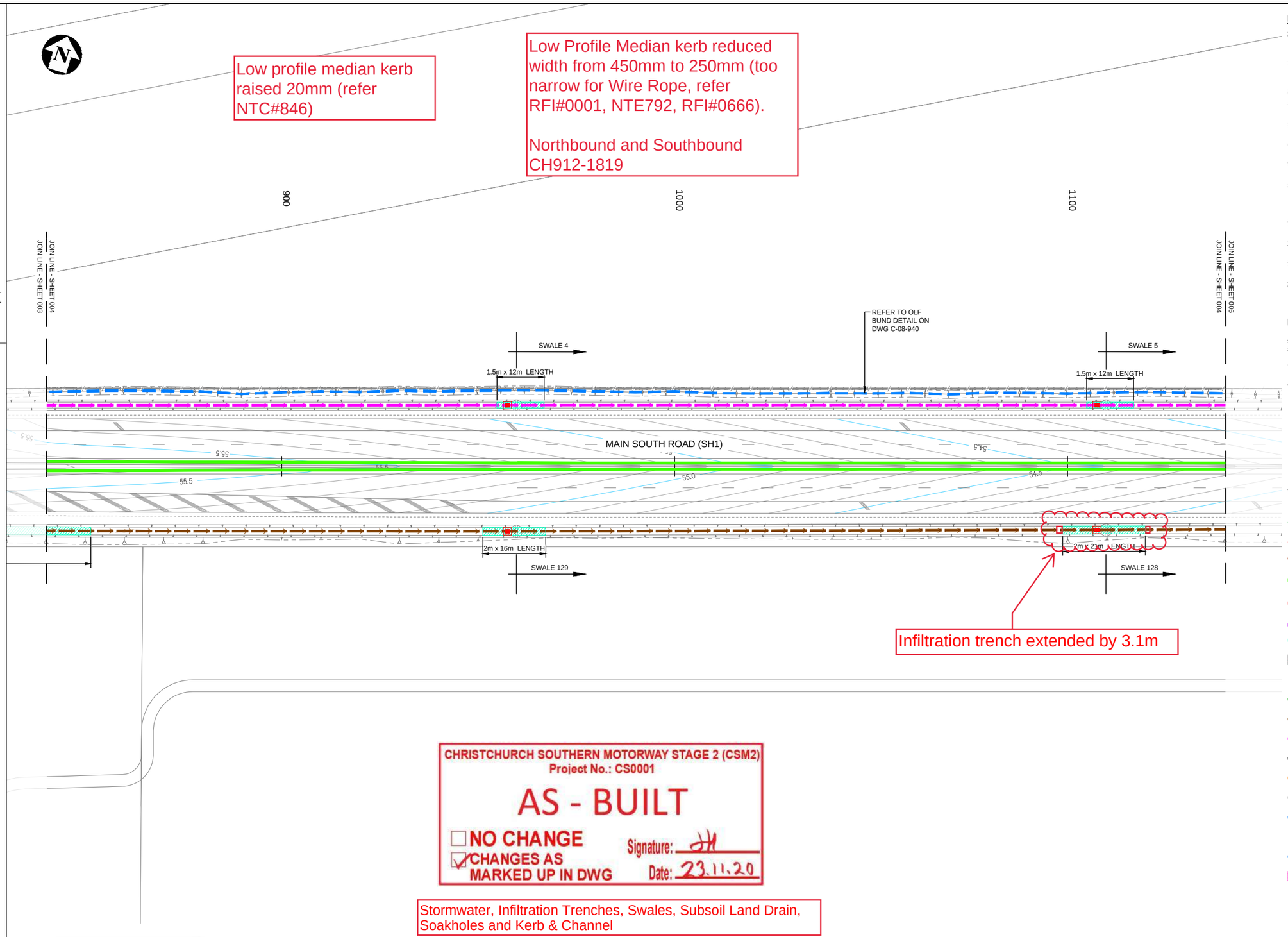
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Low profile median kerb raised 20mm (refer NTC#846)

Low Profile Median kerb reduced width from 450mm to 250mm (too narrow for Wire Rope, refer RFI#0001, NTE792, RFI#0666).

Northbound and Southbound CH912-1819



Infiltration trench extended by 3.1m

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)
Project No.: CS0001

AS - BUILT

☐ NO CHANGE
☑ CHANGES AS MARKED UP IN DWG

Signature:
Date: 23.11.20

Stormwater, Infiltration Trenches, Swales, Subsoil Land Drain, Soakholes and Kerb & Channel

FOR CONSTRUCTION

NOTES:

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4. FOR STOCKWATER RACE PLANS AND DETAILS REFER TO C-19 SERIES DRGS.
5. REFER TO DRG CSM2-C-08-934 FOR TYPICAL INFILTRATION TRENCH DETAIL.
6. WHERE KERB CROSSES ADJACENT ACCESSES, DROP KERBS SHALL BE CONSTRUCTED FOR THE FULL WIDTH.
7. WHERE KERB CROSSES ADJACENT COMMERICAL ACCESSES, DROP KERBS SHALL BE CONSTRUCTED FOR THE FULL WIDTH.
8. ALL MANHOLES TO BE 1050dia PRECAST CONCRETE MANHOLES AS PER CCC CSS SD303 UNLESS SHOWN OTHERWISE ON DRAINAGE LONGSECTION DRGS CSM2-C-08-950 TO 983
9. REFER TO DRG CSM2-C-08-933 FOR BUBBLEUP SUMP TYPICAL DETAILS.
10. REFER TO DRG CSM2-C-08-938 FOR SUBSOIL DRAIN TYPICAL DETAIL.
11. REFER TO DRAINAGE LONGSECTIONS ON DRGS CSM2-C-08-950 TO 979 FOR PIPE DIAMETERS.
12. WHERE OVERLAND FLOW BOULDER HOLES ARE ADJACENT TO FENCES (OR SIMILAR) THEY SHALL BE OFFSET AS AGREED WITH THE ENGINEER SO AS TO NOT DESTABILIZE FENCE (OR SIMILAR).

LEGEND:

- NEW SWALE DRAIN
- EXISTING PARCEL BOUNDARY
- PROPOSED FENCE
- NEW BUBBLE UP SUMP (NOT SHOWN TO SCALE)
- NEW SINGLE/DOUBLE SUMP (CCC DRAWING SD325 & DRAWING C-08-946). NOT SHOWN TO SCALE
- MANHOLE - DETAILS AS PER CCC DRAWING SD303 & DRAWING C-08-945. (NOT SHOWN TO SCALE)
- NEW STORMWATER PIPE (300mm Ø RCRRJ CLASS 4 UNLESS OTHERWISE SHOWN)
- SUBSOIL LAND DRAIN
- VEE DRAIN
- SEMI MOUNTABLE KERB (CCC SD603)
- LOW PROFILE KERB (REFER DRG NO. C-06-040 DETAIL E)
- LOW PROFILE KERB & CHANNEL (REFER DRG NO. C-06-040 DETAIL F)
- SM2 KERB AND CHANNEL
- DISH CHANNEL
- INFILTRATION TRENCH ADJACENT TO SUMP
- SWALE BUND AND DOUBLE / SINGLE SUMP
- SWALE TYPE A (1V:4H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE B (1V:3H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE C (1V:3H, 1.5m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE D (1V:3H, 1V:4H, 2m BASE) (REFER DRAWING C-08-932)
- SWALE TYPE E (1V:4H, 1.5m BASE) (REFER DRAWING C-08-932
- SWALE TYPE F (1V:4H, 5m BASE) (REFER DRAWING C-08-932)
- OVERLAND FLOW BUND
- LL IL — LL IL — OVERLAND FLOW SIPHON INLET /OUTLET
- OVERLAND FLOW SIPHON
- OVERLAND FLOW BOULDER HOLES

10 0 10 20 30 40 50 1:500 (A1)
DIMENSIONS ARE IN METRES

Rev	Revision Description	Designed	Drawn	Checked	Approved	Date
0	FOR CONSTRUCTION	KC/SG	GK	MM/AW	KF	28.06.2016

Tab 0

Scales 1:500 (A1) 1:1000 (A3)

Original Size A1

DO NOT SCALE

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CSM2 TEAM
URS AECOM GHD

NZ TRANSPORT AGENCY WAKA KOTAHI

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)

DRAINAGE LAYOUT PLANS
MAIN SOUTH ROAD SH1
CHAINAGE 840 - 1140

Status FOR CONSTRUCTION

Drawing Number CSM2-C-08-004

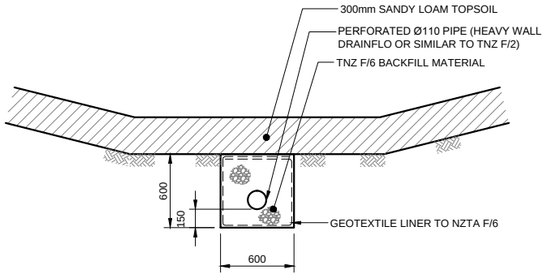
Revision ~~0~~ --

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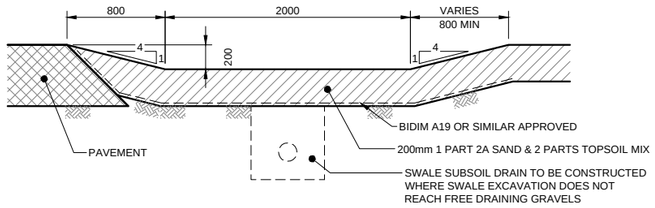
X02

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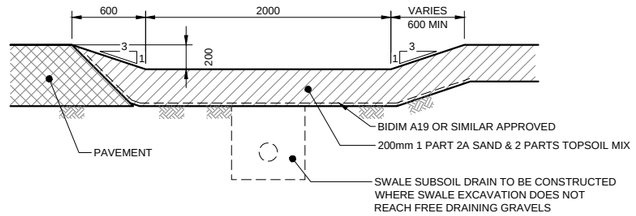
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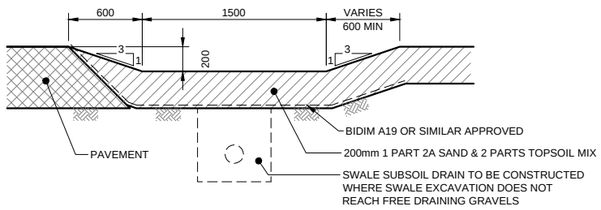
SWALE SUBSOIL DRAIN
SCALE 1:25 (A1); 1:50 (A3)



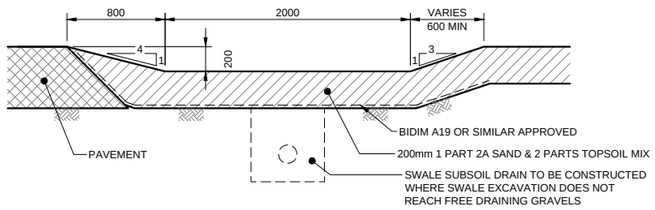
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SCALE 1:25 (A1); 1:50 (A3)



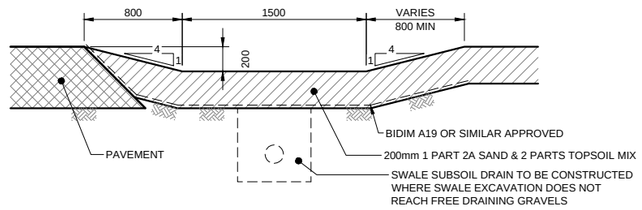
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SCALE 1:25 (A1); 1:50 (A3)



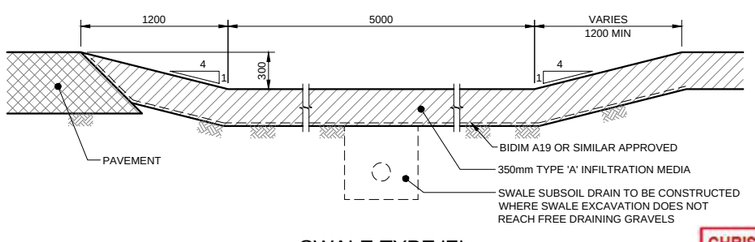
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SCALE 1:25 (A1); 1:50 (A3)



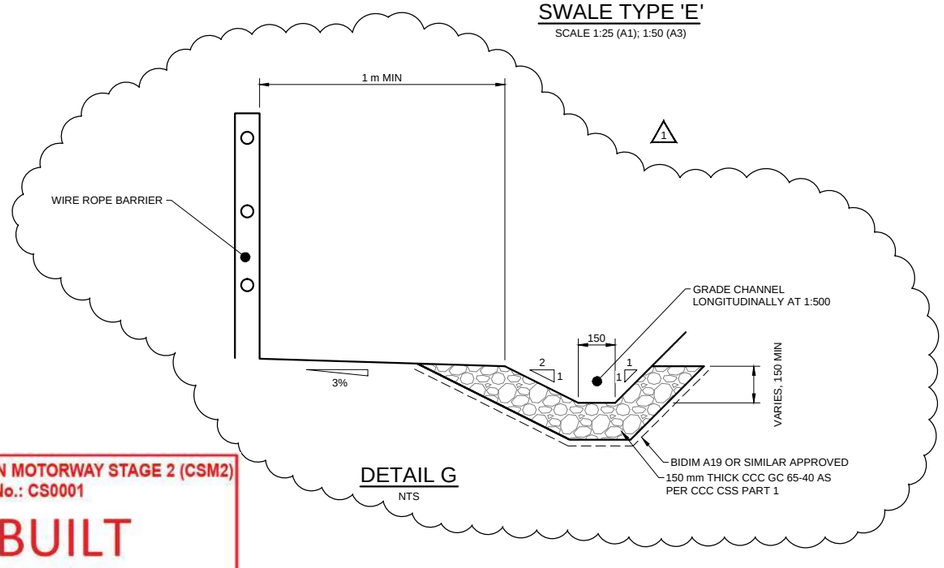
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SCALE 1:25 (A1); 1:50 (A3)



SWALE TYPE 'E'
SCALE 1:25 (A1); 1:50 (A3)



SWALE TYPE 'F'
SCALE 1:25 (A1); 1:50 (A3)



DETAIL G
NTS

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)
Project No.: CS0001

AS - BUILT

☑ NO CHANGE
☐ CHANGES AS MARKED UP IN DWG

Signature: JH
Date: 23.11.20

FOR CONSTRUCTION

500 0 500 1000 1500 2000 2500 1:25 (A1)
DIMENSIONS ARE IN MILLIMETRES

Rev	Revision Description	Designed	Drawn	Checked	Approved	Date
1	CH60–CH230 CHANNEL ADDED	DH	DH	KC	DA	3.2.2017
0	FOR CONSTRUCTION	KC/SG	GK	MM/AW	KF	28.06.2016

Tab 1
Scales 1:25 (A1) 1:50 (A3)
Original Size A1

DO NOT SCALE

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CSM2 TEAM
URS AECOM GHD

NZ TRANSPORT AGENCY WAKA KOTAHI

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)

DRAINAGE DETAILS
SWALES

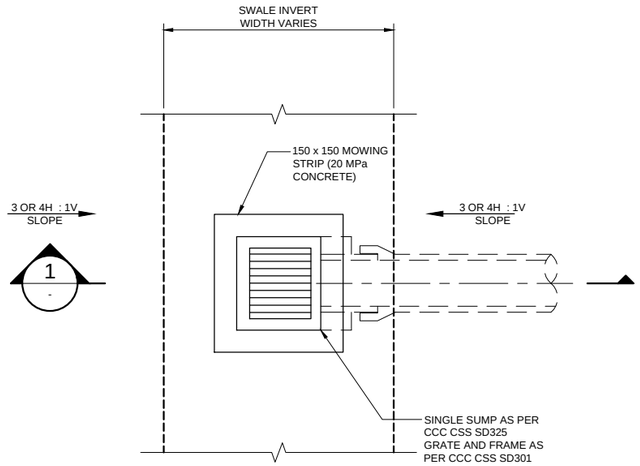
Status FOR CONSTRUCTION
Drawing Number CSM2-C-08-932
Revision ~~1~~

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X01

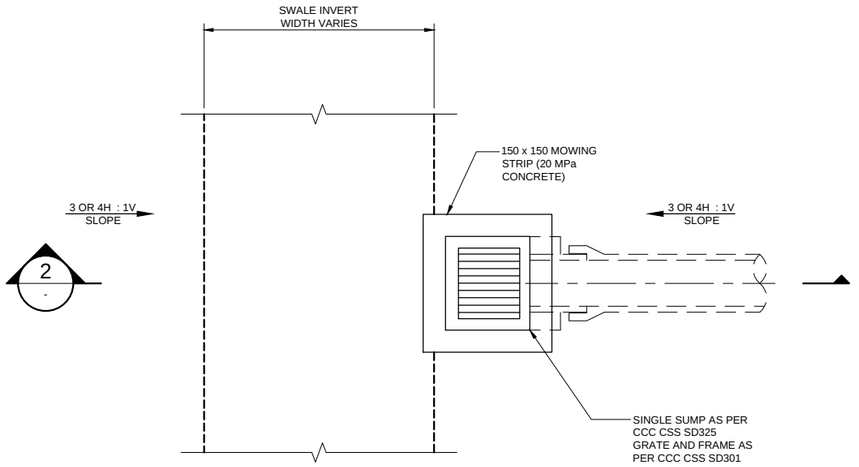
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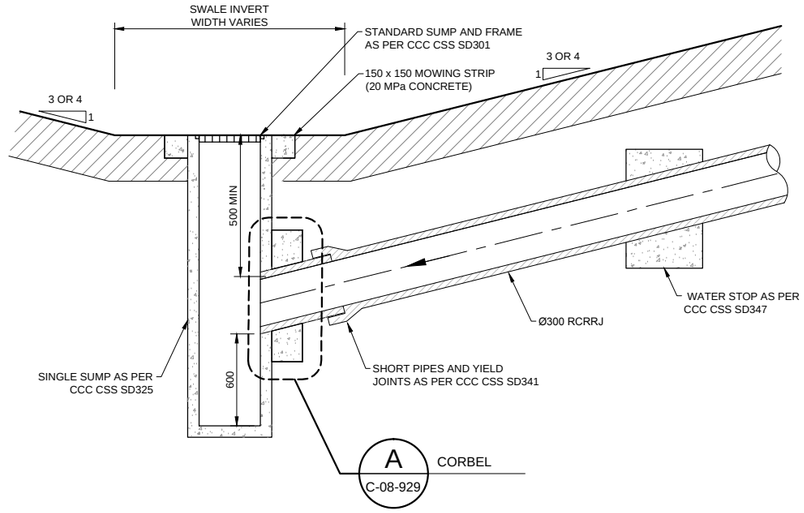
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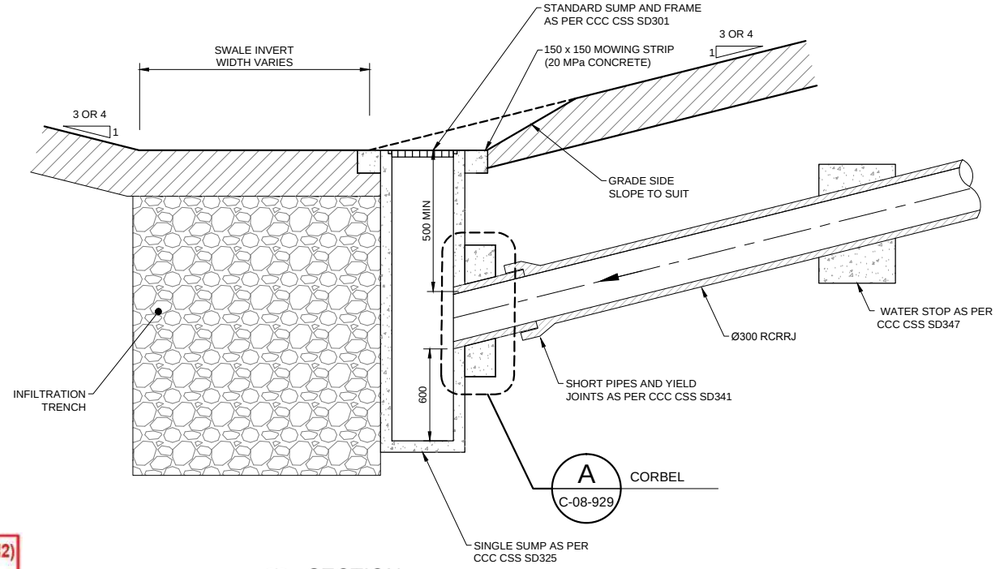
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1 SECTION

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2 SECTION

SCALE 1:25 (A1) 1:50 (A3)

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)
Project No.: CS0001

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DRAINAGE DETAILS
SWALE BUBBLE UP SUMPS

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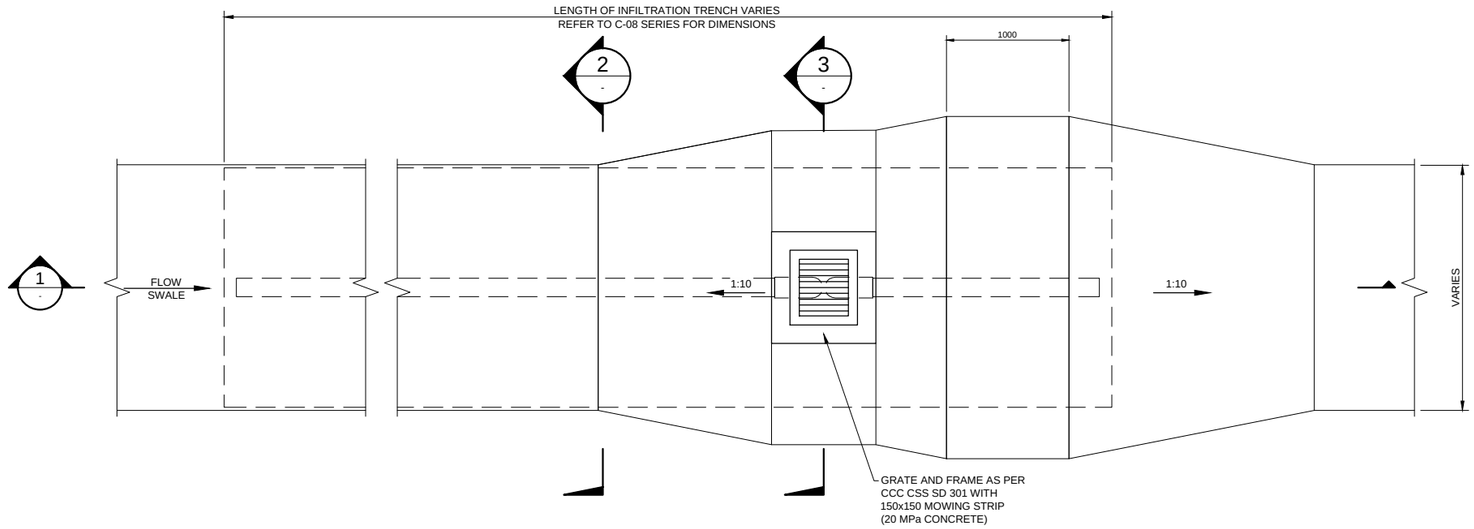
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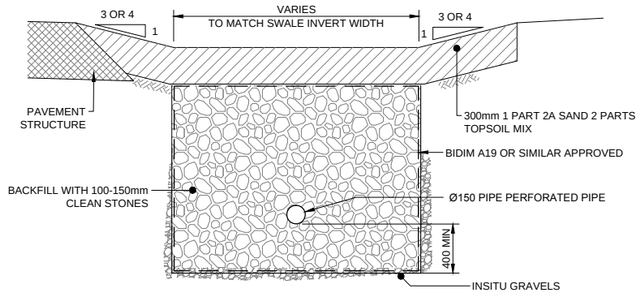
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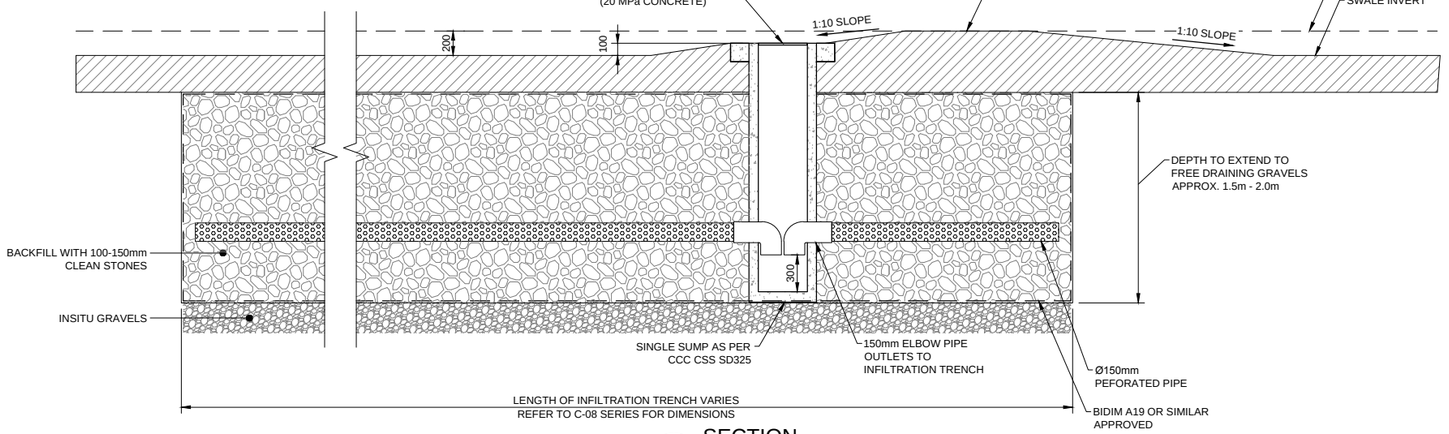
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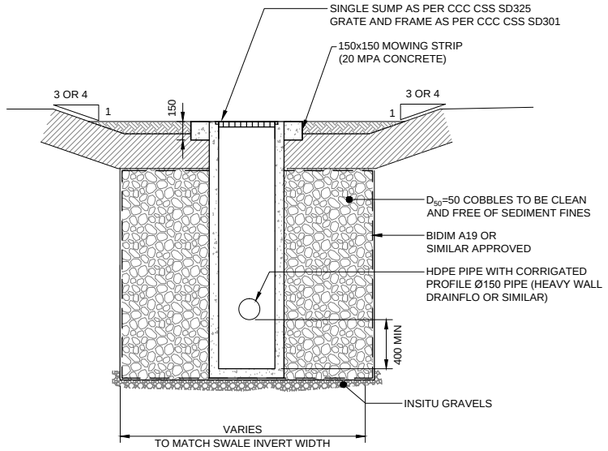
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3 SECTION

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CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)

DRAINAGE DETAILS
SWALE SOAKHOLE TYPE 1

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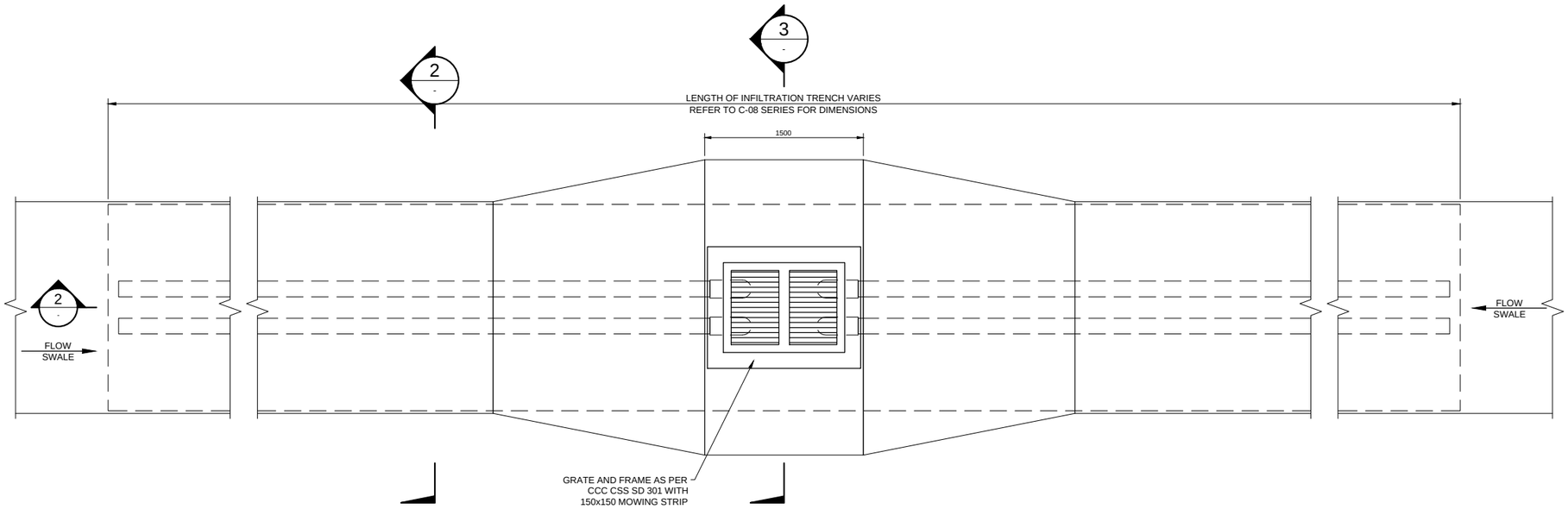
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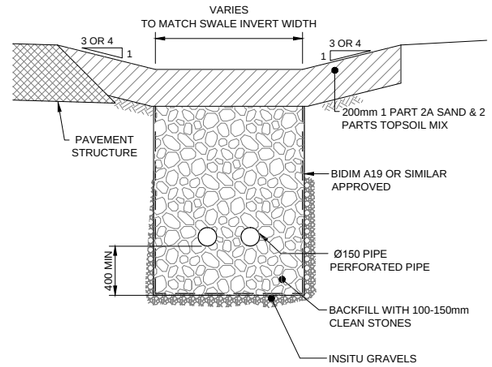
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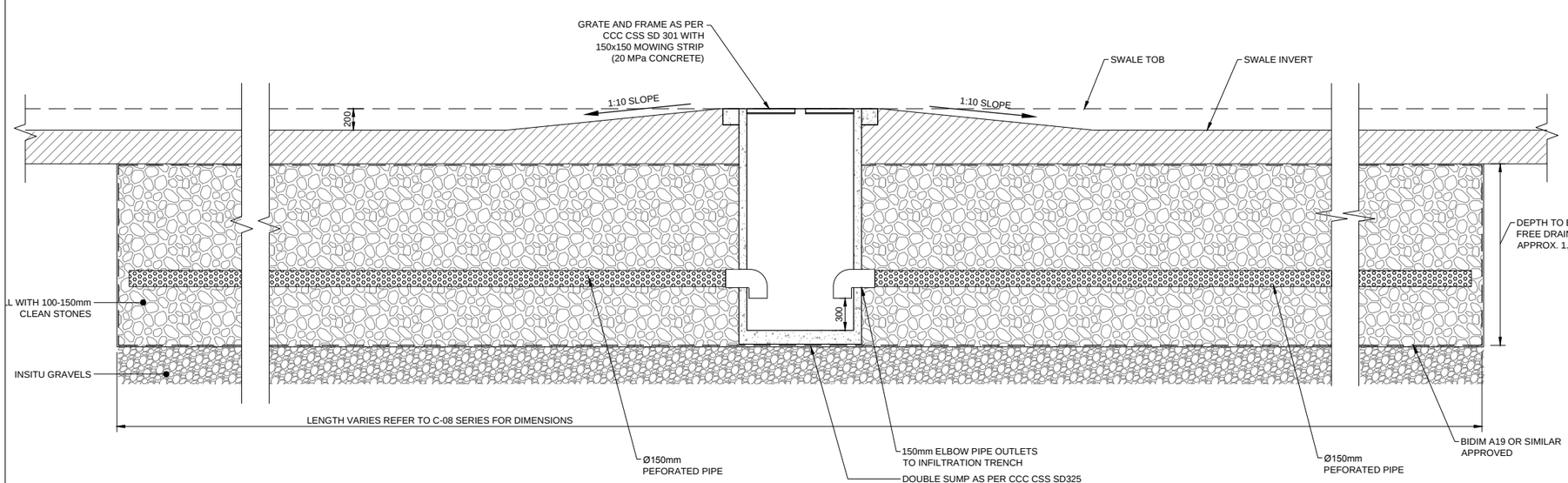
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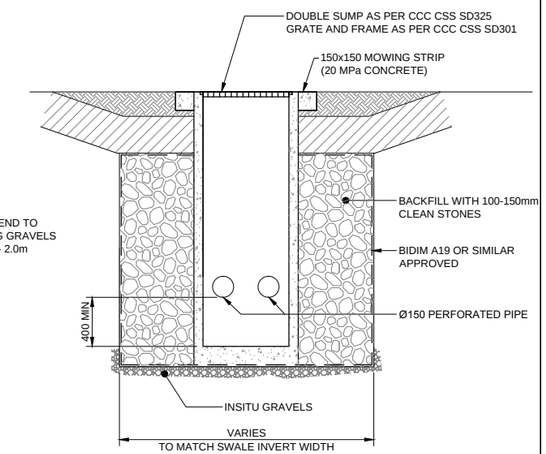
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DRAINAGE DETAILS
SWALE SOAKHOLE TYPE 2

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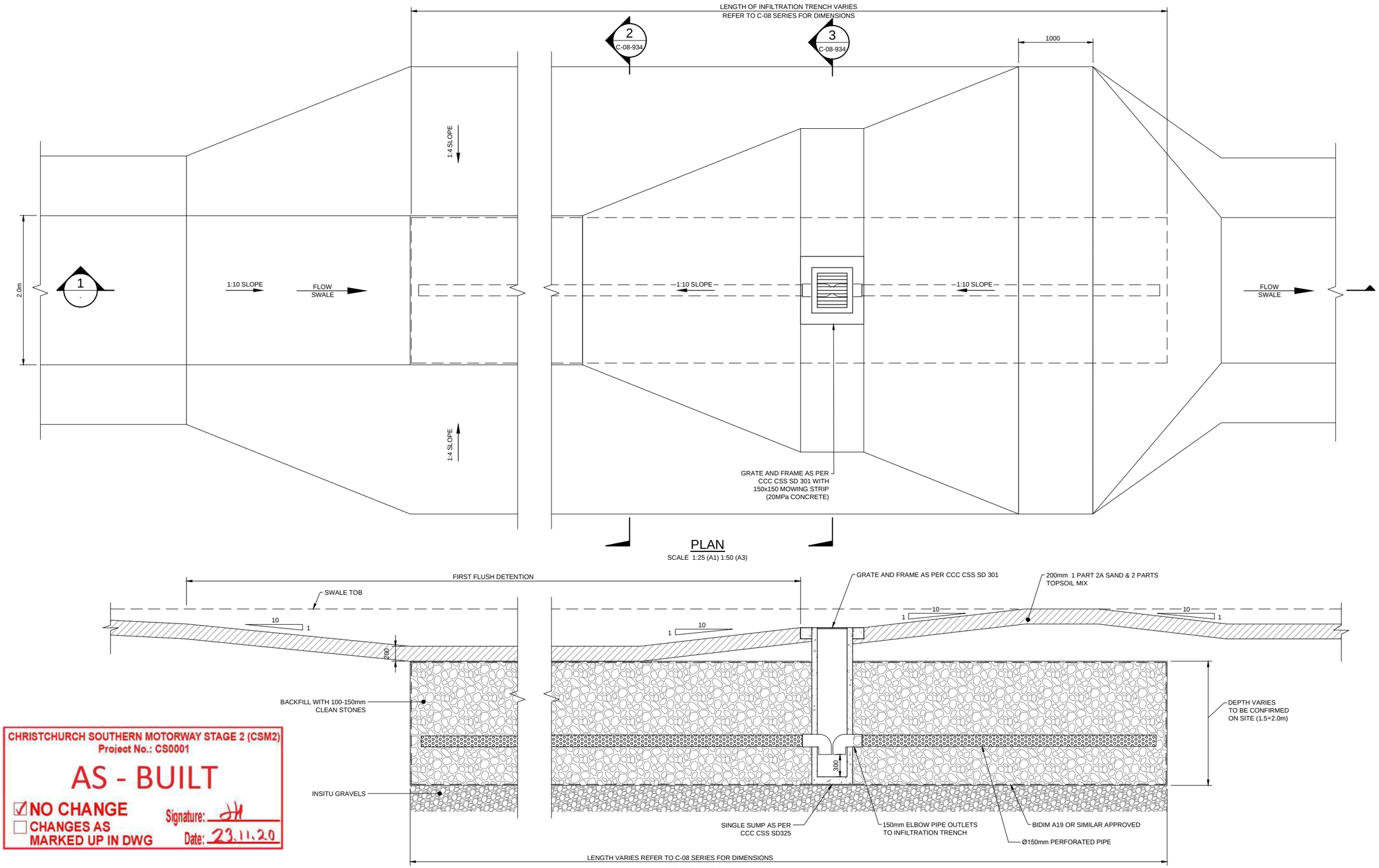
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SCALE 1:25 (A1) 1:50 (A3)

SECTION

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SCALE 1:25 (A1) 1:50 (A3)

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DRAINAGE DETAILS
SWALE SOAKHOLE TYPE 3

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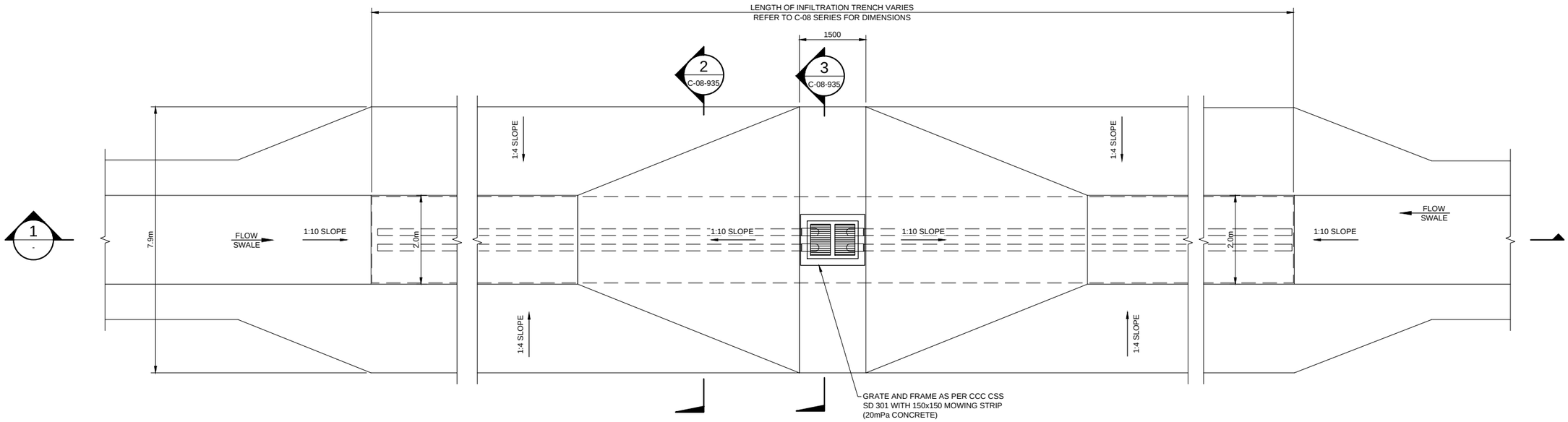
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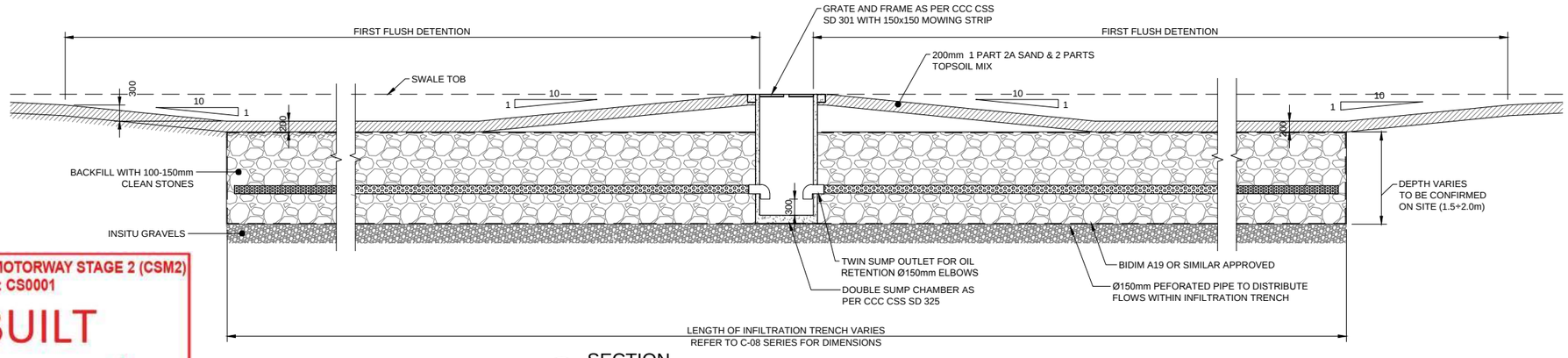
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FIRST FLUSH BASIN - DOUBLE SUMP PLAN

SCALE 1:50 (A1) 1:100 (A3)



1
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SECTION

SCALE 1:50 (A1) 1:100 (A3)

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)
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CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)

DRAINAGE DETAILS
SWALE SOAKHOLE TYPE 4

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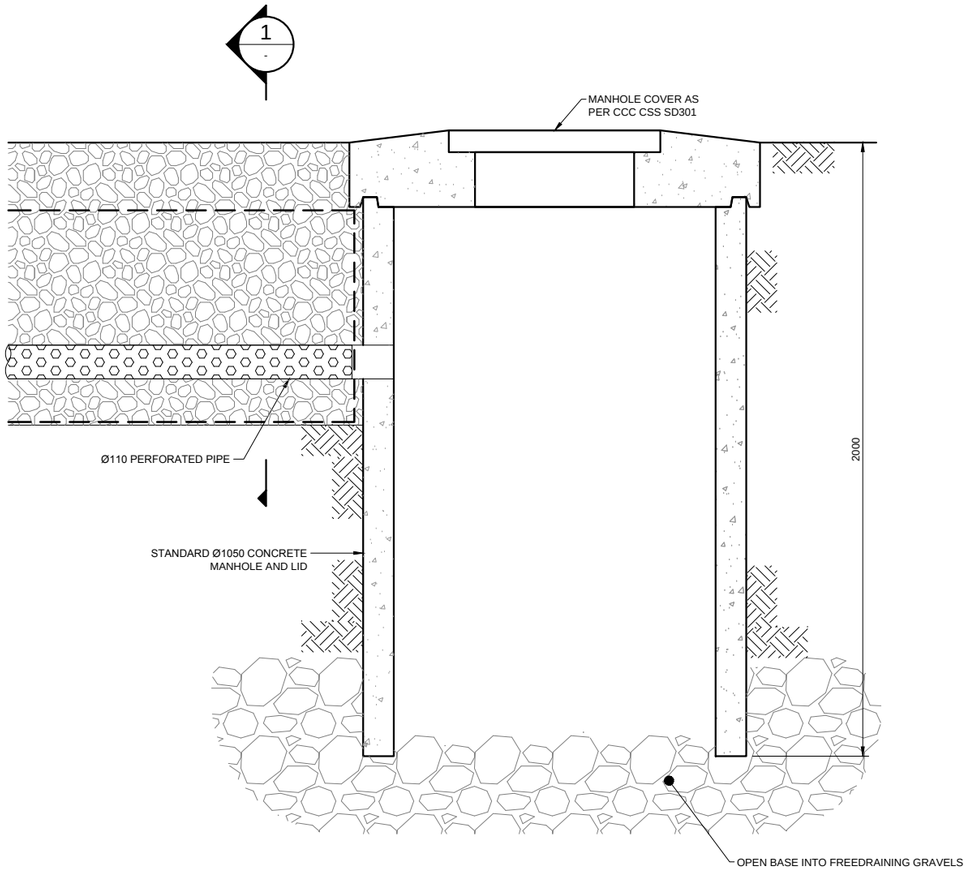
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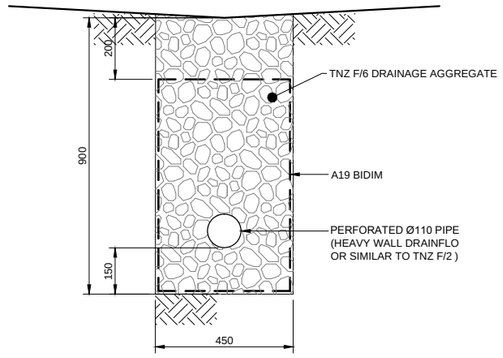
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SUBSOIL LAND DRAIN
DISCHARGE MANHOLE

SCALE:1:10 (A1) 1:20 (A3)



1 - SUBSOIL LAND DRAIN SECTION

SCALE 1:10 (A1) 1:20 (A3)

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)
Project No.: CS0001

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CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)

DRAINAGE DETAILS
SUBSOIL LAND DRAIN DISCHARGE MANHOLE

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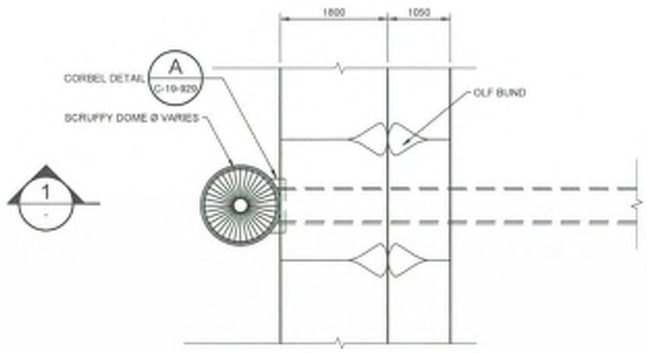
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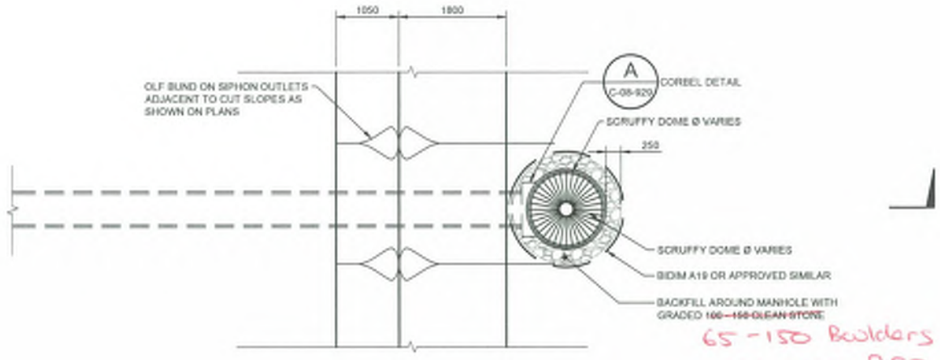
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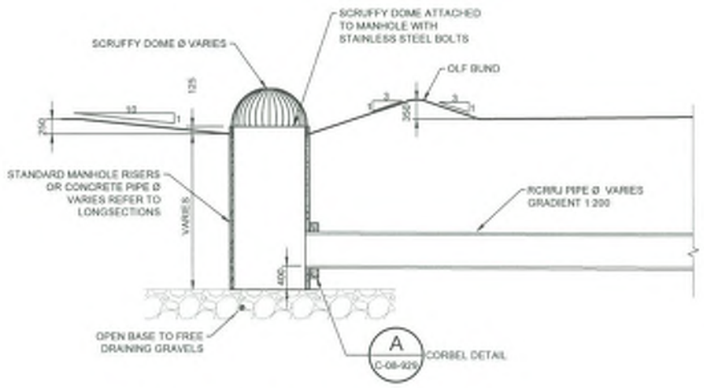




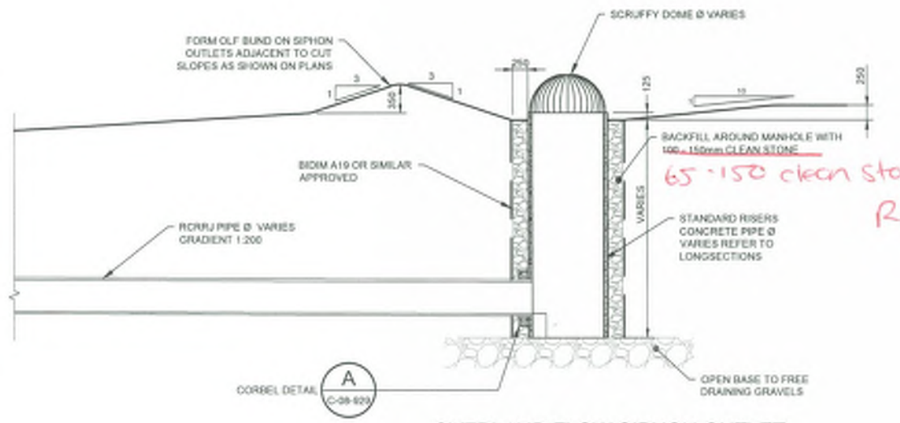
65-150 Boulders as per RFI 0051.

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)
Project No.: CS0001
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PLAN
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OVERLAND FLOW SIPHON INLET



65-150 clean stone as per RFI 0051.

OVERLAND FLOW SIPHON OUTLET

CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)
Project No.: CS0001
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CHRISTCHURCH SOUTHERN MOTORWAY STAGE 2 (CSM2)

DRAINAGE DETAILS
OVERLAND FLOW SIPHON
INLET AND OUTLET DETAILS

Status FOR CONSTRUCTION
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D

Appendix D – Detailed Site Investigation Report

Sensitivity: General

Rolleston Access Improvement - (Package 2)

Detailed Site Investigation Report

Prepared for NZ Transport Agency Waka Kotahi
Prepared by Beca Limited

2 October 2024



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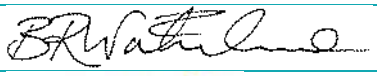
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Appendix F – Hills Laboratory Reports and Chain of Custody Forms
Appendix G – Results Analysis Tables

Revision History

Revision Nº	Prepared By	Description	Date
0	Maisie Hopkins	Final	30/09/2024

Document Acceptance

Action	Name	Signed	Date
Prepared by	Maisie Hopkins		30/09/24
Reviewed by	Ben Waterhouse		30/09/2024
Approved by	David Aldridge		02/10/2024
on behalf of	Beca Limited		

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Executive Summary

New Zealand Transport Agency Waka Kotahi (NZTA) have commissioned Beca Ltd (Beca) to undertake a Detailed Site Investigation (DSI) in relation to the proposed works associated with upgrades to the SH1 Rolleston Access Improvements. For reporting purposes, the proposed development has been divided into two sections – 'Package 1' and 'Package 2'. This DSI report is concerned with the investigations undertaken for Package 2 only.

The purpose of this investigation was to identify areas of soil contamination which may require management during redevelopment, potential for soils reuse in stormwater basins, and to inform the likely contaminated land consent requirements under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS) and rules of the Environment Canterbury Land and Water Regional Plan (LWRP).

A Preliminary Site Investigation (PSI) of the wider development area was undertaken by Stantec in May 2023. The Stantec PSI and high-level additional information review undertaken as part of this investigation, identified the following HAIL activities and potential sources of contamination for the site:

- 21 off-site HAIL areas (located on adjacent properties within 50 m of the site)
- HAIL activity F6 (Railyards) was identified for a portion of the site, in relation to a former railyard, located north of Main South Road and the existing railway line.
- Potential use of coal tar in historic roading construction
- Potential use of asbestos containing material (ACM) and lead-based paint, in an area of former farm buildings (demolished), and former railyard buildings (north of Main South Road), identified in review of historical aerial imagery,
- Accumulation of contaminants within road verges and the railway corridor from prolonged use of the site as a road and railway line

Based on the findings of the PSI and information review, further investigation (in the form of a DSI) was required to inform material handling, reuse, and disposal options during the works.

Summary of DSI Findings

Soil sampling was undertaken between the 18 June and 29 of July 2024, from 14 machine excavated test pits, 18 pavement pits and 7 infiltrations pits, 2 boreholes, and 3 utility services trenches; targeting the various areas of proposed development within the site, and the above HAIL activities/potential sources of contamination. Samples were analysed for at least one of the following contaminants of concern: heavy metals (antimony, arsenic, cadmium, copper, chromium, nickel, mercury, tin and zinc), polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPH) , semi-volatile organic compounds (SVOC), and asbestos. Field observations and results indicate:

- Human health criteria were exceeded in three road surface material samples, within the Main South Road section. The samples also indicated that road surface material in this portion of the site is considered to contain coal tar.
- All remaining road surface material samples returned contaminant concentrations that do not indicate the presence of coal tar in the remainder of the site. Note that coal tar distribution can be variable spatially and by depth and could still be encountered during works.
- 12 samples exceeded the ANZG sediment criteria, for heavy metals and/or total TPH concentrations, within the Rolleston Drive and Main South Road sections of the site.
- Three soil samples exceeded the terrestrial ecological soil guideline value for TPH, and one sample for zinc.
- Uncontrolled, buried waste was encountered in one pavement pit (PP10), located within the Main South Road section, south-west of the proposed overpass.

- A layer of black stained and hydrocarbon odorous soil was observed in four sampling locations within the former railyard area, north of Main South Road.

Three complete source-receptor exposure pathways were identified in the conceptual site model (CSM), based on the findings above:

- Exposure of workers to contaminants in soils and groundwater during construction i.e., via dermal contact, ingestion, or inhalation of dust/vapours.
- Contaminated sediment and runoff directly into surface water or runoff into stormwater system which may discharge to surface water, during construction.
- Exposure of terrestrial ecology to contaminants in soils– dermal contact or ingestion.

Soil Reuse and Disposal

From a contamination perspective, the uncontrolled waste material encountered in pavement pit PP10, and the stained and odorous material in shallow soils around TP18, TP22, IP10 and BH05 are not considered suitable for reuse on site and will require disposal to a licensed fill facility. For the remainder of the site, based on the observed results, soils can be reused onsite, subject to geotechnical limitations.

If off-site disposal is required, the soil shallower than 0.5m bgl are generally not considered to meet clean fill criteria and will likely require disposal to a fill facility licensed and consented to accept the contaminant levels observed on site. Depending on the depth of required excavations for the proposed development, soils at 0.5m bgl or greater depths across the site may be accepted at clean fill facilities, or managed fill facilities with lower acceptance criteria.

Consenting Requirements

NESCS

The Rolleston Drive section of the site has been partially identified as **HAIL F6 (Railway Yards) and G3 (Landfill Sites)**, therefore the NESCS applies to these portions of the site. Based on indicative earthworks volumes for the proposed works in this area, the Permitted Activity criteria are unlikely to be met, and resource consent under the NESCS will likely be required. Once soil disturbance and disposal volumes are confirmed, these should be assessed against the Permitted Activity (PA) criteria. As soil analytical results exceeded published background concentrations in this area, should PA criteria not be met, resource consent under the NESCS will likely be required as a controlled activity.

ECan LWRP

- The portion of the site identified as HAIL F6 and G3 meet the definition of '*Potentially Contaminated'* Land and therefore the LWRP rules referring or relating to this definition apply to this portion of the site, given contaminants were detected at concentrations in soils in this are above published background concentrations.
- Except for the area of black-stained soils observed within the former railyard area, based on the soil analytical results, the environmental risk within the 'potentially contaminated land' is considered low in relation to the proposed project earthworks and stormwater basins.
- The remainder of the site does not meet the definition of '*Potentially Contaminated'* or '*Contaminated*' Land, as no activities described in 'Schedule 3' of the Plan are or have been undertaken, and analytical results indicate that the proposed works are not reasonably likely have a significant adverse effect on the environment in a terrestrial land use context.

Recommendations

- Results indicate there is a risk to human health with respect to exposure to road surface material during construction. Therefore, the works will require management via the procedures outlined in a CSMP.
- There is an environmental risk to aquatic receptors if erosion and transport of contaminated sediment occurs during construction, therefore it is recommended the works be undertaken with an erosion sediment control plan (ESCP). This pathway is considered incomplete on completion of works and when the site is fully stabilised.
- Soils within the stained and odorous layer in the former railyard area, and the uncontrolled buried waste in pavement pit PP10 are not suitable for reuse within the proposed soakage basins or swales, nor for reuse within the wider site and will require offsite disposal to a facility licensed to accept it.
- Soils within the remainder of the site are suitable for reuse on site in basins, swales and terrestrial landscaped areas if geotechnically suitable.
- Soils up to 0.5 m bgl across the site are unlikely to be accepted as clean fill for off-site disposal and will likely require disposal at a managed fill facility. Soils at depths of approx 0.5 m or deeper may be accepted at clean fill facilities, or managed fill facilities with lower acceptance criteria, however acceptance is ultimately at the discretion of the receiving facility.
- It is recommended that acceptance of soils to be disposed off-site is obtained from the receiving facility prior to earthworks, and that a copy of the soil analytical results be provided to the nominated disposal facilities by the contractor for review.
- Where road surface material has been identified to contain coal tar (within a portion of the Main South Road section), this material will require disposal at a facility that accepts coal tar. Toxicity characteristic leaching procedure (TCLP) tests may be required prior to acceptance to a Class A facility (such as Kate Valley Landfill).
- Further sampling is recommended within the northern proposed soakage basin are west of the proposed overpass that was inaccessible for site investigation work, as well as delineation of the areas of black stained soil and uncontrolled buried waste, to inform material handling and off-site disposal options.
- Although not currently anticipated, if dewatering is required for the proposed works, groundwater sampling and analysis is recommended to assess for potential contamination and inform options for dewatering methodology and disposal of dewatered groundwater.

1 Introduction

1.1 Background

The New Zealand Transport Agency Waka Kotahi (NZTA) has engaged Beca Limited (Beca) to prepare a Detailed Site Investigation – Contamination (DSI) for the proposed works associated with upgrades to the Rolleston transport network.

For reporting purposes, the proposed development has been divided into two sections – namely 'Package 1' and 'Package 2'. This DSI report is concerned with the investigations undertaken for Package 2 only (see Section 2.1 for location details of each section/package).

As part of this investigation, Beca relied on the Stantec Ltd (Stantec) Preliminary Site Investigation (PSI)[1] undertaken for the project. Beca has not peer reviewed or independently verified the Stantec PSI, and all findings have been taken as reported by Stantec.

1.2 Purpose

The purpose of this DSI is to:

- Identify contaminants in soils and groundwater within the proposed areas for upgrades as a result of current or historical activities.
- Refine the Conceptual Site Model for the site to confirm the presence or absence of complete contaminant source-pathway-receptor connections.
- Identify areas of soil contamination which may require management with respect to risks to human health and the environment.
- Comment on contaminated land consent requirements for the proposed works under the following legislation:
  - Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS)
  - Environment Canterbury (ECan) Land and Water Regional Plan (LWRP)
- Provide initial comments on soil disposal and/or re-use options in relation to soil contamination, particularly around stormwater basins.

1.3 Scope

The scope of the works for Package 2 comprised:

- Machine excavation and collection of representative soil samples by an environmental scientist from 14 test pits, 18 pavement pits, 7 infiltration pits, 2 boreholes, and 3 utility service trenches, to a maximum depth of 4 m below ground level (bgl).
- Drilling of an additional three boreholes, and excavation of an additional 37 utility service trenches in conjunction with the Beca Geotechnical team.
- Laboratory analysis of 123 soil and road surface material samples for at least one of the following - heavy metals (arsenic, cadmium, chromium, copper, lead, nickel, mercury and zinc), polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPH), semi-volatile and volatile organic compounds (SVOC and VOC), and asbestos.
- Assessment of laboratory results against published background soil concentrations, human health and environmental criteria.

[1] Rolleston Access Improvements Preliminary Site Investigation. Stantec, May 2023.

- The investigation has been undertaken and reported in general accordance with:
- Ministry for the Environment (MfE) Contaminated Land Management Guidelines No. 1 – Reporting on Contaminated Sites in New Zealand (2021).
- MfE CLMG No.5 - MfE CLMG No. 5 – Site Investigations and Analysis (2021).

2 Site Description

2.1 Site Location

The proposed works are located in Rolleston (within the Selwyn District, approximately 25 m south-west of Christchurch City Centre). Majority of the wider development is located within the SH1 (Main South Road) road carriageway and reserve and extends from approximately 1km east of the central commercial and industrial area of Rolleston to approximately 400 m west of Dunns Crossing Road and Walkers Road intersection.

Works within the Package 2 section (herein referred to as 'the site') are located within the road carriageway and reserve of the following:

- SH1/Main South Road
- Rolleston Drive
- Jones Road
- Kidman Street
- Hoskyns Road

The site also occupies a portion of the existing railway corridor, and intersects property parcels (Selwyn District Council owned) located within a commercial/industrial area between SH1 and Jones Road. For ease of reference throughout this report, the site has been subdivided into three separate sections – referred to as the 'Main South Road', 'Rolleston Drive' and 'Hoskyns Road' sections, as indicated on Figure 1 and Figure 2

Further details on the proposed works are detailed in Section **2.2.**



Figure 1. Package 2/Site Boundary (approximate and indicative only).



Figure 2. Subdivided sections of the Site, as described above.

2.2 Proposed works

Concept design drawings for the site are included as **Appendix A**. The main features of the design include:

- A overpass connecting the residential and industrial areas of Rolleston north and south of SH1 respectively, including facilities for pedestrians and cyclists.
- Safety improvements to intersections along SH1 through Rolleston, including 'left out only' at Hoskyns Road, and a 'left in/left out only' at Tennyson Street, Brookside Road and Rolleston Drive South.
- A service lane from the southbound off-ramp from Rolleston Drive North to provide left-in access to McDonalds, BP service station, and Tennyson Street.
- Removal of the southbound merge lane at the end of the Christchurch Southern Motorway on SH1, north of Rolleston. This will include extension of two lanes from the Weedons Ross Road interchange to south of the new overpass.
- Stormwater soakage basins, to the north and south of the proposed overpass.

The proposed works is estimated to cover an approximate area of 22,000 m^2, and earthworks are expected to be to a maximum depth of 1.0 m bgl within the stormwater soakage basins and0.5 m bgl relating to roading modifications For the overpass, piles are expected to be installed at a maximum depth of approximately 15 m bgl, while the retaining wall piles will require excavations to approximately 2.1 m bgl. Development plans of the proposed stormwater soakage basins are shown in Figure 3.

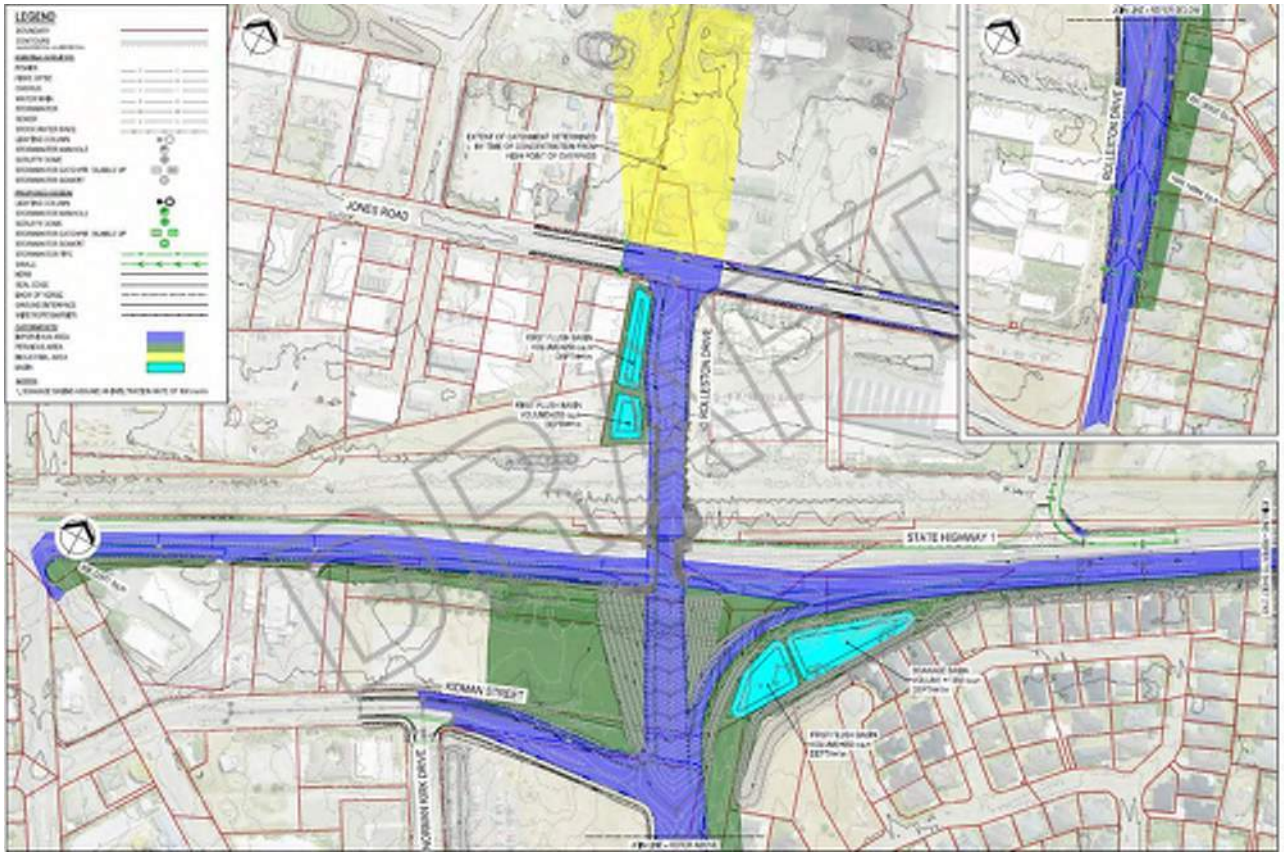


Figure 3. Design Plans for the proposed stormwater soakage basins, north and south of the proposed overpass (Figure adapted from Stormwater Catchment Plan (Drawing No 3338703-20-CD-2101), Beca July 2024).

3 Environmental Setting

3.1 Current Land Use

The majority of the proposed works is to be undertaken within the road corridors of the following:

- SH1/Main South Road
- Rolleston Drive
- Jones Road
- Kidman Street

Hoskyns Road
The site also occupies a portion of the existing railway corridor, and intersects property parcels (Selwyn District Council owned) located within a commercial/industrial area between SH1 and Jones Road. Additionally, a portion of the site is occupied by an existing railway line that is located between SH1 and Jones Road.

3.2 Surrounding Land Use

The immediate surrounding area of the site consists of residential housing (south of SH1) and commercial/industrial properties (majority of which are adjacent to the north of the Main South Road and Rolleston Drive sections of the site). Some rural grassland is present adjacent to the north-east of the Hoskyns Road section.

3.3 Geology and Hydrogeology

The site is underlain with Holocene river deposits, described as 'Modern river floodplain/low-level degradation terrace. Unweathered, variably sorted gravel/sand/silt/clay'[2].

The Canterbury Maps Viewer indicates that the site is located over an unconfined/semi-confined aquifer system. The 'Wells and Bores' layer of Canterbury Maps Viewer exhibits a number of bores that are located within 50 m of the site. One bore is located on site (within the Rolleston Drive section), with a status of 'buried/unlikely to still exist'. Recordings of groundwater levels in these bores range between 9 and 23 m bgl. Groundwater is expected to flow in a general east to west direction, towards the Pacific Ocean.

3.4 Topography

The site is relatively flat, with an approximate elevation range of 53 m to 56 m above mean sea level[3].

3.5 Hydrology and Sensitive Receptors

The 'Canterbury Three Waters Data' and 'Scheme Water Race' layers of Canterbury Maps Viewer indicates that two open stock water races are located adjacent to the site, within the road verge of the Main South Road and Hoskyns Road sections. The Hoskyns Road water race flows in a north-west to south-east direction, before becoming culverted and diverted south – beneath Hoskyns Road, intersecting the Rolleston Drive Section of the works. The Main South Road water race flows in south-west to north-east direction, before becoming culverted and diverted south, beneath the adjacent residential area.

Canterbury Maps Viewer indicates that the site is located approximately 130 m north of the nearest community drinking water protection zone, in relation to a town supply. One active bore used for public water

[2] GNS Science 2016, 1:250,000 scale, (https://data.gns.cri.nz/geology/), viewed 20 August 2024.

[3] LINZ NZ Contours (Topo, 1:50k), (https://data.linz.govt.nz/layer/50768-nz-contours-topo-150k/), Viewed 20 August 2024.

supply was identified within 100 m of the site, located approximately 30 m south of the eastern extent of the Hoskyns Road section.

The closest natural surface water body in relation to the site is Bailey's Creek, approximately 6 km south of the site, which flows in a west to east direction and discharges to the Selwyn River. The Selwyn River is located approximately 7 km south-west of the site, which flows in a west to east direction, discharging to the Pacific Ocean. Given the distance from Baileys Creek to the site, and that the reticulated stormwater system in the area discharges to ground, Baileys Creek is not considered a sensitive receptor with respect to the proposed works.

4 Summary of Existing Information

The latest proposed design was reviewed against the Stantec PSI. Variations in location and extent of the proposed design have resulted in some difference in conclusions to those made in the Stantec PSI in relation to the applicability of HAIL areas to the works, as well as an additional information review for new areas of the site. A summary of the Stantec PSI is provided below, and additional information review is provided in Section 4.2.

4.1 Rolleston Access Improvements – Preliminary Site Investigation (Stantec, May 2023).

Stantec were engaged by NZTA to undertake a preliminary site investigation (PSI) of the wider development area (i.e., Package 1 and 2 sections) in relation to the proposed upgrades, in May 2023. A summary of the PSI findings and conclusions relevant to the site (Package 2) is provided below, and a copy of the report is included in **Appendix B.**

Stantec review of historical aerial imagery indicates that majority of the site has been used as roading and a railway line since at least 1940 (earliest available imagery). The current day commercial/industrial properties located between Main South Road and Jones Road (central Rolleston) were visible from the early 2000's, prior to which these properties were agricultural or forestry land. Some rural residential housing was first visible south of Main South Road from 1960 onwards. Additional observations for each section of the works are summarised below.

- **Main South Road:**
  - Extensive residential development adjacent to the south of the site is visible in the 2010 – 2014 image.
- **Rolleston Drive:**
  - Some potential industrial and rural residential buildings are visible within the vicinity of the current day Main South Road, Tennyson Street intersection in the 1940 image, with further development of few scattered commercial/industrial buildings in the 1960s.
  - A large area of farmland adjacent to the south-east of the Rolleston Drive alignment is occupied by market gardens (i.e., HAIL A10) from 1990 – 2010, which are replaced by residential housing from 2010 onwards.
- **Hoskyns Road:**
  - Scattered rural residential properties and farmland occupy the adjacent properties to the south of the site from 1940 – 1990, after which the properties are developed into an extensive area of market gardens – as identified for the Rolleston Drive section.

From 2010 to present, the adjacent properties to the south are no longer occupied by market gardens and have been replaced by residential housing. The PSI identified that there is potential for coal tar to be encountered during the proposed works. The information reviewed in the Stantec PSI did not identify any existing data or information specifically confirming coal tar was used in the construction of the site, however, due to the era of construction of the roads within the site, it is considered a potential source of contamination.

From review of the Environment Canterbury Listed Land Use Register (LLUR) and associated previous site investigation reports, a total of 21 off-site HAIL areas (on adjacent properties located within 50 m of all sections of the site) were identified. **Table 1** provides a summary of the identified HAIL areas and their location with respect to the site. The basis of applicability was applied by Stantec based on the proposed alignment at the time of the PSI report.

Table 1. Summary of HAIL areas identified within 50 m of the site (reproduced from Rolleston Access Improvements Preliminary Site Investigation Report, Stantec 2023)

HAIL Area Number	Section of Works	Address	HAIL Code/s
1	Main South Road	4 Brookside Road	F7 – Service Stations.
2	Main South Road	5 Brookside Road	A18 - Bulk storage of treated timber outside. I – Any other land that has been subject to the intentional or accidentalrelease of a hazardous substance.
3	Rolleston Drive	821 Jones Road	F4 – Motor vehicle workshops.
4	Adjacent to all sections	Main South Road Railway Reserve	F6 - Railway yards including goods-handling yards, workshops,refuelling facilities or maintenance areas.
5	Rolleston Drive	15 Kidman Street	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste. A18 – Bulk storage of treated timber outside. I – Any other land that has been subject to the intentional or accidental release of a hazardous substance.
6	Rolleston Drive	799 Jones Road	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.
7	Rolleston Drive	790 Jones Road	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.
8	Rolleston Drive	804 Jones Road	E5 – Coal or Coke yards.
9	Rolleston Drive	801 Jones Road	F6 – Railway yards.
10	Rolleston Drive	812 Jones Road	G4 – Scrap yards.
11	Rolleston Drive	814 Jones Road	G4 – Scrap yards.
12	Rolleston Drive	816 Jones Road	G4 – Scrap yards.
13	Rolleston Drive	826 Jones Road	F4 – Motor vehicle workshops.
14	Rolleston Drive	Kidman Street: Lot 2 & 3 DP 501225	A1 – Agrichemicals including commercial premises used by spray contractors for filling, storing, or washing out tanks for agrichemical application. A8 – Livestock dip or spray race operations. A10 – bulk pesticide storage or use. A17 – Storage tanks or drums for fuel, chemicals, or liquid waste. A18 – Wood treatment or preservation including bulk storage.
15	Rolleston Drive	37 & 51 Overbury Crescent	A10 – Persistent pesticide bulk storage or use.
16	Rolleston Drive	1705 Main South Road	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste. F7 – Service Stations.

17	Rolleston Drive	4 Tennyson Street	F4 – Motor vehicle workshops.F7 – Service Stations.
18	Rolleston Drive	2 Brookside Road	I – Any other land that has been subject to the intentional or accidentalrelease of a hazardous substance.
19	Hoskyns Road	Parklane Subdivision	A8 – Livestock dip or spray race operations. A10 – Persistent pesticide bulk storage or use.
20	Approximately 800 m north-west of Hoskyns Road	Jones Road railway house	I – Any other land that has been subject to the intentional or accidentalrelease of a hazardous substance.

A risk assessment of potential source-receptor pathways identified one HAIL area (HAIL area 14 in Table 1 above) as 'medium risk' to the proposed works. The HAIL area was in relation to several former HAIL activities that had occurred on a property parcel adjacent to the south and north of Kidman Street and the Rolleston Drive section of the site (. On the basis of lack of information regarding the specific location of the former HAIL activities in relation to the site, and given the results of a previous soil sampling investigation that detected contaminants at concentrations that could present a risk to human health and or the environment, further investigation was required to inform whether residual contamination had migrated to the site.

The portion of the site adjacent to this land, was provisionally identified as HAIL H (*Any land that has been subject to migration of hazardous substances from adjacent land in sufficient quantities such that it could be a risk to human health and or the environment*). Further investigation in the form of soil sampling and analysis was recommended by Stantec to inform if contamination originating from these activities had migrated to the site, and to confirm the applicability of HAIL H.

The Stantec PSI HAIL Map is provided in **Figures 4, 5 and 6 below.**

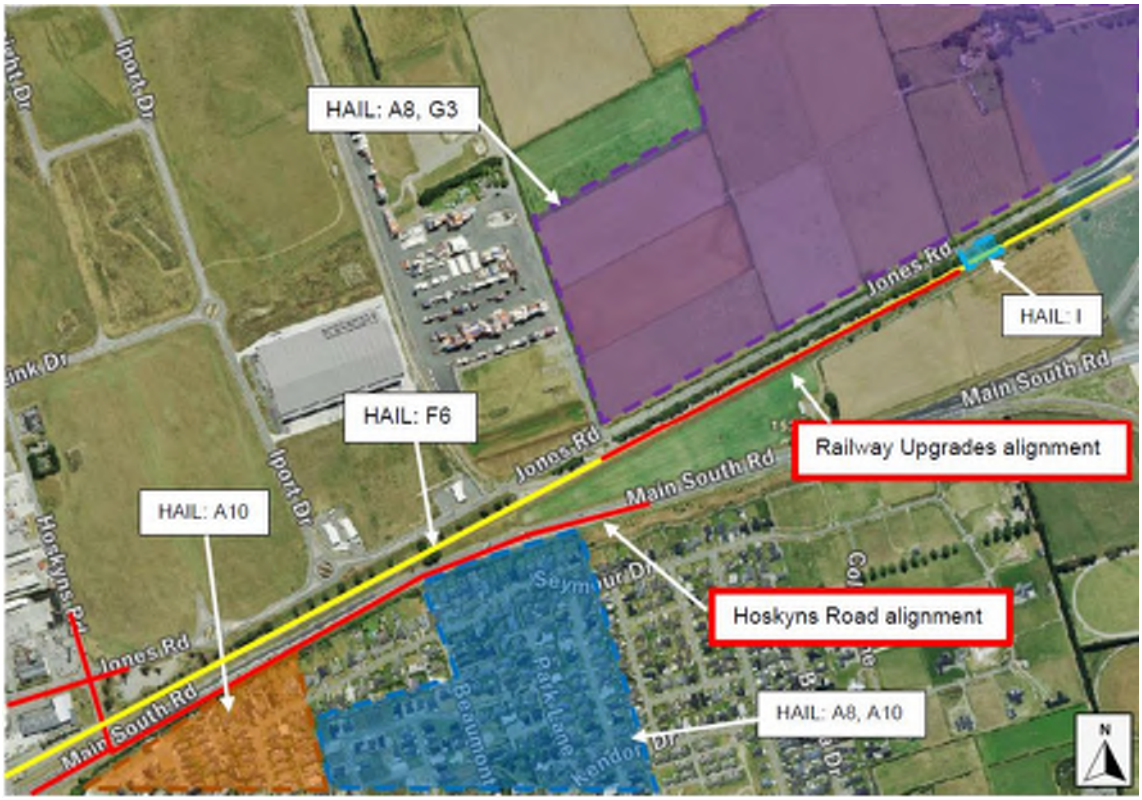


Figure 4. Stantec PSI HAIL Map – Hoskyns Road Section (Note site boundaries and sections shown differ to those referred to in this DSI report).

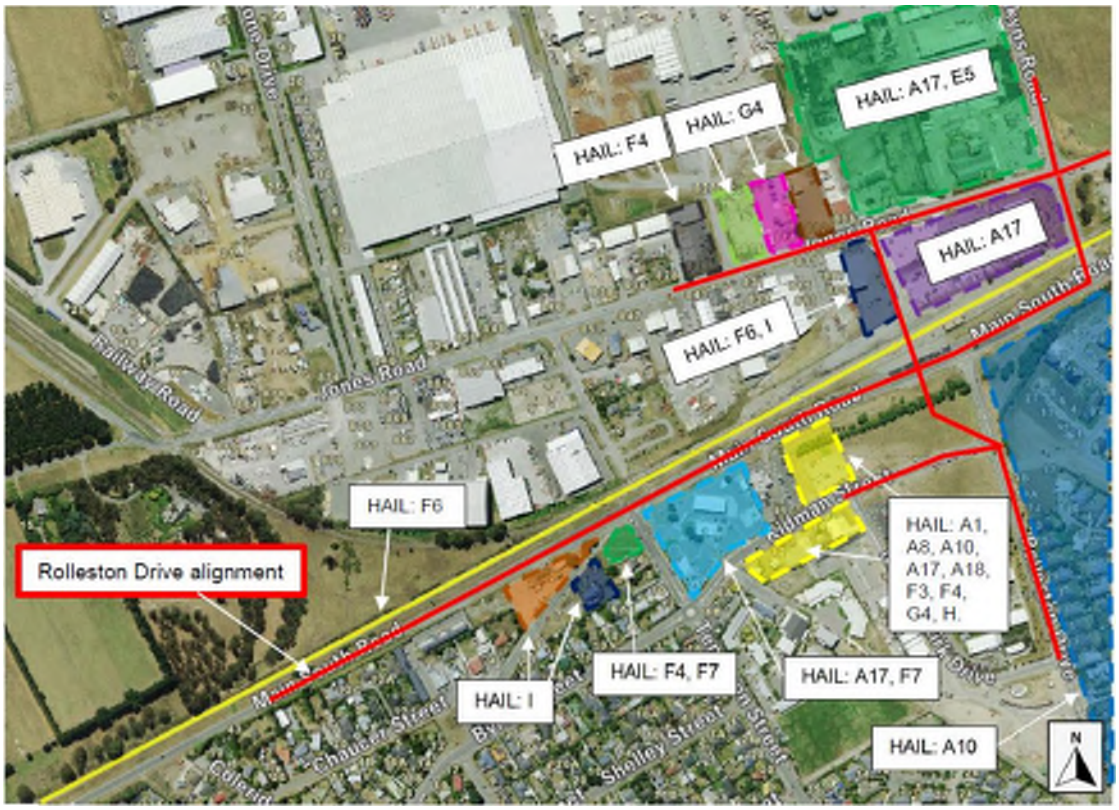


Figure 5. Stantec PSI HAIL Map (reproduced from the Stantec PSI) - Rolleston Drive Section. Note site boundaries and sections shown differ to those referred to in this DSI report.

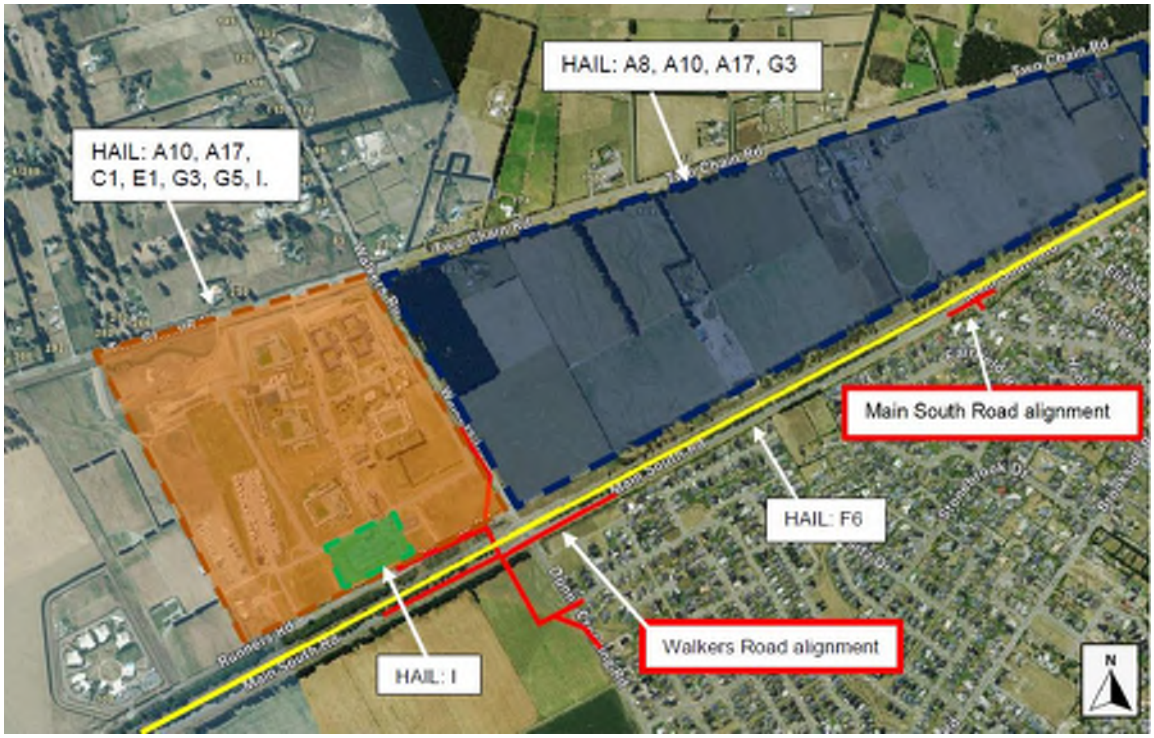


Figure 6. Stantec PSI HAIL Map (reproduced from the Stantec PSI)- Main South Road Section. Note site boundaries and sections shown differ to those referred to in this DSI report.

4.2 Additional Information Review - Rolleston Drive/Main South Road Intersection

Following completion of the Stantec PSI, a variation in design was proposed, and works are now expected to intersect the roadside berm, south-east of the eastern-most Rolleston Drive/Main South Road intersection, in relation to construction of two stormwater soakage basins. The Stantec PSI identified this portion of the site as HAIL A10 (*persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds*), and a high-level information review has been undertaken to identify potential additional sources of contamination in this area.

A summary is provided in Table 2, and Historical Aerial Images are included in **Appendix C**.

Table 2. Summary of information reviewed and pertinent findings.

Information Source	Summary of Findings
Historical Aerial Imagery (Canterbury Maps Viewer).	• Historical aerial imagery was available for all decades from 1940 – present, except for the period of 1950-1960. • The area was and is largely grassed/undeveloped land, however, a rural residential/farm building is visible within the central portion of this area, from the1940 to 1980's. • In the 1990-1994 image, the building/s appear to have been partially demolished, and building debris or potential scrap materials are visibly widespread across the ground surface of the area. The area appears unsealed • From the late 1990's – 2000's, the building debris is no longer present, however some structures/buildings remain in the eastern portion of the area potentially associated with the construction of Rolleston Drive. • From the early 2000's to present, the area is grassed, undeveloped land.
Bores (Canterbury Maps Viewer – 'Wells and Bores' layer)	• One bore is present within the northern portion of the area, for domestic supply, with a status of 'buried'/unlikely still exists'. • Two active bores are located within 100 m of the area (approximately 20 m south, and 35 m south-east). One is used for the purpose of water level observation(M36/7966), and the other for public water supply (BX23/0918; identified in Section 3.5). No other bores were identified within 100 m of the area.
Consents (Canterbury Maps Viewer – 'All Activities Consents' layer)	Six consents were identified within 100 m of the area, for the following activities: • Land Use- Hazardous Storage (in relation to above ground waste oil storage, at Drummond and Etheridge Limited), approximately 95 m north. • Discharge to Land – Stormwater, approximately 50 m east and 80 m south-east. • Groundwater Take, 35 m south-east • Land Use – Bore Installation, 20 m south

Property File (Selwyn District Council)	A property file was requested from SDC for the land parcel associated with the additional area. Upon review, majority of the information in the property file comprised building and other resource consent application documentation, drainage plans, and an application for a water connection. Pertinent information related to the site development is summarised: • Building consent application in relation to demolition of two buildings, dated December 1998, which details requirements for handling and disposal of asbestos materials. The buildings were located within the south-western portion of the land parcel.

The GAMAS[4] and Asbestos ACOP[5] outline that asbestos containing material (ACM) was widely used in building construction and refurbishment from the 1920s to the mid-1980s. Lead was also historically used in paint; properties built prior to 1970 are considered likely to have use used lead paint during construction, with pre-1945 paintwork containing a high lead content[6]. Based on the likely era of development of the farm/rural residential buildings (pre-1940's) identified in historical aerial imagery and any subsequent buildings prior to the above dates, there is the potential for the use of ACM and lead-based paints during construction of the buildings.

The surface cover of the portion of the site surrounding the buildings was grassed/unsealed ground, if soils were exposed during removal of the buildings, poor demolition practices may have resulted in asbestos and lead contamination in shallow soils of the site. This does not meet the 'more likely than not' threshold for the site to be identified as HAIL E1 (*Asbestos products manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition)* and I (*Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment)*, as the use and condition of ACM or lead paint in these buildings is not confirmed. Soil sampling can inform the presence of ACM or lead in these areas, and the applicability of each respective HAIL activity to the site.

[4] BRANZ (2017) New Zealand Guidelines for Assessing and Managing Asbestos in Soil.

[5] WorkSafe Management and Removal of Asbestos Approved Code of Practice (Asbestos ACOP).

[6] Ministry of Health (2021) The Environmental Case Management of Lead-exposed Persons.

4.3 Additional Potential Sources of Contamination

4.3.1 Road and Railway Corridors

Road verges can also be subject to accumulation of contaminants from exhaust residues, fuels, oils and tyre compounds over extended periods of time. Similarly, accumulation of contaminants (i.e., fuels, oils and asbestos) within the existing railway corridor from prolonged use of the site as a railway line is also considered a potential source of contamination to this specific portion of the site.

The possible use of coal tar during road construction, and accumulation of contaminants within the road verge and railway corridor do not meet the ‘more likely than not’ threshold to be a ‘piece of land’ under the NESCS, however this determination could be revised following soil sampling and testing.

Soil sampling is recommended to inform material management, re-use and disposal options as part of the proposed works.

4.4 HAIL Areas for Investigation

As detailed in Section 4.1, a number of off-site HAIL areas were identified in the Stantec PSI for properties that are located adjacent to the site. Stantec applied a risk rating in relation to the site alignment at the time. Beca have revisited the applicability of the HAIL activities in the context of the design at the time of planning the intrusive investigations in this report.

As the specific proximity of the boundaries of some the HAIL activities to the proposed works is not known, there is potential for contamination originating from these activities to have migrated to the site in quantities that may present a risk to human health and the environment (HAIL category H); and/or for the HAIL activities to have been located onsite. For example, HAIL F6 and I were identified for an area/property north of Main South Road and the existing railway line, in relation to the former railyard and was considered by Stantec as an adjacent activity. Based on current development plans for the site, the works are proposed to intersect this HAIL area as part of construction of the proposed flyover and stormwater soakage basins. Therefore, this portion of the site is identified as HAIL F6 (Figure 7).

Further investigation is required to confirm whether ‘HAIL H’ applies to the site in areas where adjacent land uses/HAIL areas are considered potential sources of contamination; and further investigation of HAIL activities that are located onsite is also required to inform management of risk to human health and the environment during earthworks, consenting, and potential disposal implications.

Therefore, the identified HAIL activities and associated contaminants of concern considered potentially applicable to the works are summarised in Table 3 together with contaminants of potential concern.

5 Risk Assessment

5.1 Potential Contaminants of Concern

Table 3 presents a summary of the identified sources of contamination and potential contaminants of concern, based on the information summarised in Section 4. Figure 7 presents a HAIL Plan for the site (note that activities that do not meet the 'more likely than not' threshold to be a 'piece of land' are not shown on Figure 7)

Table 3. Identified Sources of Potential Contamination and Associated Contaminants of Concern

Activity	HAIL Code	Potential Contaminants of Concern
• Former Railyard area (Rolleston Drive section)	• F6	• Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc) • TPH • PAH • Asbestos
• Several off-site HAIL activities identified for adjacent properties to the site	• A8, A10, A17, A18, E5, F3, F4, G4	• Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc) • TPH • PAH • SVOC • VOC • BTEX • Organo-nitro and organophosphorus and organochlorine pesticides (ONPP and OCPS) • Asbestos
• Potential use of ACM and lead paint in former farm/rural residential buildings; - within a portion of the site south of the eastern-most Rolleston Drive and Main South Road intersection - Railyard buildings adjacent to the north of Main South Road	Does not meet the 'more likely than not' threshold to be a considered HAIL E1 or I, however contamination may be present and soil sampling is required to inform the HAIL determination.	• Lead • Asbestos
• Potential use of coal tar within road pavement construction • Potential accumulation of contaminants in road verges and the railway corridor from prolonged use of the site as a road and railway line	Does not meet the 'more likely than not' threshold to be considered a 'piece of land' however contamination may be present.	• Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc) • TPH • PAH • Asbestos



Figure 7. HAIL Map for the site, as informed by the Stantec PSI and additional information review. Note potential sources of contamination and adjacent HAIL areas are not included in the figure as they are not confirmed as having occurred onsite or having migrated to site in sufficient quantities to meet HAIL H. Adjacent HAIL areas identified in the Stantec PSI are included in Appendix B.

5.2 Preliminary Conceptual Site Model

The Conceptual Site Model (CSM; Table 4) was developed to describe the relationship between sources of contamination on site, the human and environmental receptors that may be exposed to those contaminants, and the pathways by which those receptors may be exposed.

The CSM was developed for the context of soil disturbance as part of the site re-development, and use of some areas of the site for unsealed stormwater basins, soakage, and conveyance.

The CSM will be updated following the further investigation (i.e., soil sampling and analysis); pathways identified as incomplete in the preliminary CSM will not be assessed further.

Table 4. Preliminary Conceptual Site Model

Source	Receptor	Pathway	Completeness of Pathway
• Former railyard (HAIL F6) • Off-site HAIL activities on properties adjacent to the site • Potential use of ACM and lead paint in former buildings • Potential use of coal tar in road construction • Potential accumulation of contaminants within road verges and railway corridor	Construction workers	Exposure of workers to contaminants in soils and groundwater during construction i.e., via dermal contact, ingestion, or inhalation of dust/vapours.	**Potentially Complete Pathway** Potential sources of contamination have been identified for the site. Further investigation is recommended to assess the presence of contamination and to inform potential risk to human health, and inform site management practices and disposal.
	Future site users	Exposure of future site users to contaminants in soils – dermal contact, ingestion, or inhalation of dust/vapours.	**Potentially Complete Pathway.** While majority of the site will be sealed upon completion of the works, some areas of the development will remain unsealed (i.e., grassed stormwater soakage basins, swales etc.) and therefore there is potential for future site users to come into contact with potentially contaminated soils.
	General public (during construction)	Exposure of general public to contaminants in soils– dermal contact during construction, ingestion or inhalation of dust/vapours.	**Potentially Complete Pathway** The proposed works are being undertaken in close proximity to residential housing and businesses.
	Groundwater resources for public consumption	Leaching and migration of soil contaminants into groundwater.	**Potentially Complete Pathway – Stormwater Soakage Basins** One groundwater bore for domestic water supply was identified approximately 30 m south of the eastern extent of the Hoskyns Road section. Potential sources of contamination have been identified, during operation of the proposed stormwater soakage basins, contaminants may become mobilised and migrate into groundwater.

Source	Receptor	Pathway	Completeness of Pathway
			Potentially Complete Pathway – Earthworks Mobilising Contaminants Potential sources of contamination have been identified for the site, Open excavations during development and exposure to weather may result in mobilization and leaching of contaminants into groundwater.
			Incomplete Pathway - Discharge of Dewatered Groundwater to Ground Due to depth of groundwater in area and anticipated depth of earthworks, groundwater is not expected to be encountered during the proposed works – therefore dewatering is not required, and this pathway is considered incomplete. If dewatering is required, this pathway will require reassessment.
	Terrestrial ecology	Exposure of terrestrial ecology to contaminants in soils– dermal contact or ingestion.	**Potentially Complete Pathway** The proposed re-development area is predominately hard standing but includes soft landscaping/surface water basins which may provide some habitats for terrestrial ecology and subsequent ecological interactions. Further investigation is recommended.
	Surface water	Contaminated sediment and runoff directly into surface water or runoff into stormwater system which may discharge to surface water and subsequent marine environment, during construction.	**Potentially Complete Pathway** The distance to the nearest receiving surface waters (i.e., two artificial stock water races) is approximately 3 m to the south of the Main South Road section and 3 m to the north of a portion of the Hoskyns Road section of the site. Soil sampling will identify if contamination is present and inform the appropriate measures to mitigate this pathway if necessary.
		Discharge of contaminated groundwater from dewatering into the stormwater network and subsequent surface water receiving environment.	**Incomplete Pathway** Due to depth of groundwater in area and anticipated depth of earthworks, groundwater is not expected to be encountered during the proposed works – therefore dewatering is not required. Additionally, the stormwater network is expected to discharge to ground, therefore surface water is not a

Source	Receptor	Pathway	Completeness of Pathway
			receptor, and this pathway is considered incomplete.

6 Sampling and Analysis Plan

6.1 Data Quality Objectives

The data quality objectives of soil and groundwater sampling relate to the proposed development area and are to:

- Assess contaminant concentrations in soil to determine whether contaminants most associated with the identified historical and current HAIL activities have resulted in contamination of soils within the proposed development area.
- Assess the identified soil contaminant concentrations against human health and environmental criteria to determine the level of management required to protect human health and the environment during proposed soil disturbance works.
- Assess the identified contaminant concentrations in soil to determine potential offsite disposal and onsite reuse options related to the proposed development area.
- Inform the suitability of soils for use in stormwater soakage basins and conveyance in unsealed surfaces during operational phase

6.2 Investigation Rationale

The HAIL activities and other potential sources of contamination identified (Table 3) were targeted during the investigation. The investigation scope and rationale were based on the following considerations:

- Soil sampling targeting areas of proposed soil disturbance that intersect HAIL areas/sources of contamination identified or provisionally identified in the Stantec PSI.
- Soil sampling undertaken to inform soil management required to protect human health and the environment; and to provide re-use and disposal options for works within HAIL areas and the wider site (i.e., outside of the identified HAIL areas).
- Soil sampling targeting areas proposed for stormwater basins and swales.

6.3 Investigation Scope

The investigation scope comprised soil sampling from 49 locations, comprising 14 machine excavated test pits, 18 pavement pits, 7 infiltrations pits, 2 boreholes, and 3 utility services trenches. A targeted approach was undertaken to target HAIL areas. Within HAIL areas, either gird-based coverage was employed, or targeting of specific features such as firmer buildings.

Sample locations were selected based on the Stantec PSI information for HAIL areas and other identified potential sources of contamination, proximity to or within HAIL areas/potential contamination sources. Pavement pit locations were systematically laid out to inform utility service locations and road construction at regular intervals, and were opportunistically sampled or moved to target HAIL areas where there was flexibility in location on a given stretch of road.

We note that one area on the west side of the proposed overpass, north of Main South Road was not accessible due to land ownership permissions. This area has not had intrusive sampling undertaken and is in a location where a stormwater basin has been proposed. Investigation is recommended to confirm suitability of the area for the proposed purpose.

Table 5 presents a summary of the sampling scope for the soil and groundwater investigations. A Sample Location Plan is provided in **Appendix D.**

Table 5. Sampling and Analysis Locations and Rationale

Targeting/Rationale	Sampling Locations	Sampling Depths	Potential Contaminants of Concern
• On and off-site HAIL activities located on adjacent properties to the site (identified in the Stantec PSI, as listed in Table 3). • To assess suitability of soils for reuse in proposed stormwater	BH03 – BH05, IP10, PP11-PP15, TP12-TP22, UST12A, UST12, UST13	Up to 4 m bgl.	• Heavy Metals (arsenic, antimony, cadmium, chromium, copper, lead, mercury, nickel, tin, zinc) • TPH • PAH • SVOC and VOC • ONPP and OCPS • Asbestos
• Potential use of ACM and lead paint in former buildings – south of the easternmost Rolleston Drive and Main South Road intersection	TP23 -TP35	Up to 1 m bgl.	• Lead • Asbestos
• Potential use of coal tar in roading construction	PP06 – PP11, PP14, PP15, PP19 - PP25	Up to 1 m bgl.	• TPH • PAH
• Potential accumulation of contaminants within road verges and railway corridor and to assess suitability of soils for reuse in proposed swales	IP04, TP12-TP15, IP11-IP13	Up to 2.5 m bgl.	• Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc) • TPH • PAH • Asbestos
• Other development areas - to assess suitability of soils for reuse in proposed stormwater soakage basins (originally considered as an option in these locations)	IP07, IP08	Up to 1.5 m bgl.	• Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc) • TPH • PAH

6.4 Permitted Activity Provisions

6.4.1 NESCS

Given that activities listed on the HAIL have been undertaken at the site, the NESCS applies with respect to activities including soil sampling. Where undertaken in accordance with Regulation 8(2), the soil sampling for investigation of contaminated land is a permitted activity (PA). In accordance with Regulation 8(2), measures were in place to minimise human exposure to contaminants before, during and after the sampling program and the sampling locations were immediately restored to an erosion resistant state upon completion of the sampling program. No soil was removed from the site except for sample analysis in laboratory-supplied jars.

6.4.2 LWRP

Under Rule 5.185 of the LWRP, a site investigation is a permitted activity assuming, the investigation is completed in accordance with CLMG No.1 and No.5, and the site investigation report is provided to ECan within two months of the completion of the investigation.

To comply with this rule NZTA should supply this report to ECan.

7 Assessment Criteria

7.1 Human Health

The adopted assessment criteria for the investigation have been selected in accordance with the hierarchy defined by Ministry for the Environment (MfE) Contaminated Land Management Guidelines No. 2 (MfE, 2002). In the absence of a 'maintenance and excavation worker' criteria in New Zealand (which is intended to be managed under the relevant health and safety legislation), a commercial/industrial land use scenario has been selected for assessment of risk to human health associated with construction site workers being potentially exposed to contaminants during site works and the proposed end use of the site remaining as a commercial/ industrial premises.

While roading surface material is not soil, soil assessment criteria have been adopted for the asphalt samples analysed in this investigation to provide an indication of risk to human health of exposure to road surface material during the proposed works.

Human health assessment criteria are summarised in **Table 6.**

Table 6. Human Health Screening Criteria

Contaminant of Concern	Assessment Criteria
• Heavy metals (arsenic, boron, cadmium, chromium, copper, lead, mercury) • Benzo(a)pyrene (BaP) Toxic equivalency (TEQ) • SVOC (Dieldrin and DDT)	• NESCS Soil Contaminant Standards for a Commercial/ industrial outdoor worker (unpaved).
• Heavy metals (nickel and zinc)	• Australian National Environment Protection (Assessment of Site Contamination) Measure (2011). Values for 'Commercial/industrial' land use, Table 1A(1).
• Hydrocarbons • TPH • BTEX • Naphthalene • Pyrene	• Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MfE, 1999). Module 4. • Tier 1 soil acceptance criteria for a commercial/industrial use - All Pathways; sand soil type, surface (<1 m) depth of contamination (Table 4.11 and Table 4.14). • Regional Screening Levels, US Environment Protection Agency (USEPA, Spring 2024). Values applicable to 'Industrial Soil
• SVOC (various compounds)	• Regional Screening Levels, US Environment Protection Agency (USEPA, Spring 2024). Values applicable to 'Industrial Soil.
• Asbestos	• BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil (GAMAS).

7.2 Environmental

To inform environmental and ecological risk, the results were assessed against the following guidelines:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia[7] (ANZG 2018) toxicant default guideline values for sediment quality.

[7] Sourced from www.waterquality.gov.au/anz-guidelines

  - Selected primarily for the purpose of assessing risk related to erosion and a sediment transport from potentially contaminated soils into surface waters and/or stormwater network during construction.
- Terrestrial Ecology - For arsenic, cadmium, copper, chromium, lead, and zinc, Manaaki Whenua Landcare Research (2022) Exploring the implementation of ecological soil guideline values for soil contaminants selected. Trigger value for 80% species protection selected – Tables 13, 14 and 22 (EcoSGVs). TPH values applicable to 'coarse' grained soils adopted. For copper and zinc sensitive aged soil values selected
- Terrestrial Ecology - For nickel and mercury, Canadian Council of Ministers of the Environment (CCME) (1999) Soil Contact Guidelines.
  - Both guidelines were selected in the absence of criteria in the EcoSGVs to assess potential ecological risk within the development areas of soft landscaping which may provide habitat for terrestrial soil organisms.

7.3 Background Concentrations

The following background concentrations have been adopted for this investigation:

- ECan online GIS Map Viewer: Canterbury Maps (Trace Elements Level 2, Soil Group ‘Recent’ applied).
- Environment Canterbury Contaminated Land Management User Guide - Background/Typical concentration of polycyclic aromatic hydrocarbons (PAHs) in Christchurch urban soils.
- Landcare Research Manaaki Whenua Background soil concentrations of selected trace elements and organic contaminants in New Zealand. Envirolink Tools Grant: C09X1402. Table 21 mean value selected for DDT Isomers (0.431 mg/kg). This value is adopted by ECan in Canterbury.

7.4 Landfill Acceptance Criteria

- MfE Hazardous Waste Guidelines, Landfill Waste Acceptance Criteria and Landfill Classification, (2004). Table 1. Class A values were used as these are the acceptance criteria for Kate Valley Landfill.
- Cleanfill: refer to Section 7.3.

We note that for landfill acceptance there are a range of fill facilities in Canterbury that have not been assessed. These have their own acceptance criteria against which the results can be compared.

8 Sampling Methodology

The soil investigation was undertaken between the 18 June and 29 of July 2024, in collaboration with the Beca geotechnical investigation. Test pits were machine excavated by Corde. Locations were marked and cleared for services using a ground penetrating radar (GPR) and cable avoidance tool (CAT) operated by Radar Investigations, and if present, services were positively identified via hydro-excavation prior to sampling commencing.

Representative soil samples were collected from each test pit and hand pit location, based on visual observations and/or significant geological changes. A clean pair of nitrile gloves were worn for each sample. Samples were collected directly from the centre of the excavator bucket or dug using hand tools from the sides/base to minimise any potential cross contamination and placed in laboratory supplied sampling jars as appropriate.

Field sampling and relevant sampling management procedures were undertaken in accordance with the MfE CLMG No. 5 – Site Investigation and Analysis (2021). Soils encountered during the investigation were logged in general accordance with New Zealand Geotechnical Society Field Description of Soil (NZGS 2005) sufficient to inform environmental assessment, however, refer to the geotechnical report for logs for geotechnical purposes. Soil logs and photos are provided **as Appendix E.**

Visual/olfactory screening of the sample location surface and recovered material for potential buried waste/refuse, asbestos containing materials (ACM) fragments or staining was also undertaken. Observations are recorded in Section 8.2 and in the relevant soil logs (**Appendix E).**

8.1.1 Quality Assurance and Quality Control

The digging and soil sampling hand tools were decontaminated between sampling locations using Decon90 and clean water.

Each sample was collected using a clean pair of nitrile gloves. Samples were then placed into laboratory-supplied sample containers. Each sample was given a unique sample identification number, and the sample location was recorded. Following collection, all samples were placed directly into a chilled chilly bin and were transported under standard chain of custody procedures, to the laboratory for analysis to ensure that samples were analysed within the appropriate holding times for each analyte.

Hills Laboratories performed all analyses and are International Accreditation New Zealand (IANZ) accredited. All test methods were also IANZ accredited. Copies of the Hills laboratory reports and Chain of Custody forms are included in **Appendix F.**

8.2 Field Observations

The following observations were made during the investigation:

- Pavement pits that were located on sections of sealed road and test pits that were within railyard areas were located on areas of bare earth. All other locations were on undeveloped grassed areas or grassed road verges.
- On grassed areas or road verges, the site soils were predominantly a layer of topsoil, consisting of fine to medium sandy silt with trace gravels to approximately 0.3 to 0.5 m bgl, transitioning to a layer of medium to coarse silty sand with gravels down to the test pit termination depth between 1 and 4 m bgl.
- For pavement pits, a layer of asphalt (approximately 0.025 – 0.05 m thick) covered a layer of basecourse material (consisting of fine to medium silty sand with gravels) to approximately 0.3 – 0.5 m bgl, transitioning to a layer of coarse silty sand with gravels down to the test pit termination depth between 0.7 and 1.1 m bgl.

- For test pits within the railyard, a layer of sandy silt was observed from the surface to approximately 0.4 – 0.5 m bgl., transitioning to a layer of silty sand with gravels and cobbles down to the test pit termination depth between 1.5 and 3.5 m.
- In five pavement pits, a second deeper layer of asphalt was encountered between depths of 0.2 m bgl and 0.4 m bgl.
- A black stained layer was observed between the depths of 0.3 m bgl. and 0.7 m bgl. during excavation (or drilling) of TP18, TP19, IP10 and BH05 (See Figure 9). All locations were targeting current or former railyard activities.
- During excavation of PP10, uncontrolled, buried waste was observed from approximately 0.6 to 1.0 m bgl, consisting of metal scraps, bricks, wire and plastic. No suspected ACM were observed during excavation.
- Small amounts of building debris (pieces of brick, glass and plastic) were observed between the depths of 0.1 m bgl and 0.4 m bgl. during excavation of four test pits (TP26, TP28, TP29 and TP30) targeting the grassed former buildings/scrap/outdoor storage area adjacent to the intersection of Rolleston Drive and SH1. No suspected ACM were observed during excavation.
- BH03 and BH04 were unable to be sampled for soils as they were hydro-excavated to 1.5 m bgl prior to drilling due to the potential presence of services within the railyard area. Two test pits (TP16 and TP17) were located approximately 20 m south-west and north-east of the BH03 location, respectively. Two test pits (IP10 and TP18) were also located 15 m south-west and north-east of the BH04 location, respectively. Soils were collected from these test pits.
- No fill or other indications of contamination were observed in other test pits across the site.
- Groundwater was not encountered in any of the test pits.

Soil logs and photos are included as **Appendix E**.

9 Summary of Soil Analytical Results

Hill Laboratories analysis certificates are included as **Appendix F** and full summary tables, screening results against the adopted human health and environmental criteria are included as **Appendix G**.

The results are summarised below:

9.1 Rolleston Drive

9.1.1 Heavy Metals

63samples were analysed for a suite of heavy metals (arsenic, cadmium, chromium, copper, lead, nickel, mercury, and zinc). In summary:

- No samples exceeded human health criteria.
- Four samples exceeded the ANZG sediment guidelines for lead (four samples) and zinc (one sample), collected within the railyard (HAIL F6, north of Main South Road) and area of historical farm/rural residential buildings (south-east of Main South Road and Rolleston Drive intersection). Two of these samples were also collected within proposed soakage basin areas, at 0.1 and 0.5 m bgl.
- One sample (TP28 at 0.1m bgl, within the former farm buildings and proposed soakage basin area) exceeded the terrestrial ecological guideline value for zinc (490 vs 260 mg/kg).
- 24 samples across various areas returned at least one heavy metal concentration above published background concentrations.
- No samples exceeded the MfE Class A Landfill screening criteria.

9.1.2 PAH

68 samples were analysed for PAH, in summary:

- All samples recorded PAH concentrations below the human health and environmental criteria, and MfE Class A Landfill screening criteria
- Two samples(BH05 at 0.4-0.5 m bgl and IP10 at 0.1 m bgl), both from the railyard, recorded concentrations of naphthalene above published background concentrations.

9.1.3 TPH

68 samples were analysed for PAH, in summary:

- All samples recorded TPH concentrations below the human health guidelines.
- Two samples (collected from IP10 0.5 bgl and TP18 0.15 bgl) recorded total TPH concentrations which exceed the ANZG sediments guidelines terrestrial ecological guideline values. Both samples were collected within the railyard/HAIL F6 area, one of which was collected within the proposed stormwater soakage basin.

9.1.4 SVOC

22 samples were analysed for SVOC, in summary:

- Human health and environmental criteria were not exceeded in any samples.
- Three samples detected low level concentrations of SVOC compounds
- All other samples returned SVOC concentrations below the laboratory limit of detection (LOD).

9.1.5 VOC

14 samples were analysed for VOC, in summary:

- All other samples returned VOC concentrations below the laboratory limit of detection (LOD).

9.1.6 OCPS and ONPPs

22 samples were analysed for OCPs and ONPPs. All samples returned concentrations below the laboratory LOD, with the exception of one sample which returned a detection of dibenzofuran (below human health criteria).

9.1.7 Asbestos

40 samples were analysed for asbestos. No samples returned detections of asbestos.

9.2 Main South Road

9.2.1 Heavy Metals

45 samples were analysed for heavy metals (as listed in **Section 9.1.1**), in summary:

- No samples exceeded human health or terrestrial ecology criteria.
- Seven samples exceeded the ANZG sediment criteria for one or more of the following heavy metals: arsenic, cadmium, copper, lead (all seven samples), mercury, nickel, zinc.
- 24 samples returned at least one heavy metal concentration above published background concentrations.
- Five samples exceeded the MfE Class A Landfill screening criteria for lead and or zinc, two of which were marginal (108 mg/kg and 102 mg/kg for lead vs acceptance of 100 mg/kg).

9.2.2 PAH

45 samples were analysed for PAH, in summary:

- One asphalt sample (PP25_0.25) returned a concentration of naphthalene (220 mg/kg) above the human health criteria value of 190 mg/kg, and marginally above the MfE Class A Landfill screening criteria (200 mg/kg).
- Three asphalt samples (PP24_0.25, PP23_0.35 and PP22_0.25) reported concentrations (135 mg/kg, 118 mg/kg and 330 mg/kg respectively) for the Benzo(a)pyrene toxic equivalency factor (B(a)P TEF) above the human health criteria of 35 mg/kg.
- Nine samples returned PAH concentrations for at least one PAH compound above published background concentrations.
- All other samples recorded PAH concentrations below the human health and environmental guidelines, and MfE Class A Landfill screening criteria.

9.2.3 TPH

45 samples were analysed for PAH. 19 samples detected TPH (2 soil, 17 asphalt), all of which recorded concentrations below the human health and environmental guidelines.

9.2.4 SVOC

4 samples were analysed for SVOC. All samples returned concentrations of SVOC below the laboratory LOD.

9.2.5 Asbestos

2 samples were analysed for asbestos. Neither sample detected asbestos.

9.3 Hoskyns Road

9.3.1 Heavy Metals

8 samples were analysed for heavy metals, in summary:

- No samples exceeded human health or environmental criteria.
- 4 samples returned concentrations above published background concentrations for lead (four samples marginally exceeding published background concentrations) and zinc (TP12 0.1 only).

9.3.2 PAH

8 samples were analysed for PAH. All samples returned PAH concentrations below the human health and environmental criteria, published background concentrations, and Class A Landfill screening criteria.

9.3.3 TPH

8 samples were analysed for TPH. In summary, one sample (TP12_0.5), collected from within the road verge, returned a total TPH concentration above the ANZG sediment guidelines and terrestrial ecology soil guideline values.

9.3.4 SVOC

2 samples were analysed for SVOC. All SVOC compounds were at concentrations below the laboratory LOD, in both samples.

9.3.5 OCPs and ONPPs

Two samples were analysed for OCPs and ONPPs.

- No samples exceeded human health or environmental criteria.
- One sample detected 4,4, - DDE (0.019 mg/kg). The remaining sampled recorded OCP and ONPP concentrations below the laboratory LOD.

9.4 Quality Assurance/Quality Control (QA/QC)

For soil sampling, three duplicate samples were analysed to allow the relative percentage difference (RPD) to be calculated. The RPD values ranged from 0 to 86%. Generally, RPD was between 0 and 22%, with an exception of 0 to 86% in a road surface material sample from pavement pit PP08. Majority of this variation can be explained by low concentrations of analytes (e.g., nickel at 2 vs 5 mg/kg, and zinc at 9 vs 19 mg/kg in the parent and duplicate samples, respectively), which resulted in elevated RPDs. As these differences are in two analytes of 31 analysed across eight duplicate samples, which produced RPDs at an acceptable level. Therefore, the RPD suggests an acceptable level of consistency in the soil sampling methods employed on site and the results are considered appropriate for the purposes of the assessment given the data objectives.

10 Discussion and Risk Assessment

The DSI targeted site soils identified within, or in close proximity to, HAIL areas and/or potential sources of contamination identified during review of the existing information for the site. The risk assessment is based on comparison of results against the adopted human health and environmental criteria (Section 7), and the proposed development involving earthworks and potential exposure to construction workers.

Roading surface material is not soil, and therefore the NESCS is not applicable to road surface material. The results of analysis of surface roading material (i.e., asphalt, seal, and bituminous materials) and soils are therefore discussed separately below.

10.1 Road Surface Material

10.1.1 Human Health

Surface seal was sampled in 18 pavement pits located within the existing road carriageway to target to potential use of coal tar in historic roading construction. Three samples returned concentrations of naphthalene and/or B(a)P TEF above the human health criteria.

The WasteMINZ Coal Tar Guidelines[8] outline that a total PAH concentration of 20 mg/kg or greater, and/or a Benzo(a) Pyrene Toxic Equivalent (BaP TEQ) concentration >1 mg/kg in roading material, along with other evidence such as road construction era, can be adopted as an indication that coal tar is present. Three samples, collected from a second asphalt layer in pavement pits PP22, PP23 and PP24 (Main South Road) returned total PAH concentrations between 1,600 and 5,000 mg/kg, two of which also recorded BaP TEQ concentrations >1 mg/kg. Therefore, surface roading material in this section of the site is considered to be consistent with coal tar (see Figure 8), and there is a human health risk to workers from exposure to this material during construction. The proposed works should be undertaken in line with the procedures set out in a Contaminated Soils Management Plan (CSMP) to manage the associated risks.

All remaining asphalt samples analysed returned a total PAH and B(a)P TEQ concentration less than 20 mg/kg and 1 mg/kg, respectively. Therefore, the surface roading material in the remainder of the site is not considered to contain coal tar, and the risk to human health from exposure to road surface material in these areas during construction is considered low.

We note that coal tar distribution can be sporadic and inconsistent. Onsite observations, use of a CSMP and unexpected discovery protocols is recommended.

Recommendations for reuse and disposal of road surface material are discussed in Section 11.2.

10.2 Soils

10.2.1 Human Health

All soil analytical results from the proposed development area recorded contaminant concentrations below human health criteria.

Based on the investigation results, the risk to human health from soils associated with the proposed works is considered low. However, uncontrolled, buried waste was encountered in a pavement pit (PP10), located within the road carriageway of the Main South Road section of the site, south-west of the proposed overpass (see Appendix D). While contaminant concentrations in this location were below human health criteria and asbestos was not detected, the horizontal extent of the buried waste was not determined in this investigation.

[8] Guidelines for Assessing and Managing Coal Tar Contamination in Roading. WasteMINZ (December 2023).

As such, there remains a risk in this area as different types of fill material to what was observed during the investigation may be encountered. This risk and residual risk across the remainder of the site during the proposed works can be managed with robust unexpected discovery protocols and the procedures outlined in a CSMP.

10.2.2 Environmental – Stormwater Basins and Swales

Southeast Corner Rolleston Drive and Main South Road

Operational phase stormwater is to be discharged to ground within proposed stormwater soakage basins and swales. In the proposed stormwater soakage basins areas, several surface soil samples collected at 0.1 m bgl recorded heavy metal concentrations above published background concentrations. At depths greater than 0.5 m bgl soils are largely at or below published background concentrations in these areas. For the proposed swales, analytical results were similar, with surface samples) exceeding background concentrations for at least one heavy metal, however this is less frequently observed in deeper samples (0.5 m bgl), therefore soils at depths greater than 0.5 m bgl are also expected to be largely below background concentrations in these areas . The risk to human health and the environment from infiltration of stormwater through soils in the proposed basin locations and depths into ground is considered low, therefore soils at these depths are considered suitable for reuse within the stormwater soakage basins and roadside swales, from a contamination perspective.

The terrestrial EcoSGV were exceeded in one sample for zinc, at 0.1 m bgl, within the area of former farm buildings and proposed stormwater soakage basin in that area of the site. All other samples within the former buildings area (and wider site) did not exceed ecological soil guideline values for all contaminants analysed, therefore the elevated zinc concentration in test pit TP28 is likely localised to surface soils in this location. A 95% upper confidence limit (95% UCL) was undertaken on zinc data, and showed a value of 146 mg/kg against a terrestrial criteria of 290 mg/kg. Overall, on the basis of the sampling, the proposed works presents a low terrestrial ecological risk.

Based on these results, all tested soils in the southwest corner of the Rolleston Drive/Main South Road junction, and swale areas are suitable for reuse within the proposed soakage basins or swales.

North of Main South Road (former Railyard)

Soil sampling was not possible in the northern basin of the two basins proposed in north of Main South Road due to access permissions. The southern proposed basin had targeted sampling undertaken in it, as did the remaining project area within the former railyard.

For the tested soils, at depths greater than 0.5 m bgl soils are largely at or below published background concentrations relatively uniformly across the tested area, apart from the stained soils (discussed below) where 0.7m bgl below the staining was at or below background concentrations. As basins exceed 0.7m bgl in depth, the risk from infiltration of stormwater through tested soils in the proposed southern basin location into ground is considered low, therefore soils at these depths are considered suitable for reuse within the stormwater soakage basins and roadside swales, from a contamination perspective.

For the northern basin, as the wider area test results were relatively uniformly at or below background concentrations at depths greater than 0.5m bgl, this indicates a potentially low risk that soils at the depths of the base of the basins would be unsuitable for use. However confirmatory testing is recommended to confirm this.

For shallow soils (<0.5m bgl) in the former railyard area, results returned some exceedances of background levels, the EcoSGV for TPH, and a layer of staining and hydrocarbon odour was observed that coincided with the exceedances. The sample collected beneath this (at 0.7m bgl) was below background concentrations. It is recommended that the stained and odorous layer is not suitable for reuse onsite and will require offsite disposal to a facility licensed to accept it. Horizontal delineation of the stained and odorous layer was not

undertaken, therefore further sampling may be required to determine the extent of contamination. Remaining areas are suitable for reuse on site in basins and terrestrial landscaped areas.

Swales

For the proposed swales, analytical results were similar to that of basins, with surface and deeper samples (0.5 m bgl) exceeding background concentrations for at least one heavy metal. The terrestrial EcoSGV were exceeded in one sample for TPH, at 0.5 m bgl, within the road verge of the Hoskyns Road section and proposed swale. All other samples within this area of the site did not exceed ecological soil guideline values for all contaminants analysed, therefore the elevated TPH concentration in test pit TP12 is likely localised to surface soils in this location, therefore the proposed works overall presents a low terrestrial ecological risk.

On the basis of sampling and analysis, the risk from stormwater passing through soils in the proposed swale locations into ground is considered low, therefore soils at these depths are considered suitable for reuse within the roadside swales, from a contamination perspective.

Given the observed fill material around PP10, additional sampling is recommended between PP10 and BH02 to inform use as a swale. Based on the observed results, the soils around BH02 are suitable for use in the swale location.

10.2.3 Environmental – Sediment Management

Twelve samples recorded exceedances of ANZG sediment guidelines for one or more heavy metals. Five of these samples were collected within the Rolleston Drive section, from the railyard area, former farm buildings area, and PP10 (where uncontrolled buried waste was encountered). The remaining seven were collected from the Main South Road section, in pavement pits and test pits targeting the road carriageway, road verge, and proposed swales.

The nearest surface water body is an open, stock water race, located adjacent to the south of a portion of the Main South Road section of the site. A second, open stock water race is located adjacent to the east of the northern extent of the Hoskyns Road section. As the ANZG sediment criteria were exceeded in several locations across the site, there is an environmental risk to these receptors if erosion and transport of contaminated sediment occurs during soil disturbance. Therefore, this pathway will require management during the proposed works under the procedures outlined in an Erosion and Sediment Control Plan (ESCP). This pathway will be incomplete once all surfaces are stabilised and works are complete.

Although the laboratory LOD for dieldrin, endrin and lindane (organochlorine pesticides) is greater than the correlating environmental sediment criteria for these compounds, all other SVOC compounds analysed were also below the LOD. Therefore, dieldrin, endrin and lindane are considered to be equivalent to below the ANZG sediment criteria.

10.2.4 Background concentrations

The LOD for mercury, naphthalene and fluorene is greater than the published background concentrations. All but three samples returned detections of PAHs in soil (excludes roading material) were below background concentrations. The detections of PAH and mercury that exceeded background were in samples where other metals and/or hydrocarbons exceeded background levels or an applied criterion, e.g. TP28 0.1 and IP10 where numerous heavy metals were above published background levels. Additionally, the detection limit for mercury is similar to background concentrations within the wider Canterbury region. Overall, where it was expected from other results to observe these analytes above background concentrations, it was generally observed; and where all others were below, results are consistent with these observations. Therefore, these compounds, are considered to be equivalent to below background concentrations unless specifically detected.

10.3 Determination of HAIL Areas

The following HAIL activities have been identified for portions of the Rolleston Drive section of the site:

- HAIL F6 (Railyards) – in relation to a former railyard area (originally identified in the Stantec PSI).
- HAIL G3 (Landfill Sites) – in relation to uncontrolled, buried waste identified in PP10 (south of Main South Road, south-west of the proposed overpass). In the absence of a HAIL code specific to this activity, HAIL G3 is considered most applicable.

Asbestos and lead were identified as contaminants of concern in the information review of this assessment, in relation to an area of former farm buildings (demolished), within the road berm south-east corner of the easternmost Rolleston Drive/Main South Road intersection. Lead concentrations in this area were below human health criteria, and no asbestos was detected in any sample analysed. On this basis, HAIL codes E1 and I are not considered applicable to this area of the site.

A number of off-site HAIL activities located adjacent to the site (i.e., on neighboring properties), were identified as potential sources of contamination in the Stantec PSI and information review of this assessment. Soil sampling and analysis in areas of the site at risk of impact from these activities did not identify contaminants at concentrations that would present a risk to human health or the environment, therefore the 'more likely than not' threshold of HAIL H in relation to adjacent HAIL activities is not met.

An updated HAIL Plan is provided in Figure 8.



Figure 8. Revised HAIL and Coal Tar Map. Note site and polygon boundaries are approximate. HAIL and coal tar areas have not been delineated horizontally as part of this investigation.

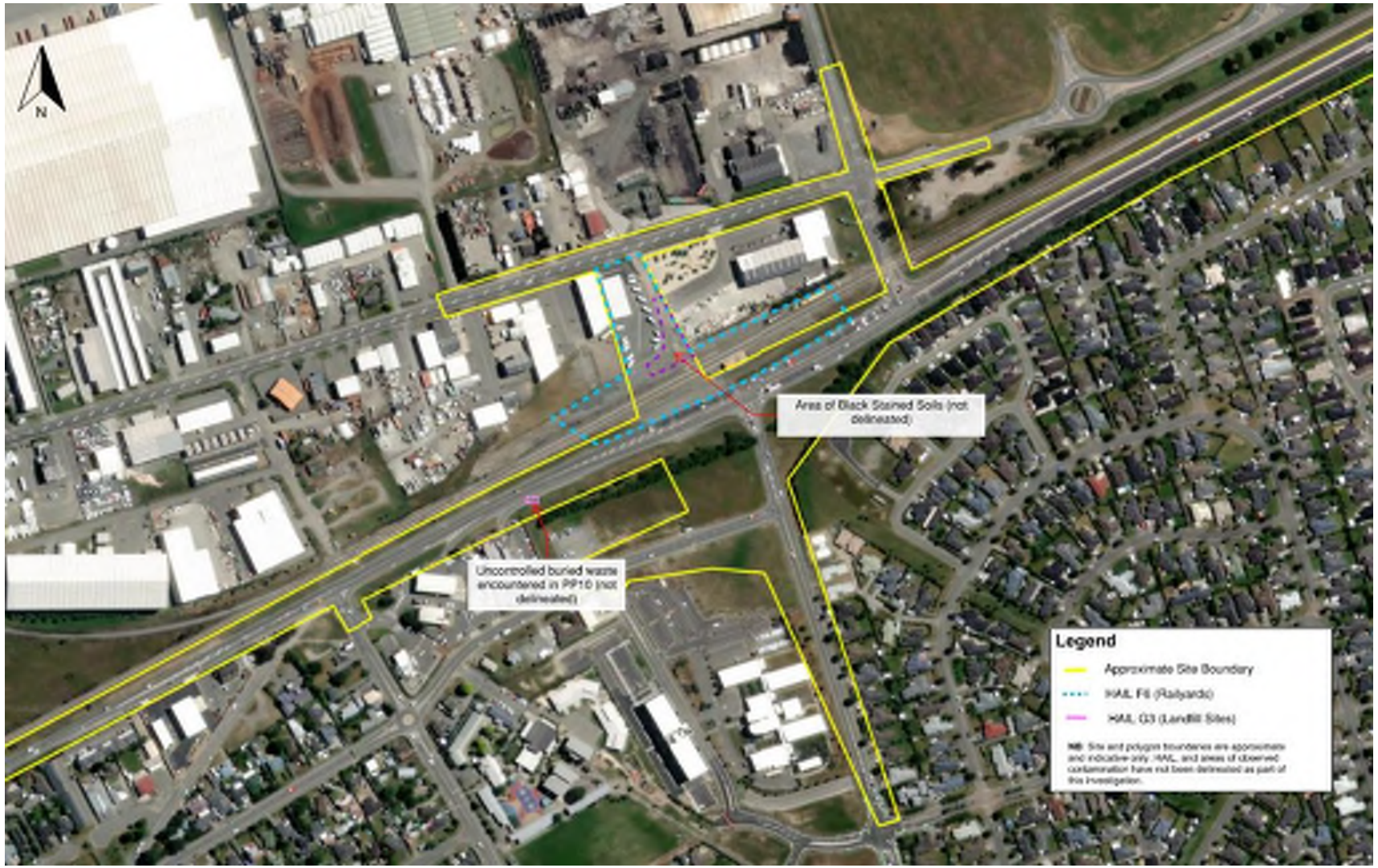


Figure 9. HAIL Map and area of black stained soils observed within the former railyard. Note polygon boundaries are approximate and areas of contamination observed have not been delineated horizontally as part of this investigation.

10.4 Revised Conceptual Site Model (CSM)

The preliminary CSM (Table 7) was refined post-investigation to describe the relationship between sources of contamination on site, the human and environmental receptors, and the pathways by which those receptors may be exposed related to redevelopment of the site. Pathways identified as incomplete within the preliminary CSM were not brought forward for assessment in this revised CSM.

Table 7. Revised Conceptual Site Model

Source	Receptor	Pathway	Completeness of Pathway
• On and off-site HAIL activities on properties adjacent to the site • Potential use of ACM and lead paint in former buildings • Potential use of coal tar in road construction • Potential accumulation of contaminants within road verges and railway corridor	Construction workers	Exposure of workers to contaminants in soils and groundwater during construction i.e., via dermal contact, ingestion, or inhalation of dust/vapours.	**Complete Pathway – Road Surface Material Seal** Sampling and analysis of road surface seal material identified contaminant concentrations above the human health commercial/industrial criteria and that coal tar is present in a portion of the site. Works should be undertaken in line with a contaminated soils management plan (CSMP).
			Incomplete Pathway – Soils and Basecourse All soil and basecourse analytical results were below the human health criteria for commercial/industrial land use. Therefore, the risk to human health from exposure of workers to soils during construction is low, and this pathway is considered incomplete.
	Future site users	Exposure of future site users to contaminants in soils – dermal contact, ingestion, or inhalation of dust/vapours.	**Incomplete Pathway** All soil analytical results were below the human health criteria, therefore the risk to human health for future site users that may come into contact with soils in unsealed areas of the site is low, and this pathway is considered incomplete.
	General public (during construction)	Exposure of general public to contaminants in soils– dermal contact during construction, ingestion or inhalation of dust/vapours.	**Incomplete Pathway** All soil analytical results were below the human health criteria, therefore the risk to human health for the general public during construction is considered incomplete.
	Groundwater resources for public consumption	Leaching and migration of soil contaminants into groundwater .	**Incomplete Pathway – Stormwater Soakage Basins** This pathway is considered incomplete provided soil reuse recommendations are followed. For reasons discussed in Section 10.2.2, risk of leaching and migration of contaminants into groundwater via infiltration of stormwater in soakage basins is considered low.

Source	Receptor	Pathway	Completeness of Pathway
			Incomplete Pathway – Earthworks Mobilising Contaminants Based on the analytical results, the risk of mobilisation of contaminants in soils and migration into groundwater during earthworks is considered low. Residual risk can be managed via erosion and sediment controls outlined in an ESCP. Therefore, this pathway is considered incomplete.
	Terrestrial ecology	Exposure of terrestrial ecology to contaminants in soils– dermal contact or ingestion.	**Complete Pathway – Railyard Area** Terrestrial ecological guideline values were exceeded in samples collected within a layer of black stained soil observed in the former railyard area. Soils are not suitable for reuse on site and will require off-site disposal.
			Incomplete Pathway – Remainder of Site All soil analytical results indicate that the proposed works present a low risk to terrestrial ecology, therefore this pathway is considered incomplete.
	Surface water	Contaminated sediment and runoff directly into surface water or runoff into stormwater system which may discharge to surface water, during construction.	**Complete Pathway** Soil contamination was identified at concentrations above environmental sediment guideline values. This pathway can be managed through implementation of erosion sediment control procedures to prevent runoff of contaminated sediment into surface water and stormwater systems.

10.5 Limitations of Site Characterisation

Characterisation of subsurface conditions is dependent on the number of sample locations, methods of sampling and uniformity of subsurface conditions. There is the possibility that contamination present on the site has not been described. Whilst contaminant concentrations may be estimated at chosen sample locations, conditions at any location removed from the specific points of sampling can only be inferred on the basis of geological and hydrogeological conditions and the nature of and extent of identified contamination. Subsurface conditions can vary, resulting in uneven distribution of contaminants across a site which cannot be defined by these investigations. In addition, with time, the site conditions and environmental guidelines could change so that the reported assessments and conclusions are no longer valid. The conclusions of this report are made on the basis that the site conditions revealed by the investigation are representative of the actual conditions across the site at the time of sampling.

11 Development Implications

11.1 Consents

11.1.1 National Environmental Standard

The NESCS applies to land as per clause 5(7):

"Land covered:

(7) The piece of land is a piece of land that is described by 1 of the following:

(a) an activity or industry described in the HAIL is being undertaken on it

(b) an activity or industry described in the HAIL has been undertaken on it

(c) it is more likely than not that an activity or industry described in the HAIL is being or has been undertaken on it."

The Rolleston Drive section of the site has been partially identified as:

- HAIL F6 (Railyards) – in relation to a former railyard area (originally identified in the Stantec PSI).
- HAIL G3 (Landfill Sites) – in relation to uncontrolled, buried waste identified in pavement pit PP10 (south of Main South Road, south-west of the proposed overpass).

As the proposed works is to be undertaken within the HAIL activities identified for the site, and soil sampling observed contaminant concentrations above published background levels, the NESCS applies to the proposed works within this area. Under Regulation 8(3) of the NESCS, soil disturbance of up to 25 m^3 per 500 m^2 and disposal of up to 5 m^3 per 500 m^2 is allowed as a Permitted Activity. Based on indicative earthworks volumes for the proposed works in this area, the Permitted Activity criteria are unlikely to be met, and resource consent under the NESCS will likely be required. Once soil disturbance and disposal volumes are determined, these should be assessed against the Permitted Activity criteria to confirm whether consent under the NESCS is required.

No historical activities or land-uses have been identified for the remainder of the site that meet the 'more likely than not' threshold for the site to be a 'piece of land'. Therefore, the NESCS does not apply to the remainder of the site.

11.1.2 Canterbury Land and Water Regional Plan

Section 2.9 of the LWRP defines contaminated land as:

- *Contaminated land – means land that has a hazardous substance in or on it that –*

  a) has significant adverse effects on the environment; or

  b) is reasonably likely to have significant adverse effects on the environment.

- *Potentially contaminated - means that part of a site where an activity or industry described in the list in Schedule 3 of this Plan has been or is being undertaken on it or where it is more likely than not that an activity or industry described in the list in Schedule 3 of this Plan is being or has been undertaken on it, but excludes any site where a detailed site investigation has been completed and reported and which demonstrates that any contaminants in or on the site are at, or below, background concentrations.*

The portions of the site identified as HAIL F6 and HAIL G3 meet the definition of '*Potentially Contaminated*', and an activity described in 'Schedule 3' of the Plan has been undertaken on these areas of the site, and contaminants were detected above published background concentrations. Therefore, the LWRP rules of this definition will apply.

The remainder of the site does not meet the definition of '*Potentially Contaminated'* or '*Contaminated*' Land, as no activities described in 'Schedule 3' of the Plan are or have been undertaken, and analytical results indicate that the proposed works are not reasonably likely have a significant adverse effect on the environment in a terrestrial land use context.

11.2 Soil Re-Use and Disposal Options

11.2.1 Re-Use

Reuse on site is recommended as a generally more sustainable option compared to disposing of soil to landfill.

From a contamination perspective, the uncontrolled waste material encountered in pavement pit PP10, and the stained and odorous material in shallow soils around TP18, TP22, IP10 and BH05 (see Figure 9) are not considered suitable for reuse on site and will require disposal to a licensed fill facility (see Section 11.2.2).

For the remainder of the site, based on the observed results, soils can be reused onsite, subject to geotechnical limitations.

Upon completion of the works the re-used soil must be fully stabilised (e.g., sealed, grassed or similar stabilising landscaping) to prevent erosion and discharge of sediment during establishment.

11.2.2 Offsite Soil Disposal

Soils

If off-site disposal is required, the soil shallower than 0.5m bgl are generally not considered to meet cleanfill criteria (some areas may be separable to meet cleanfill, however generally soils were above background concentrations to 0.5m bgl) will likely require disposal to a fill facility licensed and consented to accept the contaminant levels observed on site. Additional vertical delineation of soils can be undertaken to reduce the depth at which this limitation applies.

Depending on the depth of required excavations for the proposed development, soils at 0.5m bgl or greater depths across the site may be accepted at clean fill facilities, or managed fill facilities with lower acceptance criteria. Generally, at this depth exceedances of background levels were less frequent, and to a lesser extent where it occurred and facilities may take soils on the basis of averages.

All fill facility acceptance is ultimately the discretion of the facility operator, and it is recommended that acceptance is obtained prior to works. If soils are to be disposed off-site, it is recommended (and likely required) that a copy of the soil analytical results be provided to the nominated disposal facilities by the contractor for review. It is recommended that acceptance is obtained prior to earthworks starting.

Road Surface Material

Where the road surface material has been identified to contain coal tar (within a portion of the Main South Road section), this material will require disposal at a landfill facility that accepts coal tar. Three asphalt samples in this section of the site exceeded the Class A Landfill Acceptance Criteria which may require toxicity characteristic leaching procedure (TCLP) tests prior to acceptance to a Class A facility (such as Kate Valley Landfill).

Contaminants concentrations in road surface material within the remainder of the site were largely below background concentrations and therefore may be accepted as clean fill, depending on the facility acceptance criteria.

As mentioned above, all results will likely be required by the operator, acceptance is ultimately the operator decision, and it is recommended that acceptance is obtained prior to earthworks.

11.3 Dewatering

Due to depth of groundwater in the area, dewatering is not currently anticipated for the proposed works. If dewatering is required to support development of the site, groundwater sampling and analysis is recommended to inform options of dewatering management and disposal during works.

11.4 Contaminated Soils Management Plan (CSMP)

Sampling and analysis of road surface material identified contaminant concentrations above the human health criteria and that coal tar is present in a portion of the site. Other areas showed elevated levels of soil contamination, albeit below the relevant criteria.

A contaminated soils management plan (CSMP) is required to support works and consenting.

11.5 Erosion Sediment Control Plan (ESCP)

Based on the observed results, a sediment risk to potential aquatic receptors during construction was identified across the site, and works are therefore recommended to be undertaken in line with an ESCP.

11.6 Further Work

During the soil sampling investigation, the west side of the proposed overpass, north of Main South Road was not accessible due to land ownership permissions. This area has not had intrusive sampling undertaken and is in a location where a stormwater soakage basin has been proposed. Further investigation is recommended to confirm suitability of the area for the proposed purpose.

Additionally, the areas of black stained soil within the former railyard, and uncontrolled buried waste in pavement pit PP10, were not horizontally or vertically delineated in this investigation. Further sampling is therefore recommended in these areas to inform material handling and options for off-site disposal.

12 Conclusions and Recommendations

Beca was engaged by NZTA to undertake a DSI in relation to the proposed SH1 Rolleston Access Improvements. The DSI targeted the areas of proposed earthworks, potential HAIL activities identified in the Stantec PSI (2023), and additional potential sources of contamination.

The following HAIL activities and potential sources of contamination were identified for the site, based on the findings of the Stantec PSI and additional information review component of this investigation:

- 21 off-site HAIL areas (on adjacent properties located within 50 m of the site)
- HAIL activity F6 (Railyards) was identified on a portion of the Rolleston Drive section of the site, in relation to a former railyard, located north of Main South Road and the existing railway line.
- Potential use of coal tar in historic roading construction
- Potential use of ACM and lead-based paint, in an area of former farm buildings (demolished), and former railyard buildings (north of Main South Road), identified in review of historical aerial imagery,
- Accumulation of contaminants within road verges and the railway corridor from prolonged use of the site as a road and railway line

DSI Findings

- Human health criteria were exceeded in three road surface material samples, within the Main South Road section. The samples also indicated that road surface material in this portion of the site is considered to contain coal tar.
- All remaining road surface material samples returned contaminant concentrations that do not indicate the presence of coal tar in the remainder of the site. Note that coal tar distribution can be variable spatially and by depth and could still be encountered during works.
- 12 samples exceeded the ANZG sediment criteria, for heavy metals and/or total TPH concentrations, within the Rolleston Drive and Main South Road sections of the site.
- Three soil samples exceeded the terrestrial ecological soil guideline value for TPH, and one sample for zinc.
- Uncontrolled, buried waste was encountered in one pavement pit (PP10), located within the Main South Road section, south-west of the proposed overpass.

Three complete source-receptor exposure pathways were identified in the revised CSM:

- Exposure of workers to contaminants in soils and groundwater during construction i.e., via dermal contact, ingestion, or inhalation of dust/vapours.
- Contaminated sediment and runoff directly into surface water or runoff into stormwater system which may discharge to surface water, during construction.
- Exposure of terrestrial ecology to contaminants in soils– dermal contact or ingestion.

Soil Reuse and Disposal

From a contamination perspective, the uncontrolled waste material encountered in pavement pit PP10, and the stained and odorous material in shallow soils around TP18, TP22, IP10 and BH05 are not considered suitable for reuse on site and will require disposal to a licensed fill facility. For the remainder of the site, based on the observed results, soils can be reused onsite, subject to geotechnical limitations.

If off-site disposal is required, the soil shallower than 0.5m bgl are generally not considered to meet clean fill criteria and will likely require disposal to a fill facility licensed and consented to accept the contaminant levels observed on site. Depending on the depth of required excavations for the proposed development, soils at 0.5m bgl or greater depths across the site may be accepted at clean fill facilities, or managed fill facilities with lower acceptance criteria.

Where the road surface material has been identified to contain coal tar (within a portion of the Main South Road section), this material will require disposal at a landfill facility that accepts coal tar.

Consenting

NESCS

Portions of the Rolleston Drive section of the site has been identified as HAIL F6 (Railway Yards) and G3 (Landfill sites) in this investigation, therefore the NESCS applies to these portions of the site. Based on indicative earthworks volumes for the proposed works in this area, the Permitted Activity criteria are unlikely to be met, and resource consent under the NESCS will likely be required. Once soil disturbance and disposal volumes are confirmed, these should be assessed against the Permitted Activity criteria. As soil analytical results exceeded published background concentrations in this area, should PA criteria not be met, resource consent under the NESCS will likely be required as a controlled activity.

ECan LWRP

Based on the findings of soil sampling and analysis:

- The portions of the site identified as HAIL F6 and HAIL G3 meet the definition of 'Potentially Contaminated' Land and therefore the LWRP rules referring or relating to this definition apply to this portion of the site.
- Except for the area of black-stained soils observed within the former railyard area, based on the soil analytical results, the environmental risk within the 'potentially contaminated land' is considered low in relation to the proposed project earthworks and stormwater basins.
- The remainder of the site is not considered to meet the definition of 'potentially contaminated' or 'contaminated' land.

12.1 Recommendations

- Results indicate there is a risk to human health with respect to exposure to road surface material during construction. Therefore, the works will require management via the procedures outlined in a CSMP.
- There is an environmental risk to aquatic receptors if erosion and transport of contaminated sediment occurs during construction, therefore it is recommended the works be undertaken with an erosion sediment control plan (ESCP). This pathway is considered incomplete on completion of works and when the site is fully stabilised.
- Soils within the stained and odorous layer in the former railyard area, and the uncontrolled buried waste in pavement pit PP10 are not suitable for reuse within the proposed soakage basins or swales, nor for reuse within the wider site and will require offsite disposal to a facility licensed to accept it.
- Soils within the remainder of the site are suitable for reuse on site in basins, swales and terrestrial landscaped areas provided geotechnically suitable.
- Soils up to 0.5 m bgl across the site are unlikely to be accepted as clean fill for off-site disposal and will likely require disposal at a managed fill facility. Soils at greater depths of approx. 0.5 m or deeper may be accepted at clean fill facilities, or managed fill facilities with lower acceptance criteria, however acceptance is ultimately at the discretion of the receiving facility.
- It is recommended that acceptance of soils to be disposed off-site is obtained from the receiving facility prior to earthworks, and that a copy of the soil analytical results be provided to the nominated disposal facilities by the contractor for review.
- Where road surface material has been identified to contain coal tar (within a portion of the Main South Road section), this material will require disposal at a facility that accepts coal tar. Toxicity characteristic leaching procedure (TCLP) tests may be required prior to acceptance to a Class A facility (such as Kate Valley Landfill).

- Further sampling is recommended within the northern proposed soakage basin area west of the proposed overpass that was inaccessible during DSI works, as well as delineation of the areas of black stained soil and uncontrolled buried waste, to inform material handling and off-site disposal options.
- Although not currently anticipated, if dewatering is required for the proposed works, groundwater sampling and analysis is recommended to assess for potential contamination and inform options for dewatering methodology and disposal of dewatered groundwater.

Reviewing Statement

This report has been reviewed by Dr Ben Waterhouse, CEnvP Site Contamination Specialist. Ben is a suitably qualified and experienced practitioner (SQEP) with over 13 years' experience managing and delivering a wide variety of environmental investigation works in New Zealand and the United Kingdom. He is experienced in regulatory compliance, oversight of environmental investigations, monitoring and risk assessment, contractor management, preparation and review of technical reports, as well as working with regulatory bodies. Ben has been a Certified Environmental Practitioner Site Contamination Specialist since 2022.



Limitations

This report has been prepared by Beca Ltd (Beca) solely for NZ Transport Agency Waka Kotahi (Client). Beca has been requested by the Client to provide a Detailed Site Investigation (Contamination) for the site located in Rolleston, Christchurch. This report is prepared solely for the purpose of the assessment of potential soil contamination (Scope). The contents of this report may not be used by NZTA for any purpose other than in accordance with the stated Scope.

This report is confidential and is prepared solely for the Client. Beca accepts no liability to any other person for their use of or reliance on this report, and any such use or reliance will be solely at their own risk.

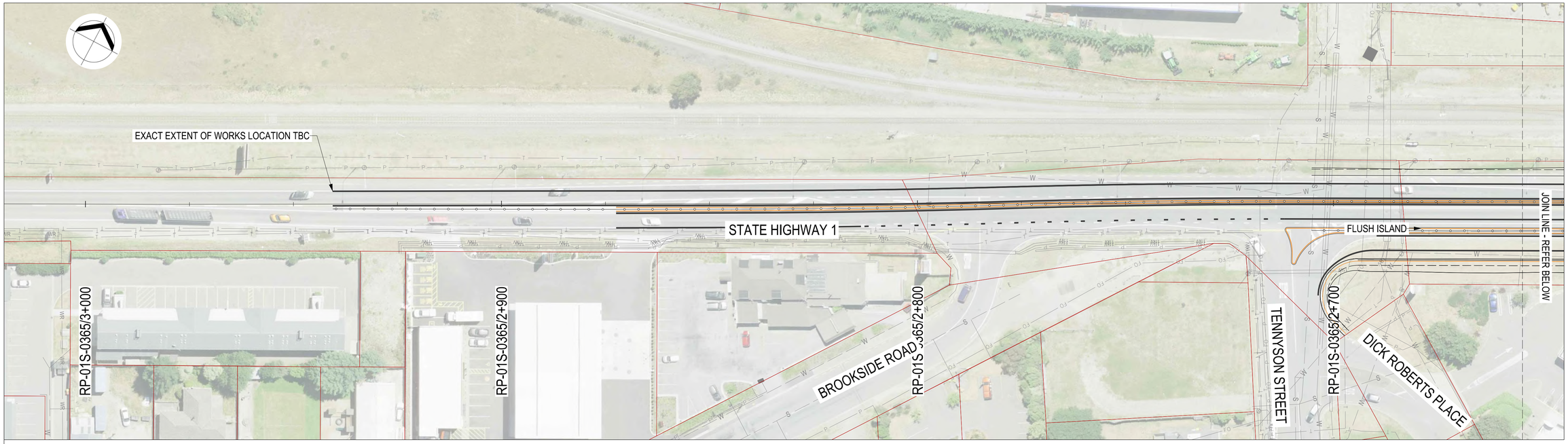
In preparing this report Beca has relied on key information as listed within the report, and including: information provided by NZTA, Environment Canterbury, Retrolens, Google Earth and R J Hill Laboratories Limited. Unless specifically stated otherwise in this report, Beca has relied on the accuracy, completeness, currency and sufficiency of all information provided to it by, or on behalf of, the Client or any third party, including the information listed above, and has not independently verified the information provided. Beca accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the information provided. Publicly available records are often inaccurate or incomplete.

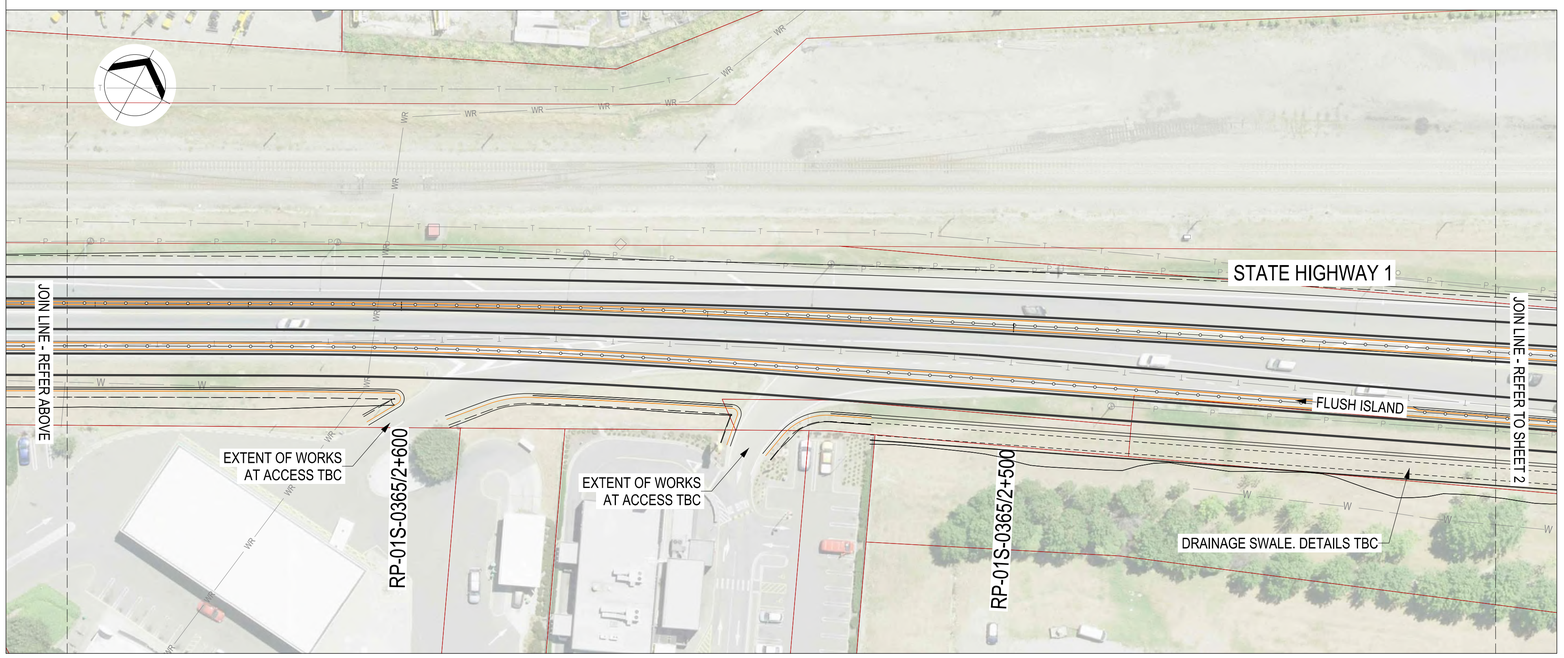
The contents of this report are based upon our understanding and interpretation of current legislation and guidelines (“Standards”) as consulting professionals, and should not be construed as legal opinions or advice. Unless special arrangements are made, this report will not be updated to take account of subsequent changes to any such Standards.

This report should be read in full, having regard to all stated assumptions, limitations and disclaimers.

A

Appendix A – Concept Design Drawings





LEGEND

- BOUNDARY

EXISTING SERVICES
- OVERHEAD POWER
- 11kV CABLE
- LOW VOLTAGE POWER
- FIBRE OPTIC
- CHORUS
- WATER MAIN
- STORMWATER
- SEWER
- STOCK WATER RACE
- LIGHTING COLUMN

PROPOSED DESIGN
- LIGHTING COLUMN
- KERB BREAK
- STORMWATER MANHOLE
- SCRUFFY DOME
- STORMWATER CATCHPIT
- STORMWATER PIPE
- SWALE
- KERB
- SEAL EDGE
- BACK OF VERGE
- GROUND INTERFACE
- WIRE ROPE BARRIER

NOTES:

CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	FOR INFORMATION	JC	MH	BC	28.05.24
B	50% GEOMETRIC DESIGN	RAA	MH	BC	09.08.24

Original Scale (A1) 1:500
Reduced Scale (A3) 1:1000

Design	M.HARRIS	03.04.24	Approved For Construction*
Drawn	R.ANDERSON	03.04.24	
Dsg Verifier			
Drg Check			Date

* Refer to Revision 1 for Original Signature

Beca

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 2

Title: GENERAL ARRANGEMENT SHEET 1 OF 7

Discipline: CIVIL ENGINEERING

Drawing No.: 3338703-20-CA-1201

Rev.: B

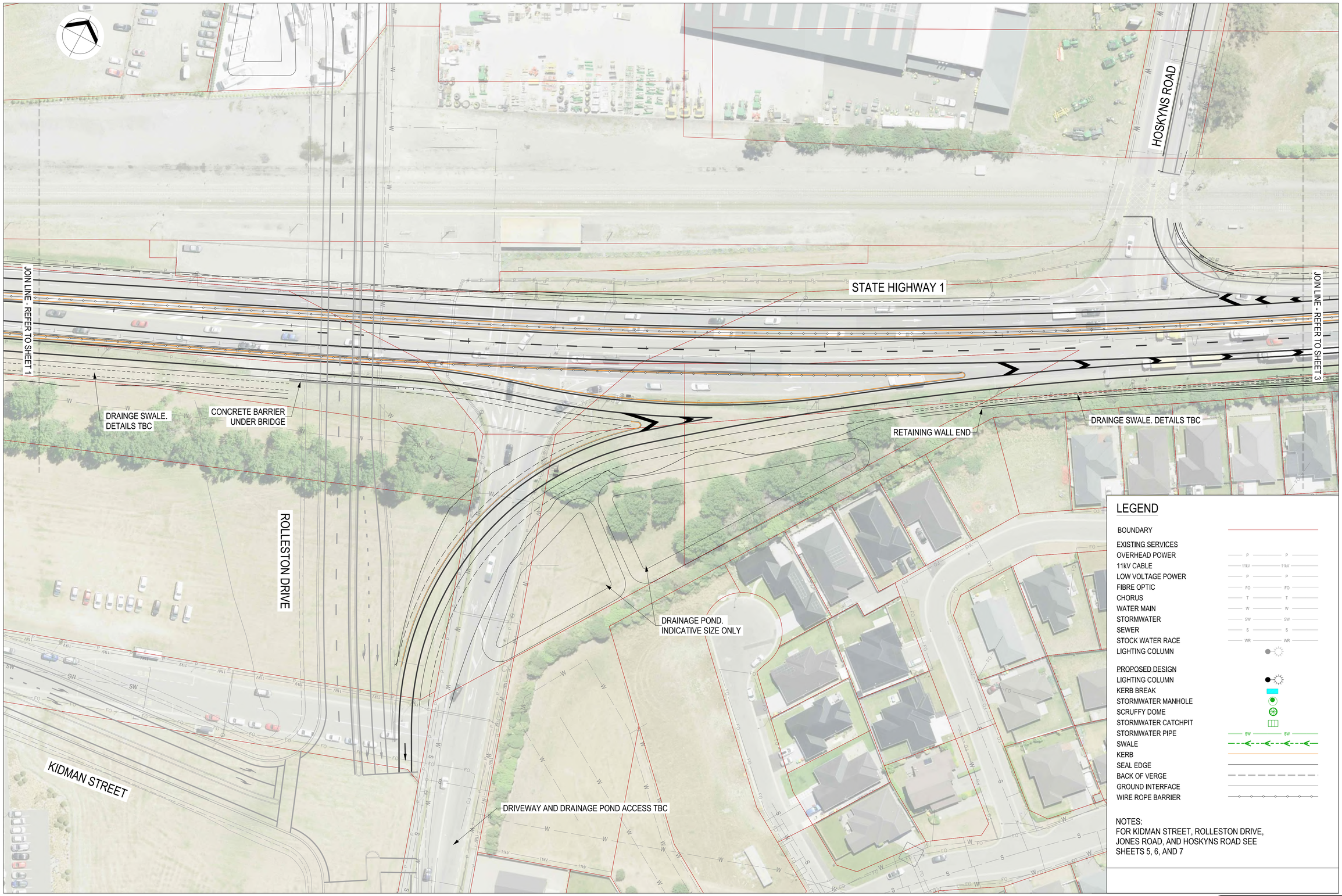
Document No. $FILE$

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DO NOT SCALE FOR SET OUT DIMENSIONS

DO NOT SCALE

IF IN DOUBT ASK.



LEGEND

- BOUNDARY

EXISTING SERVICES
- OVERHEAD POWER
- 11kV CABLE
- LOW VOLTAGE POWER
- FIBRE OPTIC
- CHORUS
- WATER MAIN
- STORMWATER
- SEWER
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- STORMWATER CATCHPIT
- STORMWATER PIPE
- SWALE
- KERB
- SEAL EDGE
- BACK OF VERGE
- GROUND INTERFACE
- WIRE ROPE BARRIER

NOTES:
FOR KIDMAN STREET, ROLLESTON DRIVE, JONES ROAD, AND HOSKYNS ROAD SEE SHEETS 5, 6, AND 7

CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
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Project: SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 2

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Discipline: CIVIL ENGINEERING

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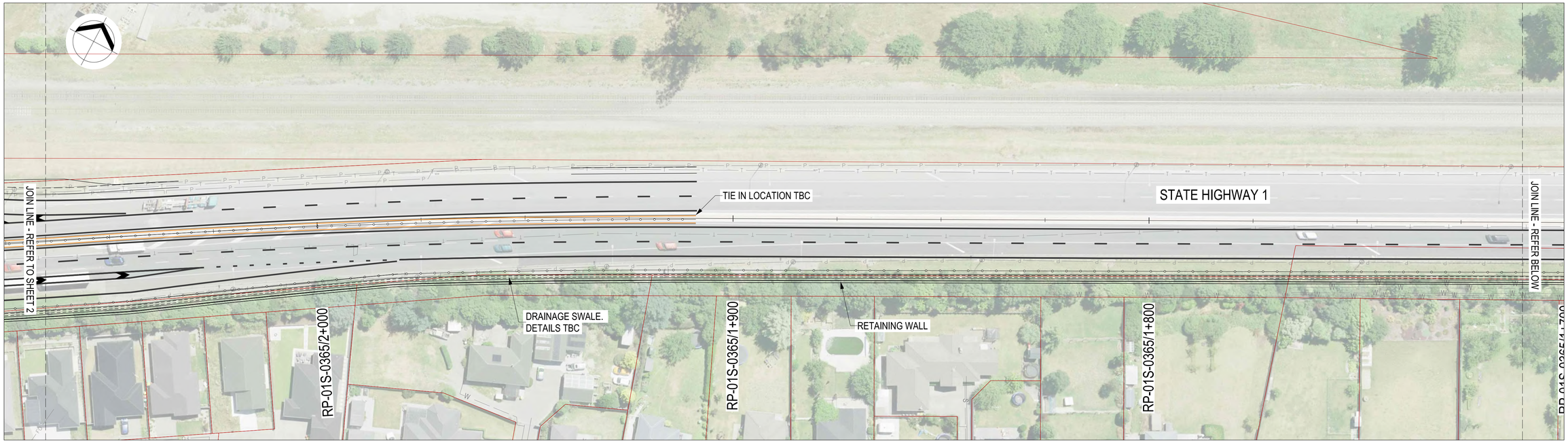
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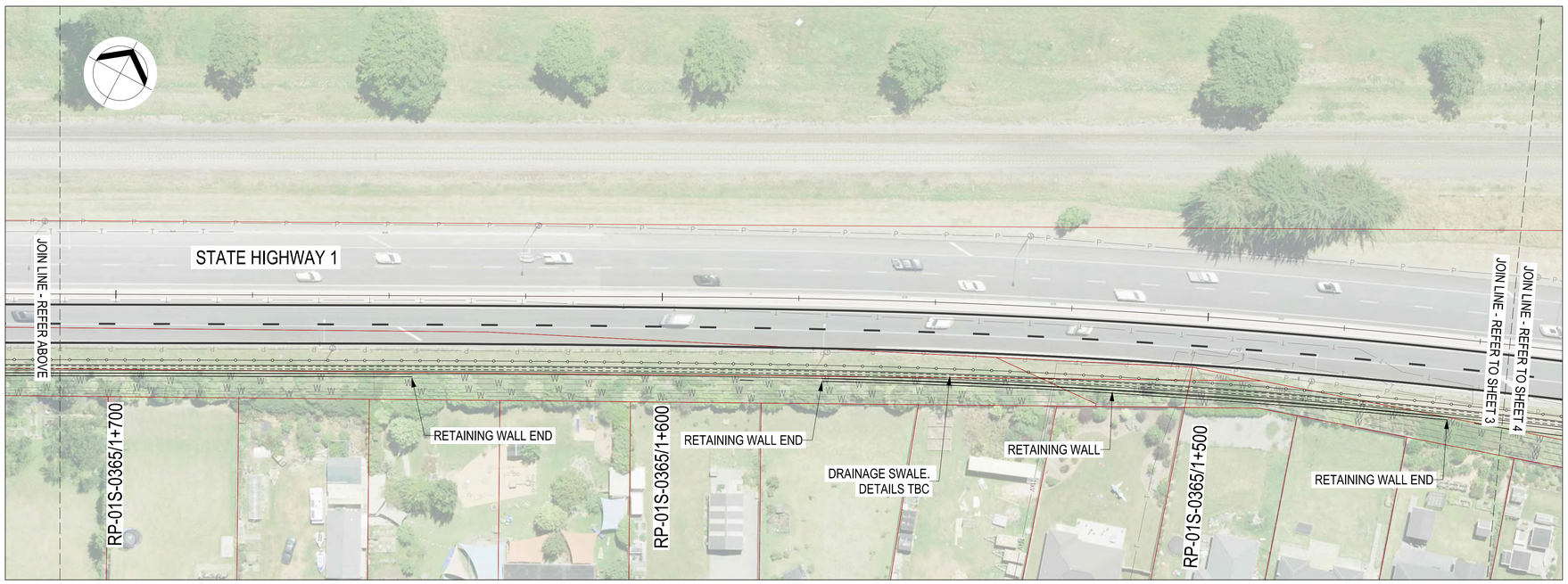
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LEGEND

- BOUNDARY
- EXISTING SERVICES
- OVERHEAD POWER
- 11kV CABLE
- LOW VOLTAGE POWER
- FIBRE OPTIC
- CHORUS
- WATER MAIN
- STORMWATER
- SEWER
- STOCK WATER RACE
- LIGHTING COLUMN
- PROPOSED DESIGN
- LIGHTING COLUMN
- KERB BREAK
- STORMWATER MANHOLE
- SCRUFFY DOME
- STORMWATER CATCHPIT
- STORMWATER PIPE
- SWALE
- KERB
- SEAL EDGE
- BACK OF VERGE
- GROUND INTERFACE
- WIRE ROPE BARRIER

NOTES:

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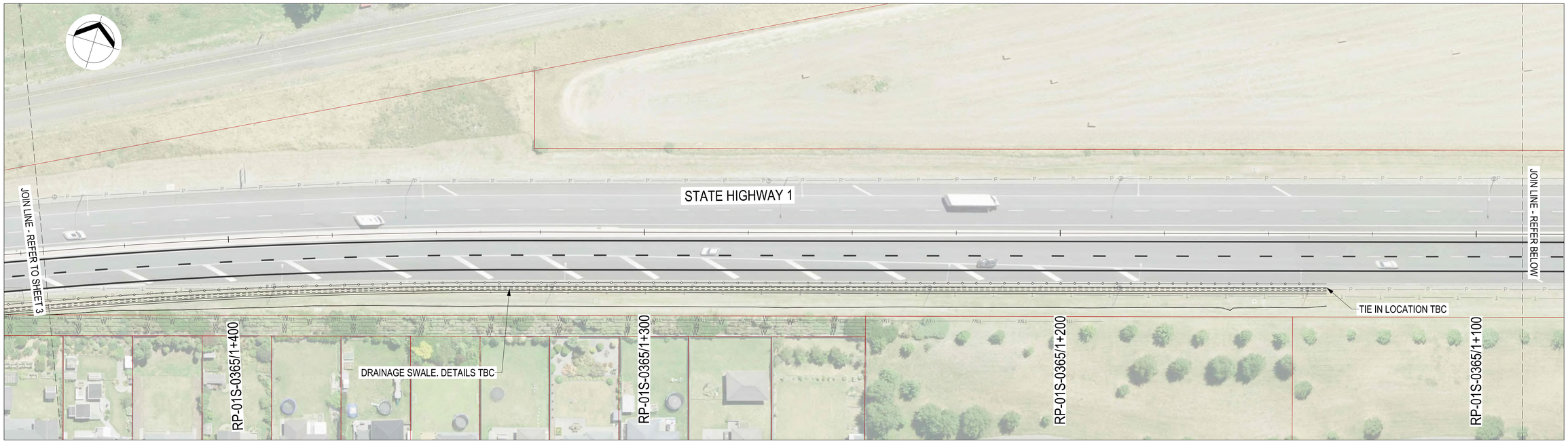
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LEGEND

BOUNDARY	
EXISTING SERVICES	
OVERHEAD POWER	P
11kV CABLE	11kV
LOW VOLTAGE POWER	P
FIBRE OPTIC	FO
CHORUS	T
WATER MAIN	W
STORMWATER	SW
SEWER	S
STOCK WATER RACE	WR
LIGHTING COLUMN	
PROPOSED DESIGN	
LIGHTING COLUMN	
KERB BREAK	
STORMWATER MANHOLE	
SCRUFFY DOME	
STORMWATER CATCHPIT	
STORMWATER PIPE	SW
SWALE	
KERB	
SEAL EDGE	
BACK OF VERGE	
GROUND INTERFACE	
WIRE ROPE BARRIER	

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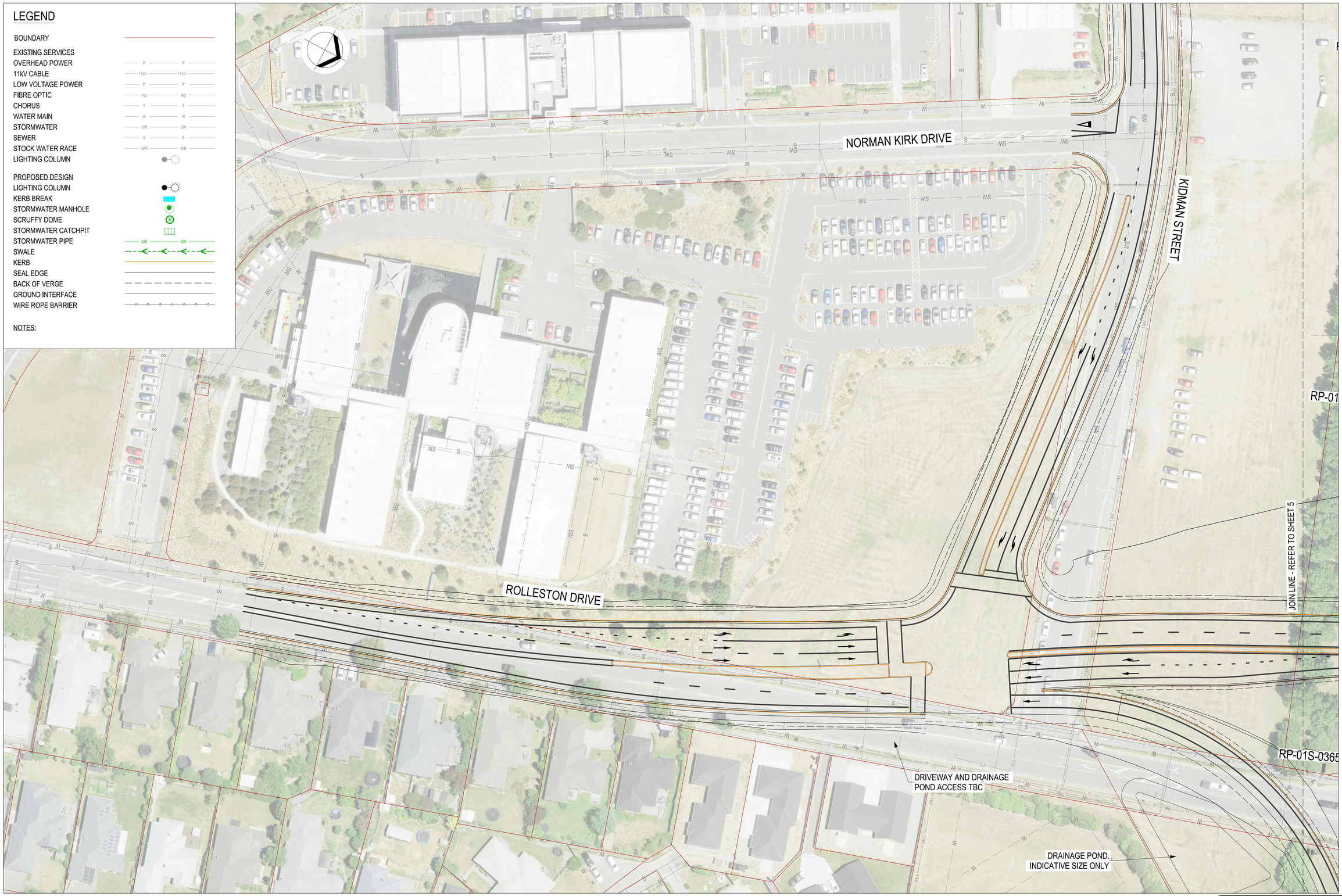
LEGEND

BOUNDARY

EXISTING SERVICES
- OVERHEAD POWER
- 11kV CABLE
- LOW VOLTAGE POWER
- FIBRE OPTIC
- CHORUS
- WATER MAIN
- STORMWATER
- SEWER
- STOCK WATER RACE
- LIGHTING COLUMN

PROPOSED DESIGN
- LIGHTING COLUMN
- KERB BREAK
- STORMWATER MANHOLE
- SCRUFFY DOME
- STORMWATER CATCHPIT
- STORMWATER PIPE
- SWALE
- KERB
- SEAL EDGE
- BACK OF VERGE
- GROUND INTERFACE
- WIRE ROPE BARRIER

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Project: SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 2

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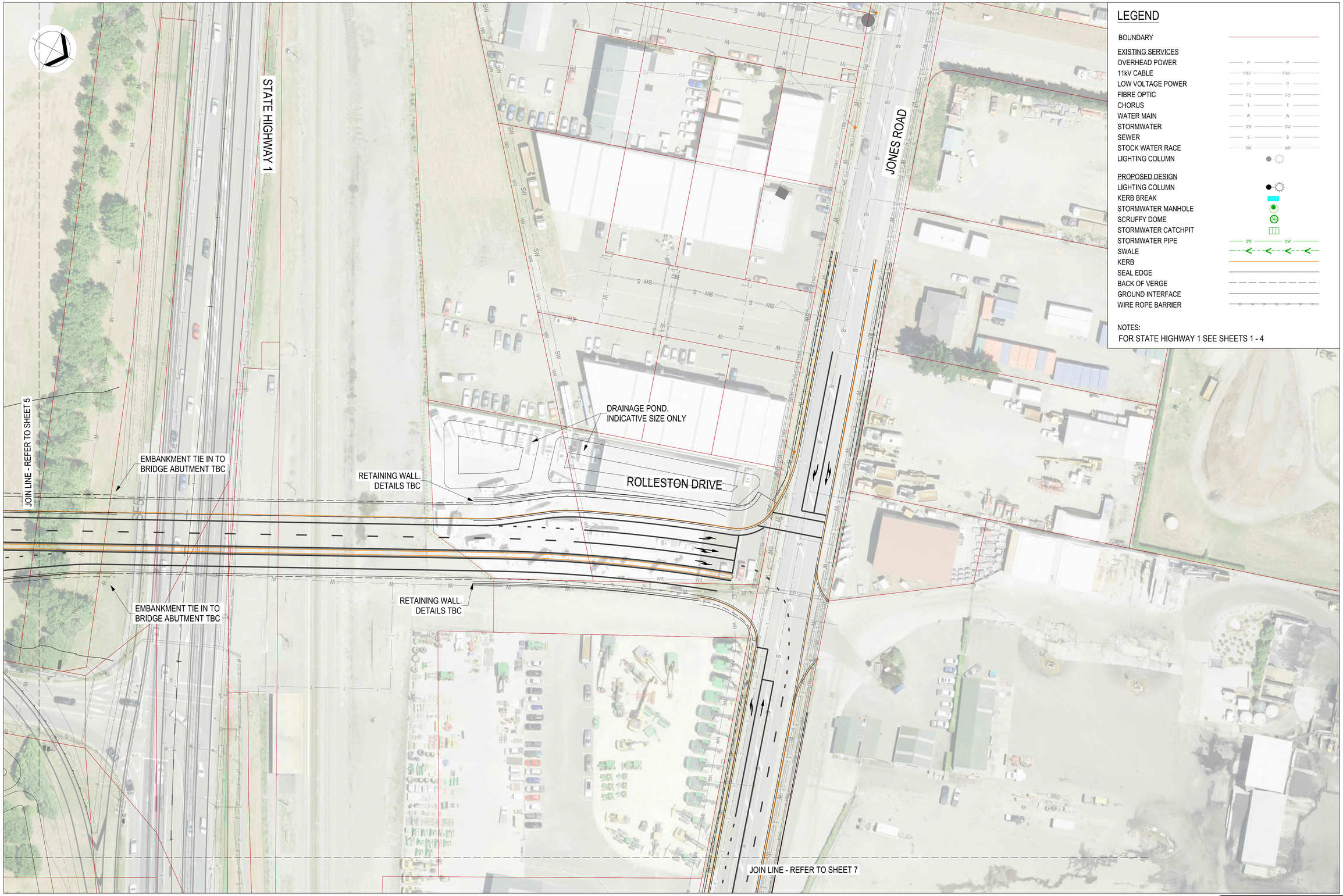
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LEGEND

- BOUNDARY

EXISTING SERVICES
- OVERHEAD POWER
- 11kV CABLE
- LOW VOLTAGE POWER
- FIBRE OPTIC
- CHORUS
- WATER MAIN
- STORMWATER
- SEWER
- STOCK WATER RACE
- LIGHTING COLUMN

PROPOSED DESIGN
- LIGHTING COLUMN
- KERB BREAK
- STORMWATER MANHOLE
- SCRUFFY DOME
- STORMWATER CATCHPIT
- STORMWATER PIPE
- SWALE
- KERB
- SEAL EDGE
- BACK OF VERGE
- GROUND INTERFACE
- WIRE ROPE BARRIER

NOTES:
FOR STATE HIGHWAY 1 SEE SHEETS 1 - 4

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LEGEND

BOUNDARY

EXISTING SERVICES
OVERHEAD POWER
11kV CABLE
LOW VOLTAGE POWER
FIBRE OPTIC
CHORUS
WATER MAIN
STORMWATER
SEWER
STOCK WATER RACE
LIGHTING COLUMN

PROPOSED DESIGN
LIGHTING COLUMN
KERB BREAK
STORMWATER MANHOLE
SCRUFFY DOME
STORMWATER CATCHPIT
STORMWATER PIPE
SWALE
KERB
SEAL EDGE
BACK OF VERGE
GROUND INTERFACE
WIRE ROPE BARRIER

NOTES:
FOR STATE HIGHWAY 1 SEE SHEETS 1 - 4

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LEGEND

- BOUNDARY
- CONTOURS (0.5m MAJOR INTERVAL, 0.1m MINOR INTERVAL)

EXISTING SERVICES
- POWER
- FIBRE OPTIC
- CHORUS
- WATER MAIN
- STORMWATER
- SEWER
- STOCK WATER RACE
- LIGHTING COLUMN
- STORMWATER MANHOLE
- SCRUFFY DOME
- STORMWATER CATCHPIT / BUBBLE UP
- STORMWATER SOAKPIT

PROPOSED DESIGN
- LIGHTING COLUMN
- STORMWATER MANHOLE
- SCRUFFY DOME
- STORMWATER CATCHPIT / BUBBLE UP
- STORMWATER SOAKPIT
- STORMWATER PIPE
- SWALE
- KERB
- SEAL EDGE
- BACK OF VERGE
- GROUND INTERFACE
- WIRE ROPE BARRIER

CATCHMENTS:
- IMPERVIOUS AREA
- PERVIOUS AREA
- INDUSTRIAL AREA
- BASIN

NOTES:
1. SOAKAGE BASINS ASSUME AN INFILTRATION RATE OF 100 mm/hr

EXTENT OF CATCHMENT DETERMINED BY TIME OF CONCENTRATION FROM HIGH POINT OF OVERPASS

JONES ROAD

ROLLESTON DRIVE

FIRST FLUSH BASIN
VOLUME=250 cu.m
DEPTH=1m

FIRST FLUSH BASIN
VOLUME=250 cu.m
DEPTH=1m

footpath to boundary

JOIN LINE - REFER BELOW

891.26535 Sq.m

1445.14984 Sq.m

100

91.544 CT

STATE HIGHWAY 1

75

50

25

0

54.976 CTC

19.976 CTC

JOIN LINE - REFER TO SHEET 2102

806.22871 Sq.m

footpath

KIDMAN STREET

NORMAN KIRK DRIVE

SOAKAGE BASIN
VOLUME = 1350 cu.m
DEPTH=1m

FIRST FLUSH BASIN
VOLUME=950 cu.m
DEPTH=1m

JOIN LINE - REFER ABOVE

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Project: SH1 ROLLESTON ACCESS IMPROVEMENTS

Title: STORMWATER CATCHMENT PLAN PACKAGE 2 SHEET 1 OF 7

Discipline: CIVIL ENGINEERING

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B

Appendix B – Stantec Preliminary Site Investigation Report (2023)

Rolleston Access Improvements Preliminary Site Investigation

PREPARED FOR Waka Kotahi NZ | May 2023

We design with community in mind

Stantec

Revision schedule

Rev No	Date	Description	Signature of Typed Name (documentation on file)			
			Prepared by	**Checked by**	**Reviewed by**	**Approved by**
1	5/11/2023	Rolleston Access Improvements PSI	E Wilson-Hill	S Fellers	K Halder	A Newman

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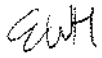
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Quality statement

Project manager	Project technical lead
Alix Newman	Alan Kerr / Melissa Merlo

PREPARED BY



Ellen Wilson-Hill ..... 1 / 05 / 2023

CHECKED BY



Scott Fellers ..... 03 / 05 / 2023

REVIEWED BY



Kathryn Halder ..... 08 / 05 / 2023

APPROVED FOR ISSUE BY



Alix Newman ..... 11 / 05 / 2023

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P.O Box 13-052, Armagh, Christchurch, 8141
Tel +64 3 366 7449
STATUS FINAL | Project No 310204503

Executive summary

Waka Kotahi NZ Transport Agency (the client) has engaged Stantec New Zealand (Stantec) to complete a Preliminary Site Investigation (PSI) in accordance with the Statement of Work for the improvement of safety and access along State Highway One (SH1) through Rolleston, Christchurch. The overall project alignment has been split into five sub-project alignments, that follow Main South Road (SH1) and its surrounding areas. The project works will comprise of the upgrade of approximately 6.7 km of road alignment.

The PSI comprised of a desktop study review and virtual site inspection of publicly available information pertaining to the project site to determine:

- If an activity or industry described in the October 2011 edition of the Ministry for the Environment (MfE) Hazardous Activities and Industries List (HAIL) is being undertaken, has been undertaken, or is more likely than not to have been undertaken within or adjacent to the proposed project site; and
- The risk to human health from potentially contaminated soil.

Land use activities described in the October (2011) edition of the HAIL list were identified through the publicly available information from Environment Canterbury's databases, the Listed Land Use Register[1] and Canterbury Maps[2].

The PSI has identified several confirmed and potential HAIL sites in the area within and surrounding the overall project alignment. It is considered possible that the associated contaminants from three HAIL sites could have migrated in concentrations to impact soils within this project alignment. Thus, it is considered that portions of the Rolleston Drive alignment are likely to be a HAIL sites and therefore subject to the Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).

It is recommended that:

- Further investigation including soil testing be conducted on Kidman Street along the property boundaries of Lot 2 & 3 DP 501225, to assess if this part of the alignment has contaminant concentrations above background levels and thus confirmed as a HAIL site.
- Further investigation including soil testing be conducted on the northwest corner of Runners Road and Walkers Road, as shown in Figure 8-2, to assess if this part of the alignment has contaminant concentrations above background levels and thus confirmed as a HAIL site.
- The NESCS activity status of soil disturbance works as shown in Figure 8-1 and Figure 8-2, should be assessed based results of soil testing and soil disturbance and disposal volumes to determine if this is a permitted activity under Section 8*(3)* of the NESCS.
- The unexpected discovery protocol outlined in Section 10 should be followed during the construction phase for the remainder of the project site.

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Abbreviations

Abbreviation	Full Name
PSI	Preliminary Site Investigation
MfE	Ministry for the Environment
CLMG No.1	Ministry for the Environment's C*ontaminated Land Management Guidelines No. 1*
NESCS	Ministry for the Environment's *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*
HAIL	Hazardous Activities and Industries List
ECan	Environment Canterbury
LLUR	Listed Land Use Register
CSM	Conceptual Site Model
SQEP	Suitably Qualified and Experienced Practitioner
CLS	Contaminated Land Specialist
SH1	State Highway 1

1 Introduction

Waka Kotahi NZ Transport Agency has engaged Stantec New Zealand (Stantec) to complete a Preliminary Site Investigation (PSI) associated with the improvement of safety and access along State Highway One (SH1) through Rolleston, Christchurch. The overall project works comprise of the upgrade of approximately 6.7 km of access ways across five different sub-project alignments.

The proposed upgrade works will involve soil disturbance within the current road reserves and surrounding properties. The construction methodology used will be a conventional design build and therefore this PSI has been based on the concept design.

Based on the expected soil disturbance and the change of use of some land to accommodate the road improvements, a PSI is required to identify if there are any potentially contaminating historical and/or current land uses included on the Ministry for the Environment's (MfE) Hazardous Activities and Industries List (HAIL) associated with any of the land at or near the project alignment and the likelihood that there will be a risk to human health or the environment as a result of the propose works.

1.1 Investigation Objectives

The objectives of this PSI are as follows:

- Determine if an activity or industry described in the October 2011 edition of the MfE HAIL is being undertaken, has been undertaken, or is more likely than not to have been undertaken within or adjacent to the proposed project site,
- Identify potential historical and/or current sources of contamination within the proposed project site works areas and immediate surrounding areas,
- Consider the likelihood that any potentially contaminating activities identified within the project site works areas pose a risk to human health,
- Assess the need for any further investigations within any of the project site works areas and outline any further recommendations.

1.2 Scope of Report

This PSI focuses on the individual project works area and their immediate surrounds. It has been undertaken in accordance with the MfE Contaminated Land Management Guidelines (CLMG) No.1 Reporting on Contaminated Sites in New Zealand (2021) and the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).

The scope of this PSI includes the following:

- Review of Environment Canterbury's (ECan) Listed Land Use Register (LLUR)[1],
- Review of historical aerial photography held on ECan's Canterbury Maps website[2]
- Review of relevant publicly available information from ECan's databases available on Canterbury Maps[2],
- Conduct a virtual site inspection of the project alignment via Google Maps Street View[3],
- Assessment of activities or industries listed in the October 2011 edition of the MfE HAIL which are being undertaken, have been undertaken or are more likely than not to have been undertaken on or adjacent to the project alignment,
- Determine the likelihood that potentially contaminating activities identified within the project site or adjacent to it pose a risk to human health,

[1] https://llur.ecan.govt.nz/home
[2] https://mapviewer.canterburymaps.govt.nz/
[3] https://www.google.co.nz/maps

2 Site Identification

2.1 Site Overview

The project alignment is located in the Rolleston suburb of Christchurch (Figure 2-1), approximately 25 km to the southwest of the Christchurch City Centre. For this report, the project alignment has been divided into five sub-project alignments, the Walkers Road, Main South Road, Rolleston Drive, Hoskyns Road, and Railway Upgrade alignments. Descriptions of these sub-projects are provided in Sections 2.2.1, 2.2.2, 2.2.3, 2.2.4, and 2.2.5.

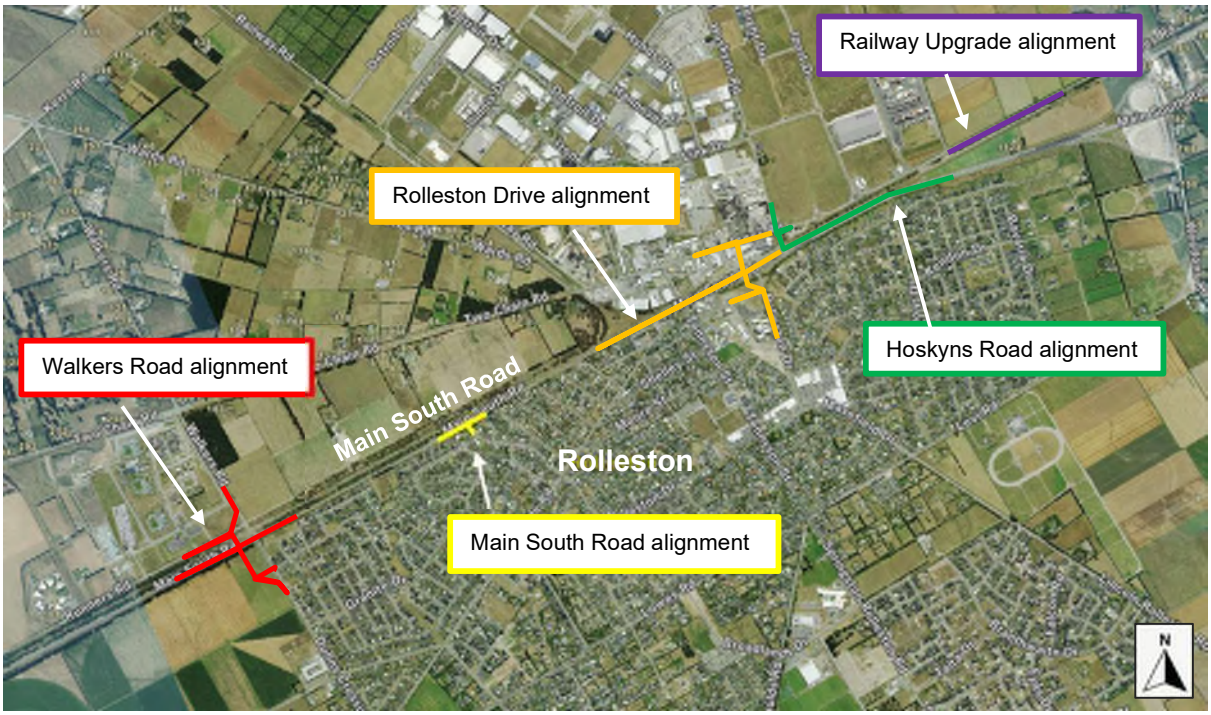


Figure 2-1 Project alignment.

2.2 Proposed Activities and Summary of Works

2.2.1 Walkers Road alignment

The proposed alignment will extend along portions of Walkers Road, Main South Road, and Dunns Crossing Road. The proposed works are located within the current road reserve and portions of surrounding properties with approximately 1.6 km of road improvements and improved access from SH1 to Walkers Road and Rolleston.

2.2.2 Main South Road alignment

The proposed alignment will extend along a portion of Main South Road and Rolleston Drive. The proposed works are likely located within the current road reserve with approximately 0.3 km of road improvements.

2.2.3 Rolleston Drive alignment

The proposed alignment will extend along a portion of Main South Road, Jones Road, Rolleston Drive, and Kidman Street. The proposed works are likely located within the current road reserve and portions of surrounding properties with approximately 2.2 km of road improvements and improved access across SH1.

2.2.4 Hoskyns Road alignment

The proposed alignment will extend along a portion of Hoskyns Roads, Jones Road, and Main South Road. The proposed works are likely located within the current road reserve with approximately 1.9 km of road improvements.

2.2.5 Railway Upgrade alignment

The proposed alignment will extend along the Railway that runs between Jones Road and Main South Road. The proposed works involve the construction of two sets of tracks in parallel to the existing railway track, with approximately 0.7 km of railway improvements.

3 Site Description

3.1 Environmental Setting

3.1.1 Geology

The regional geology of the area is described in the Institute of Geological and Nuclear Science (GNS) 1:250,000 scale geological map[4]. The Walkers Road and Main South Road project alignments' geology is defined as grey river alluvium beneath plains or low-level terraces (Q1a). While the Rolleston Drive, Hoskyns Road, and Railway Upgrade alignments' geology is defined as brownish-grey river alluvium (Q2a). Generally, alluvial deposits allow for water drainage and migration of certain contaminants through the groundwater.

3.1.2 Hydrology and Hydrogeology

The closest surface water body to the project alignment is Baileys Creek, located approximately 5.1 km south of the project alignment. There are three community drinking water protection zones[2] located within 100 m the overall project alignment, with one located within the Main South Road alignment. Piezometric data available on Canterbury Maps shows groundwater is moving in a general west to east direction towards the Pacific Ocean. Depth to groundwater is estimated to be between 4.8 and 17.5 m bgl, based on nearby bore hole data obtained from the New Zealand Geotechnical Database[5].

4 Historical Site Uses

4.1 Environmental Canterbury's Listed Land Use Register

A summary of the HAIL sites identified from ECan's Listed Land Use Register[1] (LLUR) within the 50 m of the project alignments is provided in Table 4-1 below and maps of nearby HAIL sites are provided in Figure 4-2, Figure 4-3, and Figure 4-4. Property statements and available relevant reports of the sites that have been received from the LLUR have also been summarised below.

Table 4-1 Summary of identified HAIL sites.

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
Main South Road Railway Reserve	Adjacent to all five sub-project alignments	SIT120659 SIT121411	F6 - Railway yards including goods-handling yards, workshops, refuelling facilities or maintenance areas.	This property is located within and adjacent to all five project alignments. The railway line was constructed in 1941 and is currently still in use. The railway way in its entirety is not considered a HAIL but discrete locations where a credible source of contamination has been determined to be present, should be assessed as a HAIL activity. Part of this alignment includes the Rolleston train station located at the intersection of Main South Road and Rolleston Drive, adjacent to the Rolleston Drive alignment. The railway line and station have not been investigated.	Not investigated.
Runners Road – Rolleston Prison.	Walkers Road	SIT2541	A10 – Persistent pesticide bulk storage or use. A17 – storage tanks or drums for fuel, chemicals, or liquid waste.	This property is located adjacent to the Walkers Road alignment. Since 1958 this property has been used as Rolleston Prison, prior to this it was used as agricultural land and an army detention centre. Several investigations have taken place across various areas of this property indicating several HAIL activities. Not all investigations have been summarised or available for review but those that have, have indicated that site remediation actions have occurred, or any contaminants detected were	Partially investigated

[4] GNS Web Maps
[5] https://www.nzgd.org.nz/

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
			C1 – Explosive or ordinance production, bulk storage, or disposal. E1 – Asbestos products, manufacture, or disposal. G3 – Landfill sites. G5 – Waste disposal to land. I – Any other land that has been subject to intentional or accidental release of a hazardous substance.	below background concentrations and residential land-use guidelines. Only one investigation has occurred within 50m of the project alignment. WSP conducted a soil validation report in 2019 for the sites redevelopment. They identified sources of asbestos across the property site, including ACM pipes in the Prison's visitors carpark, 60 m north of to the project alignment. After remediation works the site was considered successfully remediated and suitable for on-going use as Rolleston Prison. The HAIL category for this site notes the potential for a mortar (riffle shooting) site to have been present on this site, however there is no information on the type of activities that may have occurred. Anecdotal evidence suggests the mortar site was located on the corner of Runners Road and Walkers Road was not identified in historical aerials. However, one has been located at Burnham Military Camp as Aylesbury Shooting range since prior to 1940 and is not located within the project alignment. In accordance with the MfE guidance gun clubs or rifle ranges, including clay target clubs are excluded from the HAIL activity list. Therefore, it is likely there are none of the HAIL activities identified on the council records for this site that have occurred within 50 m of the project alignment.	
139 Two Chain Road	Walkers Road, Main South Road, and Rolleston Drive alignment	SIT120543	A8 – Livestock dip or spray race. A10 – Persistent pesticide bulk storage or use. A17 – Storage of tanks or drums for fuel, chemicals, or liquid waste. G3 – Landfill site.	This property is located adjacent to the Walkers Road, Main South Road, and Rolleston Drive alignment. This sites primary use is as agricultural land, with some associated residential properties. Several investigations have taken place across various areas of this property indicating several HAIL activities. However, none of these HAIL activities have occurred within 50 m of the project alignment.	Partially investigated.
799 Jones Road	Rolleston Drive	SIT123882	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.	This site is located adjacent to the Rolleston Drive alignment, on the southwest corner of Hoskyns Road and Jones Road. It is currently used as Drummond and Etheridge Ltd, an agricultural service. Since 2013, this site has had storage tanks or drums for fuel, chemicals, or liquid waste. There have been no investigations into activities at this site.	Not investigated.
790	Rolleston Drive	SIT16354	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.	This site is located adjacent to the Rolleston Drive alignment, on the northwest corner of Hoskyns Road and Jones Road. 73 Hire, a building equipment hire service is located at this site. Based on signage at this property, it is also used as an automotive and battery centre. Prior to 2010 it	Not investigated.

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
			F4 – Motor vehicle workshops.	appears to have been used as agricultural land until 1970, then as NRM Feeds from 1970 – 2010. The LLUR file states from 1995-1997, this property has had storage tanks or drums of fuel, chemicals, or liquid waste. Information from the landowner states that a 15,000l above ground diesel tank has been installed in 2013. The location of the fuel tank shown on the LLUR is approximately 75m north of the project alignment.	
804 Jones Road	Rolleston Drive	SIT18823	E5 – Coal or Coke yards.	This site is located adjacent to the Rolleston Drive alignment, on the northwest corner of Hoskyns Road and Jones Road. Tailored Energy Solutions Limited, a coal supplier, is located at this site and has been used as a coal or coke yard since around 2010 to present. Coal appears to have been stockpiled on site since around the 1970s. Kirk Roberts conducted a DSI in 2022 at this site due to development occurring in the south-eastern property section. The report identified potential contamination from hydrocarbons, boron, and arsenic as well as coal tar. Soil samples were analysed and were found to be below background concentrations and below commercial / industrial NESCS standards. Thus, concluded the risk to site users/construction works is low.	Investigated
801 Jones Road	Rolleston Drive	SIT263238	F6 – Railway yards. I – Any other land that has been subject to intentional or accidental release of a hazardous substance.	This site is located adjacent to the Rolleston Drive alignment. Historically this site was used as a railway yard in which coal was unloaded which caused a layer of coal dust on this property. A DSI conducted by Engineering Design Consultants in 2018 indicated that there was a large layer of black dense coal dust contaminated gravel at this property. They also indicated the potential for asbestos contamination from train brake pad use. Soil samples were collected, and results were found to be below industrial/commercial SCS. Although coal contaminated soils within the southern lot were considered combustible and have potential to create toxic, asphyxiant or noxious gasses. The risk to human health from gas/vapour inhalation was assessed as moderate. A site remediation plan was completed in 2021. The site validation report concluded that the risk to human health at this site is now negligible.	Investigated and site remediated.
812 Jones Road	Rolleston Drive	SIT24351	G4 – Scrap yards.	This property is located adjacent to the Rolleston Drive. It is used as a Global Tractors sales yard. The LLUR file for this property states it was previously used as a scrap yard including automotive dismantling, wrecking, or scrap metal yards. Based on historical aerials it was used as a scrap yard until around 2015, and the entirety of the property was covered in cars and scrap metal.	Not investigated.
814 Jones Road	Rolleston Drive	SIT176679	G4 – Scrap yards.	This property is located adjacent to the Rolleston Drive. It appears to have an abandoned house in the front yard, which historical aerials indicate was built around 2000, and multiple storage containers at the back, and an office building at the front. This property has been used as a scrap yard since prior to 2000 until 2015 with the majority of the property covered in cars and scrap metal.	Investigated.

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
				Separate Phase Ltd conducted a PSI at this site in 2017 due to the sites intended redevelopment. It was assessed that due to the historical storage of vehicles, minor hotspots of contamination may be present in topsoil. However, the property's topsoil had since been removed and the redevelopment intended to import aggregates and asphalt the site. Thus, it was concluded that this site was highly unlikely to pose a risk to human health and should be reclassified on ECan's LLUR as 'investigated – verified non-HAIL.'	
816 Jones Road	Rolleston Drive	SIT176681	G4 – Scrap yards.	This property is located adjacent to the Rolleston Drive. It is used as Canterbury Cranes, a construction company. It has been identified as a HAIL site since post-2000s and historical aerials state it was used as a scrap yard until around 2015, and the majority of the property was covered in cars and scrap metal.	Not investigated.
826 Jones Road	40 m west of Rolleston Drive	SIT3394	F4 – Motor vehicle workshops. A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.	This property is located 40 m west of the Rolleston Drive alignment. It has been used as Holland Collision Centre since around 2007 and conducts spray paintings and panel beating activities. This site was visited by Pollution Protection and noted it stores 1,000 L of waste oil and approximately 820 L of various engine / transmission oils.	Not investigated.
Kidman Street: Lot 2 & 3 DP 501225	Rolleston Drive		A1 – Agrichemicals including commercial premises used by spray contractors for filling, storing, or washing out tanks for agrichemical application. A8 – Livestock dip or spray race operations. A10 – bulk pesticide storage or use. A17 – Storage tanks or drums for fuel, chemicals, or liquid waste. A18 – Wood treatment or preservation including bulk storage.	This property is located within the Rolleston Drive alignment. Currently it appears to be an empty field with a small car park on the western side. Numerous HAIL activities have occurred on parts of this site. This includes Canterbury Tractor Company, livestock dip and spray races associated with saleyards present, a furnace, and storage of treated timber. From 1960 – 1968 this site has had storage tanks or drums for fuel, chemicals, or liquid waste on site. Malloch Environmental Ltd conducted a PSI in 2014 across Lot 2, 3 and 5 of 501225 for the Selwyn District Council. The PSI concluded that there was a low to moderate risk to human health if this site was used for residential or commercial use. It was recommended that a DSI be carried out to further investigate, as sections of this property are likely to have had activities that would have resulted in some level of soil contamination. However, there is no record of a DSI taking place. At risk areas are outlined in Figure 4-1. The investigation indicated that the most likely contaminants present are heavy metals, particularly arsenic, PAH, and TPH.	Partially investigated.

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
			F3 – Engine reconditioning workshops. F4 – Motor vehicle workshops. G4 – Scrap yards including automotive dismantling, wrecking, or scrap metal yards. H - Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment.	 **Figure 4-1 At risk areas (shaded in blue) within Lot 2 & 3 DP 501225[6].**	
37 & 51 Overbury Crescent	Rolleston Drive	SIT248358	A10 – Persistent pesticide bulk storage or use.	This property is located adjacent to the Rolleston Drive alignment and is a large residential subdivision. It was previously used for market gardens from 1990 to 2010. Geoscience Consulting Ltd conducted a PSI in 2012. Soil samples were collected but none were found above guideline criteria and deemed the site suitable for residential development.	Investigated
15 Kidman Street	Rolleston Drive	SIT16076	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste. A18 - Bulk storage of treated timber outside. I – Any other land that has been subject to intentional or accidental release of a hazardous substance.	This property is located adjacent to the Rolleston Drive alignment. This site is currently used a McDonalds; however, the previous property alignment extends further than the McDonalds site boundary and is now covered by residential property, and the St John Ambulance building. Previously this site was used as Canterbury Tractor Company from 1962 to 1968, then as Dominion Building Supplies until around 2010. LLUR property file revealed HAIL A17 occurred at this site from 1960 to 1968. The timber storage was present on site from around 1960 – 1980. Multiple investigations have taken place at this property. A PSI was conducted by Sephira Environmental in 2016 that identified the need for a DSI. The DSI was undertaken and collected test pit soil samples at four locations along the eastern McDonalds property boundary and found no	Managed – Industrial / Commercial.

[6] https://llur.ecan.govt.nz/home

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
				exceedances of commercial/industrial SCSs. It was recommendation that no further investigations were required, however, the presence of trace heavy metals and PAHs were encountered. All other reports at this site also indicated that soil sample results were below commercial / industrial SCSs.	
1705 Main South Road	Rolleston Drive	SIT9022	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste. F7 – Service Stations	This property is located adjacent to the Rolleston Drive alignment and since 2003 it has been used as a BP service station. AECOM conducted a soil validation report at this site in 2013 during excavation works to install new underground petroleum storage tanks. The site has had a history of storage tanks dating back to 1960. Soil samples were collected from stormwater infiltration basins and in the new tank pit. Samples were tested for PAHs, BTEX, TPH, copper, lead, and zinc, the results showed the site is acceptable for commercial land use.	Investigated.
4 Tennyson Street	Rolleston Drive	SIT558	F4 – Motor vehicle workshops F7 – Service Stations	This property is located adjacent to the Rolleston Drive alignment. It appears to be an undeveloped site but previous was used as an automotive garage that sold fuel and serviced cars from 1930 until 2008. It was noted that fuel tanks were removed from site in 2001, some soil contaminated with fuel was removed during this. Malloch Environmental Ltd conducted a PSI, DSI, and Remediation Action Plan in 2015. Initial soil sampling indicated lead contamination in the surrounds of the former building. Zinc and lead levels across the site were above background levels but below residential levels. A site remediation plan proposed to excavate and remove contaminated soil and remaining building foundations, however whether this plan has been undertaken is unclear.	Investigated.
2 Brookside Road	Rolleston Drive	SIT214811	I – Any other land that has been subject to intentional or accidental release of a hazardous substance.	This property is located adjacent to the Rolleston Drive alignment. The property has a large building that operates as Rolly Inn. Historically this site had another tavern and adjoining garage, however these were demolished and the Rolly Inn bar/restaurant and two retail shops were constructed. Engineering Design Consultants Ltd conducted a DSI in 2018 at this site prior to the new Rolly Inn bar being constructed. It was stated that there was potential lead, asbestos, and PAH contamination from previous building materials and the builders yard. 17 soil samples were collected from the 20 test pit locations made across the site. Samples were tested for asbestos, petroleum hydrocarbons, BTEX, and pesticides. All samples did not exceed commercial/industrial SCSs, except for one that slightly exceeded limits for lead. It was recommended that the isolated area with elevated lead concentrations be excavated and disposed of offsite at the beginning of site development. There is no indicated this remediation occurred, but the site has since been redeveloped and capped over.	Investigated – not considered a HAIL site.
4 Brookside Road	Rolleston Drive	SIT214811	I – Any other land that has been subject to intentional or accidental release of a hazardous substance.	This property is located adjacent to the Rolleston Drive alignment and has been used as a Z petrol station since 2021. AECOM completed a DSI in 2018 prior to its development to a service station. The investigation indicated that the site is considered suitable for ongoing commercial / industrial use and is highly	Investigated – not considered a HAIL site.

Address	Alignment	LLUR ID	HAIL category	Description of HAIL activity	Contaminated Land Status
				unlikely to pose a risk to human health if the land is redevelopment into a service station.	
Parklane Subdivision	Hoskyns Road		A8 – Livestock dip or spray race operations. A10 – Persistent pesticide bulk storage or use.	This site is located adjacent to the Hoskyns Road alignment. The site is currently a residential subdivision since approximately 2010, prior to this from 1942 – 2010 this site was used as agricultural land. Geoscience Consulting Ltd conducted a PSI in 2012. The report stated that a hazelnut orchard was planted in 1995, however it was noted that no sprays or chemicals were used on the plants. LLUR files on this property state the potential for an apple orchard on this site, indicating persistent pesticide bulk storage or use could have occurred. However, it was determined that the site was suitable for residential land use.	Investigated.
57 Weedons Ross Road	50 m north of Railway Upgrades alignment.		A8 – Livestock dip or spray race operations. G3 – Landfill sites.	This property is located 50 m north of the Railway Upgrades alignment. It is used primarily for agricultural. Several investigations have taken place across various areas of this property indicating several HAIL activities. However, none of these HAIL activities have occurred within 50 m of the project alignment.	Partially investigated.

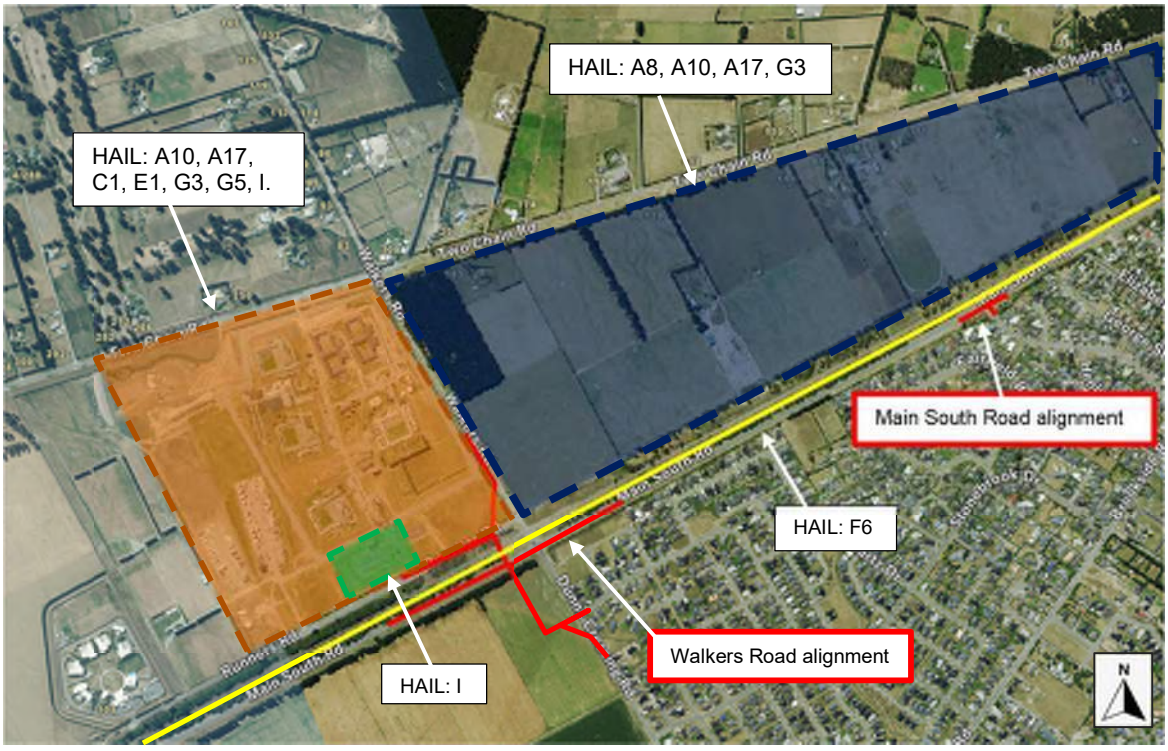


Figure 4-2 Identified HAIL sites with the Walkers Road and Main South Road alignments (red line).

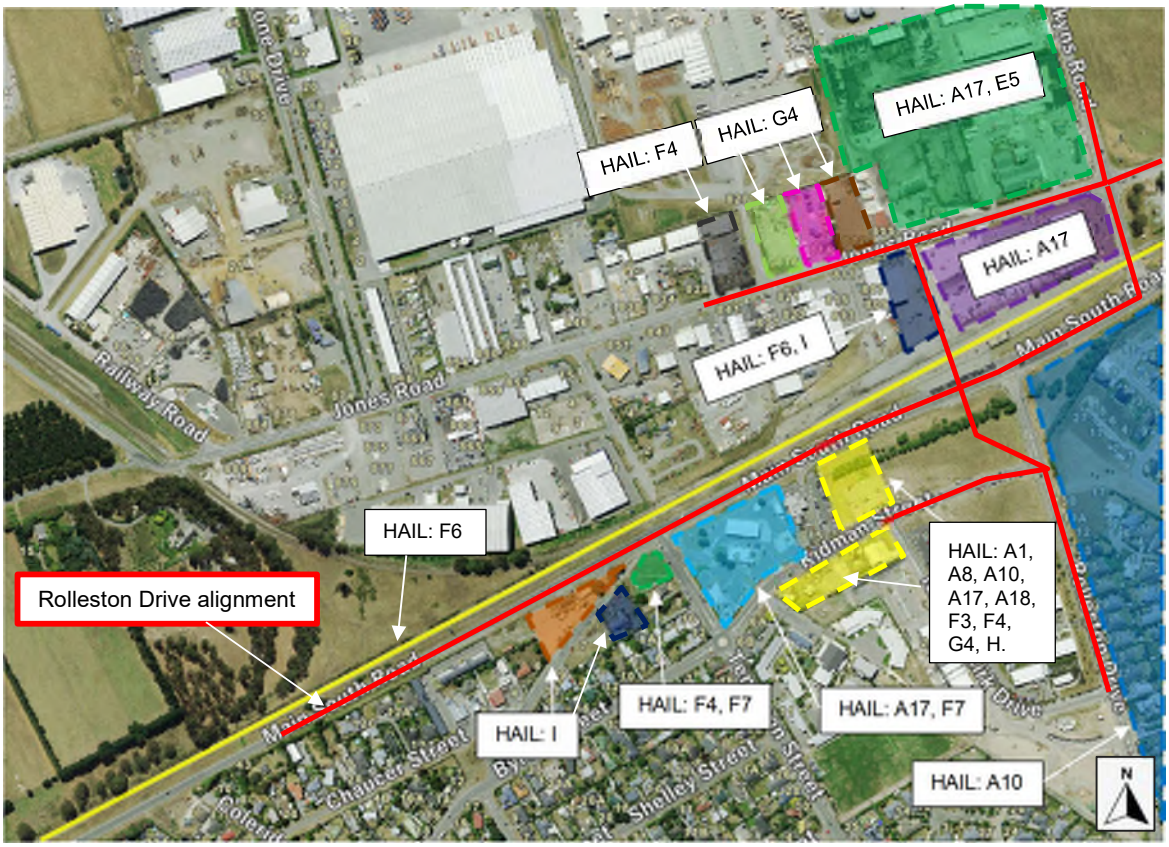


Figure 4-3 Identified HAIL sites with the Rolleston Drive alignment (red line).

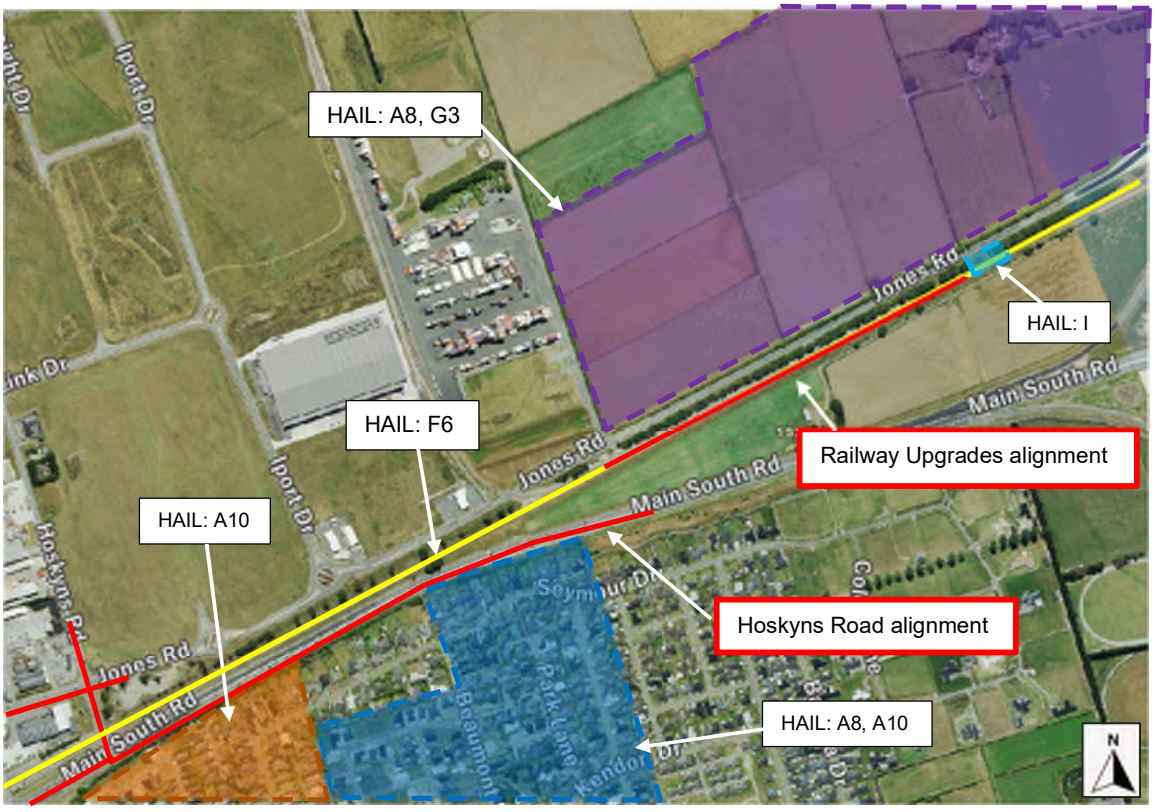


Figure 4-4 Identified HAIL sites within the Hoskyns Road and Railway Upgrades alignments (red line).

4.2 Historical Aerial Photographs

A desktop assessment of historical and current land uses in and within 50 m of the project site of the proposed project alignments has been undertaken to identify any land uses and land use changes that may indicate the presence of HAIL sites affecting the overall project alignment and to further add to the information already provided as part of Council records. This information is summarised in Table 4-2 below. The historical aerial photographs are provided in Appendix B of this report.

Table 4-2 Summary of historical aerial photographs.

Year	Walkers Road	Main South Road	Rolleston Drive & Hoskyns Road	Railway Upgrades
1940	The project alignment and the surrounding land is predominately used as agricultural and forestry land. Walkers Road, Runners Road, Main South Road, Dunns Crossing Road, and the railway track have all been constructed. A large structure, potentially a water tank, has been built adjacent to the Walkers Road project alignment, on the corner of Walkers Road and Runners Road. There is also a square platform near the tank and a small shed. The land southwest of the Main South Road and Dunns Crossing Road intersection, both within and surrounding the alignment, is being used for forestry. There is a farmland property located within the forestry land, and within the Walkers Road alignment along Main South Road.	The project alignment and the surrounding land is predominately used as agricultural land. Main South Road, Brookside Road, and the railway line (HAIL F6) have been constructed.	Jones Road, Main South Road, Tennyson Street, Hoskyns Road, Brookside Road, and the Rolleston railway line and railway station (HAIL F6) have all been constructed. The land between Jones Road and Main South Road has been used for forestry, while the rest of the land within and surrounding the alignment is predominantly agricultural land. Several industrial and residential buildings have been constructed at the intersection of Main South Road, Jones Road, and Tennyson Street. In particular, at the present 5 Brookside Road is an industrial site with three buildings. There are two rural residential/farmland properties located on the southern side of Main South Road, adjacent to the Hoskyns alignment.	Jones Road, Main South Road, and the railway line has been constructed. There are two buildings that are located east of the railway line, along Jones Road, one is adjacent to the alignment that appears to be a residential property and shed, and the other approximately 100 m east. There a residential/farmland property located 70 m south of the alignment at 1528 Main South Road.
1960	No significant change from previous aerial.	No significant change from previous aerial.	Further industrial and commercial development has occurred at the Main South Road and Jones Road intersection and along the southern Main South Road roadside, adjacent to the Rolleston Drive alignment. There appears to be a small outdoor timber storage site at 5 Brookside Road, 70 m south of the Rolleston Drive alignment.	No significant change from previous aerial, aside from the railway building east of the alignment being removed.

Year	Walkers Road	Main South Road	Rolleston Drive & Hoskyns Road	Railway Upgrades
			A large property located adjacent to the Rolleston Drive alignment along Main South Road (now 15 Kidman Street) has several industrial buildings and multiple parked cars. It also has an outdoor timber storage yard (HAIL A18) located approximately 80 m south of the alignment.	
1970	A road built off Runners Road has been extended and is now located 100 m northwest of the alignment section that runs along Runners Road. There are several residential properties along both sides of the road. Appears to be a cluster of sheep around hay bales within the project alignment on the west side of Walker Road, next to the water tank. The shed next to the water tank has been removed.	No significant change from previous aerial.	The southern side of Main South Road and both sides of Tennyson road have seen residential development. Multiple industrial buildings previously along these roads have been removed (HAIL I), including the industrial and timber storage site at 7 Brookside Road. The industrial site at 15 Kidman Street now appears to have timber stored 40 m south of the alignment. A large industrial site has been constructed adjacent to the Rolleston Drive alignment at 790 Jones Road. The property has a large industrial building and two large tanks (HAIL A17) connected at the rear, as well as several smaller buildings across the site. Another industrial building at 804 Jones Road has also been constructed.	No significant change from previous aerial, aside from the Jones Road railway house adjacent the project alignment being removed (HAIL I).
1980	The residential block on Runners road has been further developed and is now located adjacent to the project alignment along Runners Road. The property on the forestry site has been removed. The forestry trees have grown significantly.	No significant change from previous aerial.	No significant change from previous aerial, aside from the residential area that has been further developed and timber storage removed at 15 Kidman Street.	No significant change from previous aerial.
1990	Market gardens (HAIL A10) have been planted to the 70 m west of the northern most section of the project alignment along Walkers Road. These have been planted within Rolleston Prison that has been noted to	No significant change from previous aerial.	There has been significant farmland development with multiple market gardens (HAIL A10) grown adjacent to the Rolleston Drive alignment, specifically south of Main South Road adjacent to the future Rolleston Drive. A farmland property also sits on this land.	No significant change from previous aerial.

Year	Walkers Road	Main South Road	Rolleston Drive & Hoskyns Road	Railway Upgrades
	have been constructed greater than 50 m north of the alignment. The water tank and square platform located on the corner of Runners Road and Walkers Road has been removed and the water tank location dug out.		The northern roadside of Jones Road has seen a few more residential or industrial buildings constructed adjacent to the Rolleston Drive alignment.	
2000	The market gardens have been expanded to the east and are now located 40 m from the project alignment. The residential area off Runners Road has been removed and cleared (HAIL I). The dug-out area where the water tank was located has been infilled. It is unknown what materials have been used and therefore there is a potential for (HAIL G5) waste disposal to exist. The grass over the top of this area has not grown back. The forestry land has been significantly cleared.	No significant change from previous aerial.	No significant change from previous aerial aside from Rolleston Drive being constructed.	No significant change from previous aerial, aside from a large tank, likely a water tank, being constructed 50 m south of the alignment at property 1528 Main South Road.
2010	No significant change from previous aerial aside from the forestry land has been completely cleared. Evidence of the historic water tank can no longer be seen, and the land has been flattened and is used as a grassed paddock	There has been extensive residential development adjacent to the project alignment on the southern side of Main South Road. Rolleston Drive has been constructed.	The majority of the market gardens on the corner of Main South Road and east side of Rolleston Drive have been removed and replaced by residential properties, adjacent to both the Rolleston Drive and Hoskyns Road alignment. The Selwyn District Council and Youth Council has been constructed on the western Rolleston Drive roadside, adjacent to the south-western section of the Rolleston Drive alignment. Significant industrial development has occurred along both sides of Jones Road, adjacent to the Rolleston Drive alignment. This includes the multiple	No significant change from previous aerial.

Year	Walkers Road	Main South Road	Rolleston Drive & Hoskyns Road	Railway Upgrades
			collision repair shops (HAIL F4), and Tailored Energy Solutions – a coal supplier (HAIL E5), and Landscape supplier store. Also adjacent to the Rolleston Drive alignment is a BP truck stop (HAIL F7) at 1705 Main South Road and a Z service station (HAIL F7) at 4 Brookside Road. There are two cell phone towers and at the base are green electrical boxes (HAIL E2) on the corner of Hoskyns Road and Jones Road (Lot 1 DP 475847), adjacent to the Hoskyns Road alignment.	
Latest	No significant change from previous aerial aside from a large carpark that has been built approximately 50 m west of the alignment along Runners Road.	No significant change from previous aerial.	No significant change from previous aerial, aside from further residential development on the southern side of Main South Road, adjacent to the Hoskyns Road alignment. The Selwyn District Council has constructed a carpark.	No significant change from previous aerial.

5 Virtual Site Inspection

A virtual site inspection of the project alignment was completed using 2019 and 2022 Google Street Viewer[7] data and 2023 Google Maps[8] data. One site was identified in the inspection that was not outlined on the LLUR. Virtual site inspection notes can be found in Table 5-1 and the relevant screenshot found in Appendix C .

Table 5-1 Potential sites of concern from virtual site inspection.

Location	Virtual site visit notes	Potential HAIL Category
821 Jones Road	This site is located adjacent to the Rolleston Drive alignment. It has been identified as Diesel Fix, a diesel engine repair service (HAIL F4), since 2017. The site has a large building and carpark with several cars parked outside.	F4 – Motor vehicle workshops.

[7] https://www.google.com/streetview/
[8] https://www.google.com/maps/

6 Summary of Identified HAIL Sites

All identified HAIL activities for each HAIL site have been summarised in Table 6-1 below based on the information gathered from the LLUR, historical imagery, and the virtual site inspection.

Table 6-1 Summary of HAIL sites identified in PSI.

Address	HAIL Activity
Runners Road residential area	I – Any other land that has been subject to the intentional or accidental release of a hazardous substance.
Corner of Runners Road and Walkers Road.	Unverified G5 – Waste disposal to land (excluding where biosolids have been used as soil conditioners). Unverified C1 – Explosive or ordinance production, bulk storage, or disposal.
4 Brookside Road	F7 – Service Stations.
5 Brookside Road	A18 - Bulk storage of treated timber outside. I – Any other land that has been subject to the intentional or accidental release of a hazardous substance.
821 Jones Road	F4 – Motor vehicle workshops.
Main South Road Railway Reserve	F6 - Railway yards including goods-handling yards, workshops, refuelling facilities or maintenance areas.
15 Kidman Street	
799 Jones Road	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.
790 Jones Road	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.
804 Jones Road	E5 – Coal or Coke yards.
801 Jones Road	F6 – Railway yards.
812 Jones Road	G4 – Scrap yards.
814 Jones Road	G4 – Scrap yards.
816 Jones Road	G4 – Scrap yards.
826 Jones Road	F4 – Motor vehicle workshops.
Lot 2 & 3 DP 501225	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste.
37 & 51 Overbury Crescent	A10 – Persistent pesticide bulk storage or use.
1705 Main South Road	A17 – Storage tanks or drums for fuel, chemicals, or liquid waste. F7 – Service Stations.
4 Tennyson Street	F4 – Motor vehicle workshops. F7 – Service Stations.
2 Brookside Road	I – Any other land that has been subject to the intentional or accidental release of a hazardous substance.
Parklane Subdivision	A8 – Livestock dip or spray race operations. A10 – Persistent pesticide bulk storage or use.
Jones Road railway house	I – Any other land that has been subject to the intentional or accidental release of a hazardous substance.

7 Risk Assessment

Several properties have been identified as HAIL sites in proximity to the overall project alignment. However, not all these sites are likely to pose a risk to human health or the environment during the project works.

A preliminary Conceptual Site Model (CSM) is a tool used in the determination of the potential risk to human health and/or the environment as a result of soil and/or groundwater conditions. An assessment is undertaken to identify the likely presence or absence of the following elements:

- ***Source*** - a substance that is capable of causing an unacceptable risk to human and/or environmental health.
- ***Pathway*** - a mode or route by which the substance/source can migrate to a receptor.
- ***Receptor*** - someone and/or something that could be adversely affected by the substance/source.

Where one or more of the CSM elements are absent then a complete pathway for contamination cannot exist and therefore the potential risk to human and/or environmental health is considered low. Where a complete source, pathway,

receptor linkage can be identified then the likelihood of risk to the project works is considered medium or high (depending on the characteristics of the potential contaminants present) and will require further investigation and possible remediation and/or management.

A summary of the likelihood of risk to the project works associated with each site is identified in Table 7-1. The rankings, low, medium, and high, indicate the assessed level of risk to the project works or likelihood of disturbance from the contaminants potentially associated with the identified HAIL sites.

Table 7-1 Summary of risk from HAIL sites identified during desktop assessment.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
Runners Road residential area	Adjacent	Low	This sites HAIL activities relate to its identification as a HAIL I site in relation to potential contaminants from the demolition of former buildings on the site. Due to this sites redevelopment into a carpark for the Rolleston Prison in 2018, and the location adjacent to the project alignment rather than within it. It is considered unlikely that any potential contaminants would have migrated from this property to the project alignment in concentrations to cause harm to human health.	No further investigations recommended.
Corner of Runners Road and Walkers Road.	Adjacent	Low - Medium	This sites HAIL activities relate to the potential of unauthorised waste disposal to have occurred to backfill a small area on site and the unverified information that the land was once a mortar launching site. The project works cross part of this property, but the current project alignment is outside the footprint where unauthorised materials may have been disposed of. The disturbed land is located north of the alignment and the flow of groundwater west to east, it is unlikely any potential contamination at this location would migrate to the project works. The uncertainty around the historical use of this site as a mortar launching site would require further testing to assess if any residual contamination could be present.	Further investigations recommended.
4 Brookside Road	Adjacent	Low	This sites HAIL activities relate to its use as a Z service station since the end of 2021. Previous investigation at this site indicates that there is no evidence of any HAIL activities occurring at this site and is considered suitable for ongoing commercial / industrial use and is highly unlikely to pose a risk to human health if the land is redevelopment into a service station. This along with the site being modern and expected to have modern environmental protections to prevent leaks from fuel storage	No further investigations recommended.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
			tanks, and the sites location south of the alignment with the flow of groundwater west to east means it is highly unlikely that any potential contaminants would have migrated to the project alignment.	
5 Brookside Road	40 m south	Low	This sites HAIL activities related to its presence of a timber storage site and to its identification as a HAIL I site in relation to potential contaminants from the demolition of former buildings on the site. There has been no investigation into contamination at this site however due to the historical timber storage sites distance of 70 m south of the alignment, the flow of groundwater west to east, and the redevelopment of this site in around 2004 into a veterinary clinic. This site is unlikely to pose a risk to human health during site works.	No further investigations recommended.
15 Kidman Street	Adjacent	Low	This sites HAIL activities are related to the storage tanks or drums for fuel, chemicals, or liquid waste. There have been several investigations at this property. All reports have determined that any contamination at this site is below commercial/industrial guidelines, thus, this site is unlikely to pose a risk to human health during site works.	No further investigations recommended.
Main South Road Railway Reserve	Adjacent	Low	This sites HAIL activities relate to its use as a Railway reserve. There have been no investigations into potential contamination at this site. Due to this site's usage as a railway line rather than yard, it is considered unlikely that any potential contaminants would be present in concentrations that will pose a risk to human health or the environment during site works.	No further investigations recommended.
799 Jones Road	Adjacent	Low	This sites HAIL activities relate to its storage of tanks or drums for fuels, chemicals, or liquid waste. There have been no investigations at this site, however, the tanks are recently installed (2013) and are not expected to be for commercial sales, i.e., relatively small. It is considered unlikely that any potential contaminants would have migrated from this property to the project alignment in concentrations to cause harm to human health.	No further investigations recommended.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
790 Jones Road	Adjacent	Low	This sites HAIL activities relate to its storage of tanks or drums for fuels from 1995-1997, and as a current automotive service shop. The auto shop appears to be contained in modern buildings along the south part of the site. Storage of fuel and or oils appears to be located at the rear of the shop approximate 50m north of the project alignment. Some staining can be seen around the stored fuel/oil, but the site appears to be fully paved which would allow minimal contact with the underlying soils. Therefore, it is unlikely that any potential contaminants would have migrated from this property to the project alignment in concentrations harmful to human health.	No further investigations recommended.
804 Jones Road	Adjacent	Low	This sites HAIL activities relate to its use as a coal supplier. A previous investigation by Kirk Roberts at this site indicates the risk to site users and construction workers from potential contamination associated with the HAIL E5 activity is low. This, along with majority of this site's activities occurring 100 m north of the alignment, makes it unlikely that any potential contamination at this site would have migrated to the project alignment in concentrations to pose a risk to human health.	No further investigations recommended.
801 Jones Road	Adjacent	Low	This sites HAIL activities relate to its use as a railway yard. Previous investigations found soil contaminated with coal dust contaminated gravel that had combustible potential and was a risk to human health. The site has since been remediated and testing indicated that the risk of this site to human health is negligible. Therefore, this site is a low risk to the project works.	No further investigations recommended.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
812 Jones Road	Adjacent	Low	This sites HAIL activities relate to its historical use as a scrap yard from 2009 to 2014. This site is currently used as a tractor sale yard, with majority of the activities appearing to occur at the rear of the property, 60 m north of the alignment. An investigation at 814 Jones Road stated that the properties previous land use as a scrap yard likely would have resulted in minor hotspots of contamination present in topsoil. It appears in Google Street View that upon subsequent development of the site that the topsoil has been removed and the site is now covered with gravel hardstand. This has likely removed much of the source of contamination. Based on this it is unlikely that contamination has migrated to the project site is concentrations to harm human health.	Soil sampling is recommended along the property boundaries.
814 Jones Road	Adjacent	Low	This sites HAIL activities relate to its historical use as a scrap yard. Previous investigations for this site have stated that topsoil would have likely had minor hotspots of contamination. The investigation also states that topsoil has been removed and hardstand placed over the site. This has likely removed much of the source of contamination. Based on the removal of the main source of contamination and the current land use as storage for shipping containers, it is unlikely any contamination from this site would have migrated to the project alignment in concentrations that will pose a risk to human health.	No further investigations recommended.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
816 Jones Road	Adjacent	Low	This sites HAIL activities relate to its historical use as a scrap yard. This site is currently used by Canterbury Cranes with the rear appearing to be used as storage of equipment. No investigations have occurred at this site but an investigation at 814 Jones Road stated that these properties previous land use as a scrap yard likely would have resulted in minor hotspots of contamination present in topsoil. Since the site's use as a scrap yard buildings on the site have been removed and the site appears to be covered with hardstand gravel thus removing the main source of contamination. Based on the removal of the main source of contamination and the current land as storage of equipment, it is unlikely any contamination from this site would have migrated to the project alignment in concentrations that will pose a risk to human health.	Soil sampling is recommended along the property boundaries.
826 Jones Road	Adjacent	Low	This sites HAIL activities refer to its use as a collision centre panel beaters shop. The site appears tidy, modern, asphalted over, and activities appear to occur within the large buildings. It is considered unlikely that any contaminants associated with activities on the site would have migrated to the project alignment in concentrations that would impact human health.	No further investigations recommended.
Kidman Street: Lot 2 & 3 DP 501225	Adjacent	Medium	The LLUR lists the site's HAIL activities in reference to historical storage of tanks or drums for fuel, chemicals, or liquid waste. No further information is given on the LLUR about the location and scale of this tank. Previous investigation by Malloch Environmental state that numerous HAIL activities have occurred on the site. It was identified that soils within the western and south-western sections of this site present a low to medium risk to human health. These sections are located adjacent to the Rolleston Drive alignment on Kidman Street. Thus, there may be potential for contaminants associated with this site to migrate to within the project alignment and pose a risk to human health during the project works.	Soil sampling is recommended along west part of Kidman Street.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
37 & 51 Overbury Crescent	Adjacent	Low	This sites HAIL activities relate to the presence of historical market gardens. Contaminants associated with pesticides tend to bond strongly with soil. This makes it unlikely for contamination to migrate to the project alignment. Given Rolleston Drive was not established at the time the market gardens existed, there is a small chance of spray drift leading to minor contamination. If this occurred, it would have been limited to topsoil which would have been removed during the construction of Rolleston Drive. Additionally, due to the extensive residential redevelopment at this location, it is likely that any contamination at this site would have been removed during redevelopment.	No further investigations recommended.
1705 Main South Road	Adjacent	Low	This sites HAIL activities relate to its use as a BP service station. Previous investigations at this site have stated that soil at this site is considered acceptable for commercial land use and ongoing petroleum handling works. Thus, it is unlikely that this site will pose a risk to the project works and soil within commercial guidelines.	No further investigations recommended.
4 Tennyson Street	Adjacent	Low	This sites HAIL activities relate to its use as an automotive garage and service station. Previous investigations have stated that soil samples collected and analysed were below residential guidelines. However, a site remediation plan was proposed to remove contaminated soil and the remaining building foundations. It is unclear whether the site has been remediated based on suggestions. However, due to the soil being below residential guidelines, and the flow of groundwater west to east away from the alignment, it is unlikely any contamination at this site would have migrated from this property to the project alignment and will not pose a risk to human health.	No further investigations recommended.

Address	Proximity to project alignment	Risk	Comment	Further Investigations
2 Brookside Road	Adjacent	Low	This sites HAIL activities relate to its identification as a HAIL I site in relation to potential contaminants from the demolition of former buildings on the site. Previous investigations stated that any soil samples collected and analysed in the surrounding land in test pits, did not exceed commercial/industrial guidelines. Because of this, the sites redevelopment, its location south of the project alignment, and flow of groundwater west to east, it is unlikely any contamination at this site would have migrated from this property to the project alignment.	No further investigations recommended.
Parklane Subdivision	Adjacent	Low	This sites HAIL activities relate to the presence of historical market gardens. Contaminants associated with pesticides tend to bond strongly with soil. This makes it unlikely for contamination to migrate to the project alignment. Given Rolleston Drive was not established at the time the market gardens existed, there is a small chance of spray drift leading to minor contamination. If this occurred, it would have been limited to topsoil which would have been removed during the construction of Rolleston Drive. Additionally, due to the extensive residential redevelopment at this location, it is likely that any contamination at this site would have been removed during redevelopment.	No further investigations recommended.
Jones Road railway house	Adjacent	Low	This sites HAIL activities relate to its identification as a HAIL I site in relation to potential contaminants from the demolition of former buildings on the site. This site appears to not have been used since the buildings demolition, however the project works will not be occurring within this property alignment and given this properties location east of the alignment and the flow of groundwater west to east, it is unlikely any contamination at this site would have migrated from this property to the project alignment in concentrations to cause harm to human health.	

8 Conclusions

This PSI was completed in accordance with the NESCS comprising of a desktop study and of publicly available information relating to the project site and a virtual site inspection to assess potential for contaminated soil to be encountered during project works.

The PSI has identified several HAIL activities within and in the surrounds of the proposed safety and access upgrade works within the Rolleston Drive sub-project alignment. However, at all but one site it is assessed as unlikely that contaminants associated with these sites would be disturbed as part of the project or have migrated to impact soils within these sub-project alignments to the extent to be harmful to human health or the environment.

It is assessed that the site along Kidman Street at Lot 2 & 3 DP 501225 has the possibility for contaminants of concern associated with the activities to cause harm to human health during the project works. The section of Kidman Street is therefore classified under HAIL activity H which applies to, *Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment'.* Therefore, the portion of the Rolleston Drive alignment as shown in Figure 8-1 below is subject to the requirements of the NESCS.

There is also uncertainty over the historical land use on the north-western corner of Runners Road and Walkers Road. Further investigations are required to verify if any contaminants are present at this site. Therefore, the portion of the Walkers Road alignment as shown in Figure 8-2 below is subject to the requirements of the NESCS. Further information on this site has been requested from the client but has not been received at the time of this reporting.

The remainder of the project alignment is not assessed as being a HAIL site and therefore not subject to the NESC.

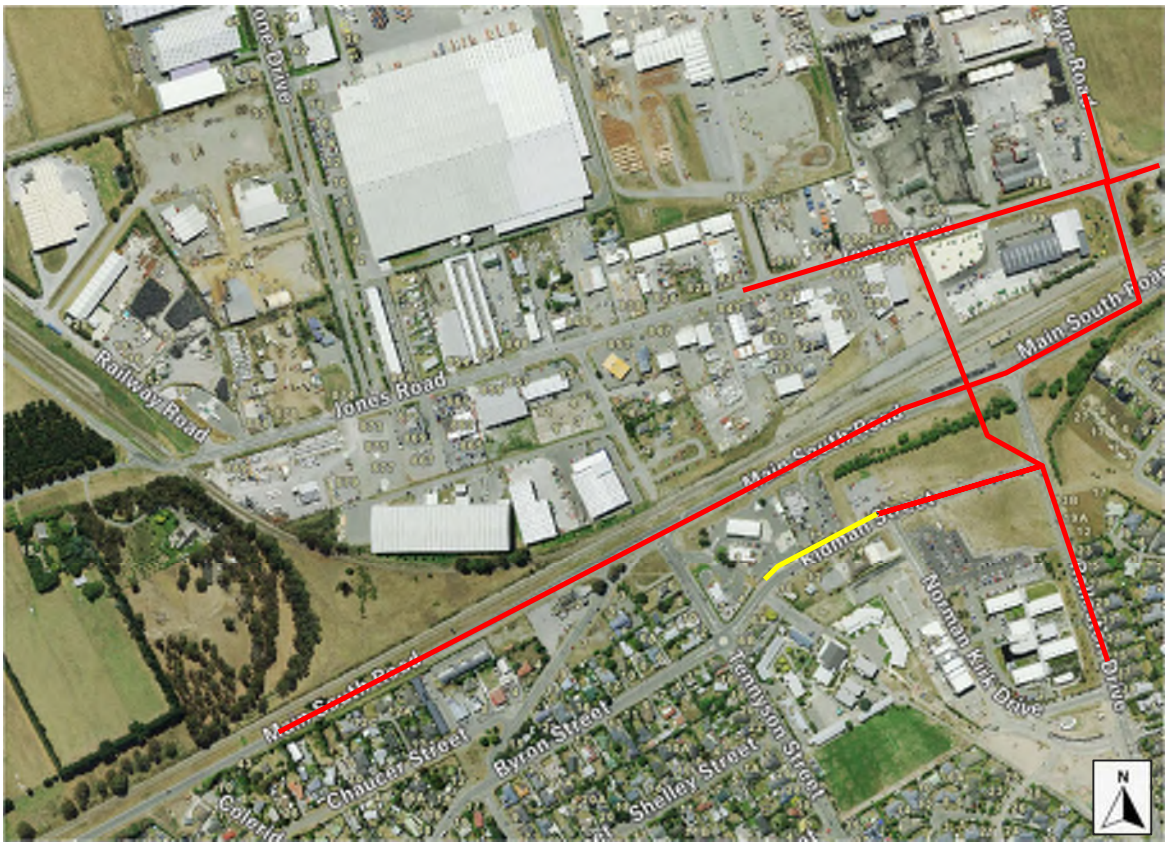


Figure 8-1 Sections of the Rolleston Drive alignment (red line) identified as possibly a HAIL H site (yellow line) and subject to the requirements of NESCS.



Figure 8-2 Sections of the Walkers Road alignment (red line) identified as possibly a HAIL H site (yellow line) and subject to the requirements of NESCS.

9 Recommendations

It is recommended that the following further investigations are required for this project:

- Further investigation including soil testing be conducted on Kidman Street along the property boundaries of Lot 2 & 3 DP 501225, to assess if this part of the alignment has contaminant concentrations above background levels and thus confirmed as a HAIL site.
- Further investigation including soil testing be conducted on the northwest corner of Runners Road and Walkers Road, as shown in Figure 8-2, to assess if this part of the alignment has contaminant concentrations above background levels and thus confirmed as a HAIL site.
- The NESCS activity status of soil disturbance works as shown in Figure 8-1 and Figure 8-2, should be assessed based results of soil testing and soil disturbance and disposal volumes to determine if this is a permitted activity under Section 8*(3)* of the NESCS.
- The unexpected discovery protocol outlined in Section 10 should be followed during the construction phase for the remainder of the project site.

10 Discovery of Unexpected Contaminants

10.1 Overview

During the construction phase of the project, it is possible that unexpected / accidental discovery of contamination / hazardous material could be encountered, including but not limited to:

- Intact or broken drums and containers.
- Soil with unusual odours.
- Indicators of coal tar (for example, strong naphthalene (moth ball) odour and texture ranging from viscous tar to low density clinker rock).
- Discoloured or stained water and soil.
- Hydrocarbon contaminated soil and/or free product.
- Liquid waste and any material that normally would be sent to a licensed landfill facility.
- Waste containers.
- Asbestos containing materials (ACM).

10.2 Unexpected Discovery Protocol

During earthworks, site personnel will actively monitor areas for the conditions/materials specified above. If newly discovered contaminated material is encountered, it must remain in situ until a Contaminated Land Specialist (CSL), or a Suitably Qualified Experienced Practitioner (SQEP) has been notified and had the opportunity to assess the material.

If potentially contaminated material is discovered, the following actions shall be taken:

- Work within the immediate vicinity of the impacted material shall cease.
- The Construction Manager (or similar) will contact the CLS / SQEP.
- Health and Safety restrictions will be implemented including limiting access to the area, shutting down equipment to reduce potential ignition sources as well as unintentionally spreading contamination around the site. Establishing an exclusion zone around the area of potential contamination, clearly delineating, isolating and securing these areas as required. The location of the zone should be established by the Site Supervisor with input from the CLS / SQEP.
- Any stormwater generated as part of the site works is to be directed away from the material, if this cannot be achieved then the material should be covered (e.g., tarpaulin) to reduce the risk of runoff.
- The CSL / SQEP will advise on the appropriate course of action which may include the completion of additional soil testing. All sampling and testing shall be completed in general accordance with the CLMG No.5 – Site Investigation and Analysis of Soils, MfE (2011).
- Construction works will not resume within the affected area until the CLS/SQEP advises it is safe to do so.

10.2.1 Asbestos

If asbestos material is observed or suspected during the earthwork, all works shall cease in the immediate vicinity and the CLS / SQEP will be contacted. The CLS / SQEP will review site conditions and provide guidance on how to proceed. Depending on the volume of asbestos discovered or whether it is friable, additional support may be required by a qualified and experienced asbestos assessor.

The following regulations and guidelines should be referenced with respect to asbestos management:

- Health and Safety at Work (Asbestos) Regulations 2016.
- New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, 2017). Works can recommence once asbestos has been appropriately managed/safely removed as advised by the asbestos professional.

10.2.2 Coal Tar

It is possible that coal tar may be encountered within the road asphalt during the site works. It is recommended that if historical paving is encountered within the site works, the material should be tested prior to disposal. If coal tar is encountered, then the material should be disposed of at a facility authorised to accept such material.

11 Report Limitations

The conclusions contained in this report are based on a desk study and virtual site inspection. It is possible these may not provide a complete or accurate assessment of the entire site. The contents of this report are for the sole use of the client and no responsibility or liability will be accepted to any third party. Data or opinions in this report may not be used in other contexts or for any other purposes without Stantec's prior review and agreement.

Only a finite amount of information has been collected to meet the specific technical requirements of the client's brief, this report does not provide a complete assessment of the environmental statues of the project site soils and is limited to the scope defined herein. Should any further information become available regarding conditions at the project sites, including previously unknown likely sources of contamination, Stantec reserves the right to review the report in the context of the additional information.

This report has been prepared for Waka Kotahi for its own use and is based on information provided. Stantec takes no responsibility and disclaims all liability whatsoever for any loss or damage the client may suffer as a result of using or relying on any such information or recommendations contained in this report, except to the extent Stantec expressly indicates in this report that it has verified the information to its satisfaction. This report is not to be reproduced either wholly or in part without prior written permission.

A copy of this report should be provided to any contractor who is required to undertake earthworks at the site. The Contractor will need to make their own interpretation of the factual data provided. The Contractor shall comply with the recommendations of the report and the Health and Safety at Work Act 2015.

12 Suitable Qualified Environmental Practitioner Certification of the Report

National Environmental Standard for assessing and managing contaminants in soil to protect human health
PRELIMINARY SITE INVESTIGATION CERTIFYING STATEMENT

I *Kathryn Halder* certify that:

This preliminary site investigation meets the requirements of the Resource Management (National Environmental Standard for assessing and managing contaminants in soil to protect human health) Regulations 2011 because it has been:

a. done under the supervision of a suitably qualified and experienced practitioner, and
b. reported on in accordance with the current edition of Contaminated land management guidelines No 1 – Reporting on contaminated sites in New Zealand, and
c. the report is certified by a suitably qualified and experienced practitioner.

For activities under R8(4) of the NESCS this preliminary site investigation concludes it is possible that there will be a risk to human health if the activity is done to the piece of land as shown in Figure 8-1.

The activity to be undertaken as defined in R 5(5) and R5(6) is described on page 2 of this preliminary site investigation.

Evidence of the qualifications and experience of the suitably qualified and experienced practitioner(s) who have done this investigation and have certified this report is in Appendix D of this Preliminary Site Investigation report.

Signed and dated:

Signed: ……Kathryn Halder……..…….

Dated: ……08 May 2023…… ……

Appendices

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Appendix A PSI Table

The Ministry for the Environment specifies certain sections that are required for a PSI. Below is the checklist provided in the MfE 2021, *Contaminated Land Management Guidelines No. 1*, Reporting on Contaminated Sites in New Zealand. Stars indicate sections included in this report.

Table A-1 Preliminary Site Investigation table of contents.

Content	Required	Required if relied on[9]
1. Introduction		
• investigation objectives	★	
• site identification (site name, address, legal description, site boundaries, a map reference and geographic coordinates)	★	
• proposed site use.		★
2. Site description		
• environmental setting		★
• site layout	★	
• current site uses	★	
• surrounding uses	★	
• geophysical surveys		☐
• site inspection.		★
3. Historical site use (sufficient to plan investigation)		
• summary of site history gained from:		
– review of existing investigation reports		★
– review of council information		★
– review of aerial photographs		★
– interviews	N/A	☐
– review of other historical Information		★
• preliminary sampling (if carried out)	N/A	☐
– description (including diagram)		
– results		
– comparison of results to guidelines.		
4. Risk Assessment		
• Evaluate the probability that pursuant to regulation 6 (3):	★	
- *An activity or industry described in the HAIL is, or is not, being undertaken on the piece of land, or*		
- *An activity or industry described under the HAIL has, or has not, been undertaken on the piece of land, or*		
- *The likelihood of an activity or industry described in the HAIL being undertaken, or having been undertaken, on the piece of land*		

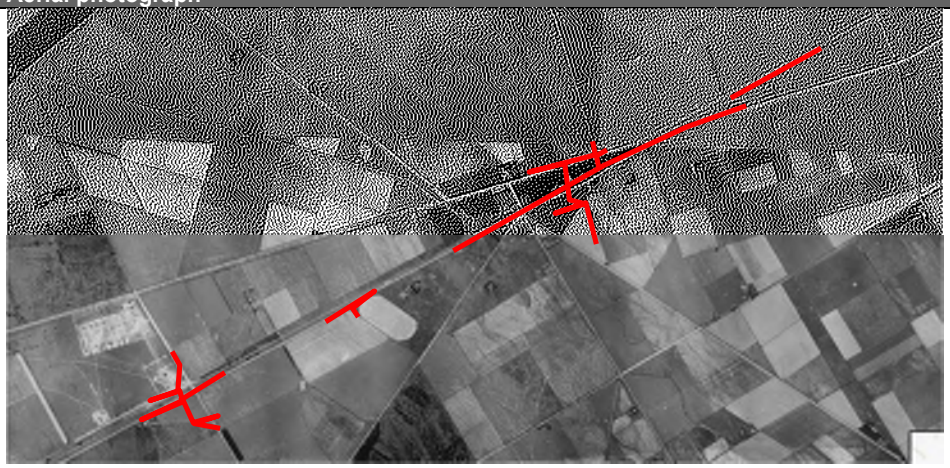
9 Any evidence relied upon to form an opinion/conclusion must be included in report.

Content	Required	Required if relied on[9]
• Evaluate the probability that pursuant to regulation 6 (3): - *The likelihood that the soil is contaminated as a result of activity or industry occurring*	★	
• Description of the limitations of the data collected and the assumptions and uncertainties inherent in the data and models used	★	
5. Conclusions	★	
6. Recommendations (if relevant to report purpose)		★
7. Report limitations	★	
8. SQEP certification of report	★	
9. References	★	
Appendices: relevant supporting information	★	

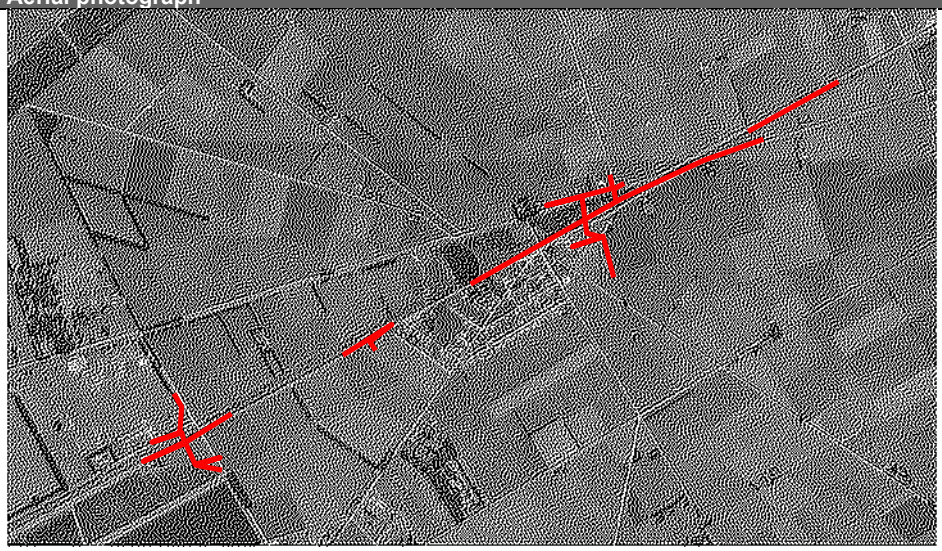
Appendix B Historical Aerial Photographs

Historical aerials were sourced from Environment Canterbury's Historical Aerial Imagery[10], the project alignments are outlined by a red line.

B-1 Historical aerial photographs of the project alignment

Year	Aerial photograph
1940-1944	
1960-1964	

[10] https://apps.canterburymaps.govt.nz/CanterburyHistoricAerialImagery/

Year	Aerial photograph
1970-1974	
1980-1984	
1990-1994	

Year	Aerial photograph
2000-2004	
2010-2015	
Latest	

Appendix C Current Site Usage Photos

C-1 Screenshots of current site usage from virtual site inspection.

Address	Current site usage
821 Jones Road	

Appendix D Evidence of Qualifications and Experience of the SQEP

KATHRYN HALDER

Kathryn is a Principal Environmental Scientist and has worked both in New Zealand and throughout the UK in contaminated land and waste management. Kathryn has over 20 years' experience working closely with Local Councils, Regulatory Authorities, Governmental bodies and businesses. She has also worked with the Ministry for the Environment in developing waste assessment guidance document and developing a NZ waste minimisation infrastructure database.

Kathryn's undergraduate and master studies were in contaminated land and site risk assessments based on historic land. She has also experience in applying the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health having carried out contaminated land investigations. She has also overseen the successful bioremediation of a number of these sites. Kathryn also has experience in working with developing 'source, pathway, receptor' models to assess risk to human health and reporting to the standard of the Ministry for the Environments Contaminated Land Management Guidelines. Kathryn has been involved as Contaminated Land technical advisor on several Waka Kotahi projects including Woodend Corridor Alignment, Ō2NL and SH58.

While in NZ, Kathryn has undertaken over 100 projects with respect to risk assessment of contaminated soil, contaminated land investigations, and contaminated soil management. Kathryn has also been responsible for:

- Preparation of preliminary site investigations (PSI)
- On site test pitting, core sample investigations, hydrovac pothole investigations and sample collection
- Preparation of detailed site investigation reports (DSI)
- Development of Waste Assessments and Waste Management and Minimisation Plans (WMMPs)
- Site Management and sediment control plans
- Hazardous Waste Management
- Landfill waste acceptance
- Environmental Monitoring
- Coal tar assessment
- Consenting applications under the National Environmental Standard for Assessing and Managing Contaminants in Soil (NESCS)

She has also spent seven years assessing special and contaminated soil waste acceptance applications for the Tasman District landfill in terms of the environmental effect, safe handling, and disposal protocols, where appropriate.

EDUCATION

- MSc (Environmental Engineering), Queens University Belfast, 1999
- BSc (Environmental Science), Aberdeen University, 1998

MEMBERSHIPS

- Member, WasteMINZ
- Full member of EIANZ
- Chartered member of CIWM while in the UK
- Environmental Practitioner (CEnvP), UK

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C

Appendix C – Historical Aerial Imagery (Additional Information Review)

canterbury maps

Historical Aerial Image - Additional Area (1940)

,QIRUPDWLRQ KDV EHHQ GHULYHG IURP YDULRXV RUJDQLVDWLRQV LQFOXGLQJ (QYLURQPHQW &DQWHUEXU\ DQG WKH &DQWHUEXU\ %RXQGDU\ LQIRUPDWLRQ LV GHULYHG XQGHU OLFHQFH IURP /,1= 'LJLWDO &DGDVWUDO 'DWDEDVH &URZQ &RS\ULJKW 5HVHUYHG &DQWHUEXU\ DQG WKH &DQWHUEXU\ 0DSV SDUWQHUV GR QRW JLYH DQG H[SUHVV[redacted]DLP[redacted]UDQW DLOLWHKW FRPSOHWHQHVV RI WKH LQIRUPDWLRQ RU LWV ILWQHVV IRU DQ\ SXUSRVH

,QIRUPDWLRQ IURP WKLV PDS PD\ QRW EH XVHG IRU WKH SXUSRVHV RI DQ\ OHJDO[redacted]DQG WKH XVHU[redacted]UHVSRQ DFFXUDF\ RI DQ\ LQIRUPDWLRQ EHIRUH WDNLQJ DQ\ DFWLRQ LQ UHOLDQFH XSRQ LW &RQWDLQV &URZQ &RS\ULJKW DQG GDWDEDVH ULJKW



canterbury maps

Historical Aerial Image - Additional Area (1960)

,QIRUPDWLRQ KDV EHHQ GHULYHG IURP YDULRXV RUJDQLVDWLRQV LQFOXGLQJ (QYLURQPHQW &DQWHUEXU\ DQG WKH &DQWHU
%RXQGDU\ LQIRUPDWLRQ LV GHULYHG XQGHU OLFHQFH IURP /,1= 'LJLWDO &DGDVWUDO 'DWDEDVH &URZQ &RS\ULJKW 5HVHUY
&DQWHUEXU\ DQG WKH &DQWHUEXU\ 0DSV SDUWQHUV GR QRW JLYH DQG H[SUHVV[redacted]DLP[redacted]UDQW DLOLWHV
FRPSOHWHQHVV RI WKH LQIRUPDWLRQ RU LWV ILWQHVV IRU DQ SXUSRVH

,QIRUPDWLRQ IURP WKLV PDS PD\ QRW EH XVHG IRU WKH SXUSRVHV RI DQ\ OHJDO[illegible]DGYLFH WKH XVHU[illegible]
DFFXUDF\ RI DQ\ LQIRUPDWLRQ EHIRUH WDNLQJ DQ\ DFWLRQ LQ UHOLDQFH XSRQ LW



canterbury maps

Historical Aerial Image - Additional Area (1970)

,QIRUPDWLRQ KDV EHHQ GHULYHG IURP YDULRXV RUJDQLVDWLRQV LQFOXGLQJ (QYLURQPHQW &DQWHUEXU\ DQG WKH &DQWHUEXU\ %RXQGDU\ LQIRUPDWLRQ LV GHULYHG XQGHU OLFHQFH IURP /,1= 'LJLWDO &DGDVWUDO 'DWDEDVH &URZQ &RS\ULJKW 5HVHUYHG &DQWHUEXU\ DQG WKH &DQWHUEXU\ 0DSV SDUWQHUV GR QRW JLYH DQG H[SUHVV [illegible] DLVWHWKW FRPSOHWHQHVV RI WKH LQIRUPDWLRQ RU LWV ILWQHVV IRU DQ\ SXUSRVH

,QIRUPDWLRQ IURP WKLV PDS PD\ QRW EH XVHG IRU WKH SXUSRVHV RI DQ\ OHJDO &RPPHUFLDO ZKHWKHU XVHU&RS\ULJKW &DQWHUEXU\ 0DSV &RQWULEXWRUV DQG GHSHQG DFFXUDF\ RI DQ\ LQIRUPDWLRQ EHIRUH WDNLQJ DQ\ DFWLRQ LQ UHOLDQFH XSRQ LW



canterbury maps

Historical Aerial Image - Additional Area (1980)

,QIRUPDWLRQ KDV EHHQ GHULYHG IURP YDULRXV RUJDQLVDWLRQV LQFOXGLQJ (QYLURQPHQW &DQWHUEXU\ DQG WKH &DQWHUEXU\ %RXQGDU\ LQIRUPDWLRQ LV GHULYHG XQGHU OLFHQFH IURP /,1= 'LJLWDO &DGDVWUDO 'DWDEDVH &URZQ &RS\ULJKW 5HVHUYHG &DQWHUEXU\ DQG WKH &DQWHUEXU\ 0DSV SDUWQHUV GR QRW JLYH DQG H[SUHVV [illegible] DQG WKH FRPSOHWHQHVV RI WKH LQIRUPDWLRQ RU LWV ILWQHVV IRU DQ\ SXUSRVH

,QIRUPDWLRQ IURP WKLV PDS PD\ QRW EH XVHG IRU WKH SXUSRVHV RI DQ\ OHJDO &RPPHUFLDO WKH XVH WKDW VXEVWDQWLDOO\ GDPDJHV &DQWHUEXU\ 0DSV &RHDWHG E&DQWHUEXU\ 0DSV RQ DFFXUDF\ RI DQ\ LQIRUPDWLRQ EHIRUH WDNLQJ DQ\ DFWLRQ LQ UHOLDQFH XSRQ LW



canterbury maps

Historical Aerial Image - Additional Area (1990)

,QIRUPDWLRQ KDV EHHQ GHULYHG IURP YDULRXV RUJDQLVDWLRQV LQFOXGLQJ (QYLURQPHQW &DQWHUEXU\ DQG WKH &DQWHU
%RXQGDU\ LQIRUPDWLRQ LV GHULYHG XQGHU OLFHQFH IURP /,1= 'LJLWDO &DGDVWUDO 'DWDEDVH &URZQ &RS\ULJKW 5HVHUY
&DQWHUEXU\ DQG WKH &DQWHUEXU\ 0DSV SDUWQHUV GR QRW JLYH DQG H[SUHVV [redacted] DLVWHU
FRPSOHWHQHVV RI WKH LQIRUPDWLRQ RU LWV ILWQHVV IRU DQ\ SXUSRVH

6FDOH 1 : #$

,QIRUPDWLRQ IURP WKLV PDS PD\ QRW EH XVHG IRU WKH SXUSRVHV RI DQ\ OHJDO &RQYH\DQFLQJ &RQWUDFW RU DQ\ GHDOLQJV &DQWHUEXU\ 0DSV &RQWULEXWRUV DQG DQ\ DFFXUDF\ RI DQ\ LQIRUPDWLRQ EHIRUH WDNLQJ DQ\ DFWLRQ LQ UHOLDQFH XSRQ LW



canterbury maps

Historical Aerial Image - Additional Area (1995-1999)

,QIRUPDWLRQ KDV EHHQ GHULYHG IURP YDULRXV RUJDQLVDWLRQV LQFOXGLQJ (QYLURQPHQW &DQWHUEXU\ DQG WKH &DQWHUEXU\ %RXQGDU\ LQIRUPDWLRQ LV GHULYHG XQGHU OLFHQFH IURP /,1= 'LJLWDO &DGDVWUDO 'DWDEDVH &URZQ &RS\ULJKW 5HVHUYHG &DQWHUEXU\ DQG WKH &DQWHUEXU\ 0DSV SDUWQHUV GR QRW JLYH DQG H[SUHVV [redacted] DQG WKH FRPSOHWHQHVV RI WKH LQIRUPDWLRQ RU LWV ILWQHVV IRU DQ\ SXUSRVH

6FDOH ˜ #$

,QIRUPDWLRQ IURP WKLV PDS PD\ QRW EH XVHG IRU WKH SXUSRVHV RI DQ\ OHJDO &RQYH\DQFLQJ ZKHWKHU XVHG RU &DQWHUEXU\ 0DSV &RQWULEXWRUV DQG DQ\ DFFXUDF\ RI DQ\ LQIRUPDWLRQ EHIRUH WDNLQJ DQ\ DFWLRQ LQ UHOLDQFH XSRQ LW



[redacted] &DQWHUEXU\ 0DSV &RQWULEXWRUV &DQWHUEXU\ DQG WKH &DQWHUEXU\ 0DSV &RQWULEXWRUV [redacted] 3URWHFWHG

canterbury maps

Historical Aerial Image - Additional Area (2000-2004)



canterbury maps

Historical Aerial Image - Additional Area (2004-2010)



canterbury maps

Historical Aerial Image - Additional Area (2010-2014)



canterbury maps

Historical Aerial Image - Additional Area (2015-2019)



D

Appendix D – Sampling Location Plan



N

Revision	Drawer	Verified	Approved	Date
0	MH	BW		17.09.24

Title: **Sampling Location Plan - Package 2 - Page 1**

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

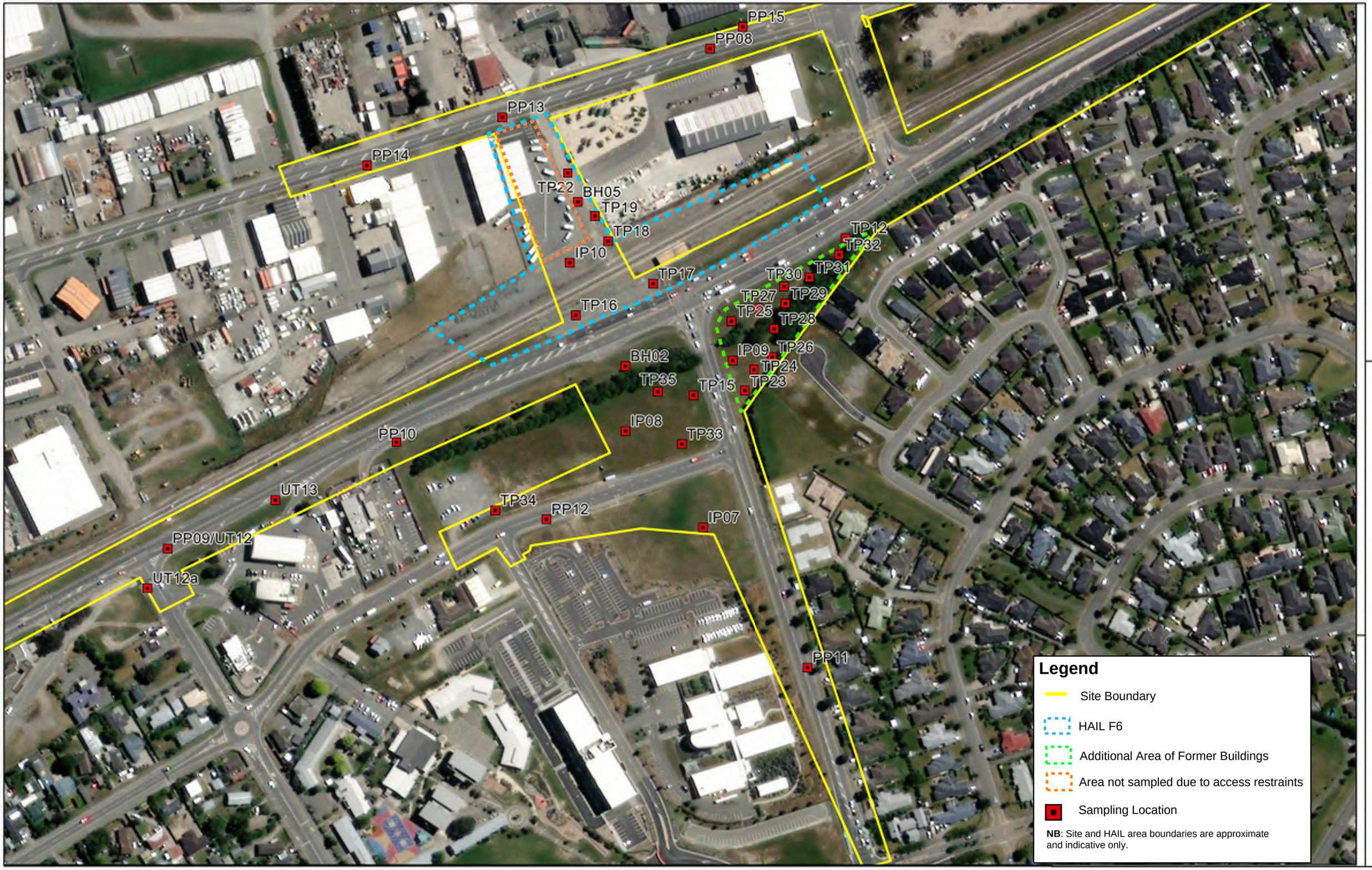
Project: Rolleston Access Upgrades

Beca

Discipline: ENVIRONMENTAL

Drawing No.

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N

Revision	Drawer	Verified	Approved	Date
0	MH	BW		17.09.24

Title: **Sampling Location Plan - Package 2 - Page 2**

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: Rolleston Access Upgrades

Beca

Discipline: ENVIRONMENTAL

Drawing No.

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N

Revision	Drawer	Verified	Approved	Date
0	MH	BW		17.09.24

Title: **Sampling Location Plan - Package 2 - Page 3**

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: Rolleston Access Upgrades

Beca

Discipline: ENVIRONMENTAL

Drawing No.

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E

Appendix E – Soil Logs and Photographs

Environmental Test Pit Log

Test Pit ID: TP12

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge approximately 50m south of Hoskyns Road and SH1 intersection	**Coordinate System:**	NZTM2000
		Northing:	5173633.7
		Easting:	1550363.3
		Vertical Datum:	
		Ground Level (mRL):	55.70
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, fine sandy SILT, trace organics; dark brown; dry, 'insensitive'. Organics: rootlets. [TOPSOIL]	
				55.5			
		ES					
						Loose, fine sandy SILT, trace organics, trace fine gravel; light brown; dry, 'insensitive'. Gravel: sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5				
		ES		55.0			
						Medium dense, fine to medium SAND, some silt; light yellowish brown; dry.	
		ES				Dense, fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
			1.0				
				54.5			
		ES					
			1.5				
				54.0			
		ES					

Date Started:	11/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Test Pit Log

Test Pit ID: TP12
Sheet 2 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge approximately 50m south of Hoskyns Road and SH1 intersection	**Coordinate System:**	NZTM2000
		Northing:	5173633.7
		Easting:	1550363.3
		Vertical Datum:	
		Ground Level (mRL):	55.70
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						2.00m - End of test pit, target depth.	
				53.5			
			2.5				
				53.0			
			3.0				
				52.5			
			3.5				
				52.0			

Date Started:	11/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP12

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On grass verge approximately 50m south of Hoskyns Road and SH1 intersection	**Coordinate system:**	NZTM2000
		Northing:	5173633.7
		Easting:	1550363.3
		Vertical datum:	
		Ground level (mRL):	55.70
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP13

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 behind 27 Marlowe Place	**Coordinate System:**	NZTM2000
		Northing:	5173820.0
		Easting:	1550690.0
		Vertical Datum:	
		Ground Level (mRL):	54.80
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				'Very loose', fine sandy SILT, some organics, fine to coarse gravel, trace clay; dark brown; moist. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
						'Loose', fine sandy SILT, trace medium to coarse gravel, trace organics; light greyish brown; dry. Gravel: gap graded, sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES		54.5		'Very dense', fine sandy fine to coarse GRAVEL, some silt, trace organics; light greyish brown; dry. Gravel: well graded, sub-rounded, slightly weathered, greywacke. Organics: rootlets. *Northern end of test pit closest to road encountered fine sandy fine to coarse GRAVEL to 0.5m bgl.*	
		ES	0.5			Medium dense, fine SAND, trace silt; light brown; dry.	
		ES		54.0			
		ES	1.0			'Dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light brown; dry. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
				53.5		1.35m - End of test pit, target depth.	
			1.5				
				53.0			

Date Started:	10/07/2024	**Logged By:**	NY	**Comments:**
Method:	VE	**Contractor:**	Alliance	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	AirVac	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP13

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 behind 27 Marlowe Place	**Coordinate system:**	NZTM2000
		Northing:	5173820.0
		Easting:	1550690.0
		Vertical datum:	
		Ground level (mRL):	54.80
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP14

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 behind 5A Seymour Drive	**Coordinate System:**	NZTM2000
		Northing:	5173962.0
		Easting:	1550960.0
		Vertical Datum:	
		Ground Level (mRL):	55.00
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				'Loose', fine sandy SILT, trace medium to coarse gravel, trace organics; light brown; dry. Gravel: gap graded, sub-rounded, slightly weathered, greywacke. Organics: rootlets. South end of pit encountered geotextile at 0.3mbgl.	
		ES					
		ES	0.5	54.5			
						0.60m - End of test pit, terminated early due to geotextile.	
			1.0	54.0			
			1.5	53.5			

Date Started:	09/07/2024	**Logged By:**	NY
Method:	VE	**Contractor:**	Alliance
Face Orientation:		**Equipment:**	AirVac

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP14

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 behind 5A Seymour Drive	**Coordinate system:**	NZTM2000
		Northing:	5173962.0
		Easting:	1550960.0
		Vertical datum:	
		Ground level (mRL):	55.00
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP15
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Grassed area north of Kidman Road, west of Rolleston Drive and south of SH1	**Coordinate System:**	NZTM2000
		Northing:	5173518.4
		Easting:	1550261.2
		Vertical Datum:	
		Ground Level (mRL):	54.60
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, fine sandy SILT, some fine to coarse gravel, some organics, minor cobbles; dark brown; moist. Gravel: gap graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
				54.5		Medium dense, silty fine to medium SAND, some fine to coarse gravel, minor organics; dark brown; moist. Gravel: poorly graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES					
						Very dense, fine to medium sandy fine coarse GRAVEL, minor silt, trace organics; light greyish brown; dry. Gravel: well graded, sub-rounded to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5				
				54.0		'Medium dense', fine to coarse SAND, minor fine to medium gravel, trace silt; light greyish brown; dry. Gravel: well graded, sub-rounded to rounded, slightly weathered, greywacke.	
		ES					
						Medium dense, fine to coarse sandy cobbly fine to coarse GRAVEL, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-rounded to rounded, slightly weathered, greywacke.	
			1.0				
		ES					
				53.5		*becomes dense*	
		ES					
			1.5				
						1.55m - End of test pit, target depth.	
				53.0			
		ES					

Date Started:	27/06/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP15

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Grassed area north of Kidman Road, west of Rolleston Drive and south of SH1	**Coordinate system:**	NZTM2000
		Northing:	5173518.4
		Easting:	1550261.2
		Vertical datum:	
		Ground level (mRL):	54.60
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP16

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On concrete area adjacent to SH1 70m southwest of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173575.0
		Easting:	1550178.0
		Vertical Datum:	
		Ground Level (mRL):	55.40
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				Dense, fine to coarse sandy fine to coarse GRAVEL, trace silt; light brownish grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES					
				55.0		Dense, fine to coarse sandy fine to coarse GRAVEL, minor cobbles, some silt; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES	0.5			*mottled orange black*	
		ES					
		ES	1.0	54.5			
		ES	1.5	54.0			
		ES		53.5			

Date Started:	22/07/2024	**Logged By:**	RO
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	DOOSAN DX140w

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Test Pit Log

Test Pit ID: TP16
Sheet 2 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On concrete area adjacent to SH1 70m southwest of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173575.0
		Easting:	1550178.0
		Vertical Datum:	
		Ground Level (mRL):	55.40
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
				53.0		2.00m - End of test pit, target depth.	
			2.5				
				52.5			
			3.0				
				52.0			
			3.5				
				51.5			

Date Started:	22/07/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP16

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On concrete area adjacent to SH1 70m southwest of Rolleston rail station	**Coordinate system:**	NZTM2000
		Northing:	5173575.0
		Easting:	1550178.0
		Vertical datum:	
		Ground level (mRL):	55.40
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP17

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On concrete area adjacent to SH1 35m southwest of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173597.3
		Easting:	1550232.7
		Vertical Datum:	
		Ground Level (mRL):	55.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Asphalt	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light brownish grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. *black staining*	
		ES		55.0			
		ES	0.5			'Very dense', silty fine to medium SAND, some fine to coarse gravel; light greyish brown; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES		54.5		'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES	1.0				
				54.0			
			1.5				
				53.5			

Date Started:	23/07/2024	**Logged By:**	RO
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	DOOSAN DX140w

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Test Pit Log

Test Pit ID: TP17
Sheet 2 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On concrete area adjacent to SH1 35m southwest of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173597.3
		Easting:	1550232.7
		Vertical Datum:	
		Ground Level (mRL):	55.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
				53.0		2.00m - End of test pit, target depth.	
			2.5	52.5			
			3.0	52.0			
			3.5	51.5			

Date Started:	23/07/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP17

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On concrete area adjacent to SH1 35m southwest of Rolleston rail station	**Coordinate system:**	NZTM2000
		Northing:	5173597.3
		Easting:	1550232.7
		Vertical datum:	
		Ground level (mRL):	55.30
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP18
Sheet 1 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 40m northwest of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173627.4
		Easting:	1550200.9
		Vertical Datum:	
		Ground Level (mRL):	55.60
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light brownish grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke.	
		ES		55.5		*black staining* *Black staining and strong hydrocarbon odour at 0.1 - 0.2 m bgl,*	
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light brownish grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke.	
		ES					
		ES	0.5	55.0		Medium dense, silty fine to medium SAND, minor fine to coarse gravel; brownish black; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. [BURIED TOPSOIL]	
						becomes orangey brown	
		ES					
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace cobbles, trace silt; brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES	1.0	54.5			
						some cobbles	
		ES	1.5	54.0			
		ES					

Date Started:	23/07/2024	**Logged By:**	RO
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	DOOSAN DX140w

Comments:
Groundwater not encountered.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Test Pit Log

Test Pit ID: TP18
Sheet 2 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 40m northwest of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173627.4
		Easting:	1550200.9
		Vertical Datum:	
		Ground Level (mRL):	55.60
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
				53.5		2.00m - End of test pit, target depth.	
			2.5	53.0			
			3.0	52.5			
			3.5	52.0			

Date Started:	23/07/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP18

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 40m northwest of Rolleston rail station	**Coordinate system:**	NZTM2000
		Northing:	5173627.4
		Easting:	1550200.9
		Vertical datum:	
		Ground level (mRL):	55.60
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP19

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 60m northwest of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173645.1
		Easting:	1550191.6
		Vertical Datum:	
		Ground Level (mRL):	56.00
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light brownish grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40.	
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; brown; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES				'Medium dense', silty fine to medium SAND, minor fine to coarse gravel; brownish black; dry. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES	0.5	55.5		Dense, fine to coarse sandy fine to coarse GRAVEL, trace cobbles, trace silt; brownish grey; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES					
		ES	1.0	55.0		Very dense, fine to coarse sandy cobbly fine to coarse GRAVEL, trace boulders, trace silt; brownish grey; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES	1.5	54.5			

Date Started:	24/07/2024	**Logged By:**	RO
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	DOOSAN DX140w

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Test Pit Log

Test Pit ID: TP19
Sheet 2 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 60m northwest of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173645.1
		Easting:	1550191.6
		Vertical Datum:	
		Ground Level (mRL):	56.00
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						Very dense, fine to coarse sandy cobbly fine to coarse GRAVEL, trace boulders, trace silt; brownish grey; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
			2.5	53.5		2.50m - End of test pit, target depth.	
			3.0	53.0			
			3.5	52.5			

Date Started:	24/07/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP19

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 60m northwest of Rolleston rail station	**Coordinate system:**	NZTM2000
		Northing:	5173645.1
		Easting:	1550191.6
		Vertical datum:	
		Ground level (mRL):	56.00
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP22

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 90m northwest of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173657.0
		Easting:	1550170.0
		Vertical Datum:	
		Ground Level (mRL):	56.00
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light brownish grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40.	
						black staining	
		ES					
		ES	0.5	55.5		Loose, silty fine to medium SAND, minor fine to coarse gravel; dark brown; dry. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. *colour changes to greyish brown. Gravel becomes sub-angular to rounded. becomes light brown*	
		ES					
		ES	1.0	55.0		Dense, fine to coarse sandy fine to coarse GRAVEL, trace cobbles, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
						Dense, fine to coarse GRAVEL, some fine to coarse sand, trace cobbles, trace silt; light brown; dry. Gravel: poorly graded, sub-rounded to rounded, slightly weathered, greywacke.	
		ES				'Dense', fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; greyish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
			1.5	54.5		'Very dense', fine to coarse sandy cobbly fine to coarse GRAVEL, trace silt; greyish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES					

Date Started:	29/07/2024	**Logged By:**	RO
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	DOOSAN DX140w

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Test Pit Log

Test Pit ID: TP22

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 90m northwest of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173657.0
		Easting:	1550170.0
		Vertical Datum:	
		Ground Level (mRL):	56.00
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			2.5	53.5		'Very dense', fine to coarse sandy cobbly fine to coarse GRAVEL, trace silt; greyish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES	3.0	53.0			
		ES	3.5	52.5			

Date Started:	29/07/2024	**Logged By:**	RO
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	DOOSAN DX140w

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Test Pit Log

Test Pit ID: TP22

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 90m northwest of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173657.0
		Easting:	1550170.0
		Vertical Datum:	
		Ground Level (mRL):	56.00
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						4.00m - End of test pit, target depth.	
			4.5	51.5			
			5.0	51.0			
			5.5	50.5			

Date Started:	29/07/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP22

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 90m northwest of Rolleston rail station	**Coordinate system:**	NZTM2000
		Northing:	5173657.0
		Easting:	1550170.0
		Vertical datum:	
		Ground level (mRL):	56.00
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP23

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate System:**	**Vertical Datum:**
		Northing:	**Ground Level (mRL):**
		Easting:	**Location Method:**

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium to fine sandy SILT; dark brown; moist; non-plastic.	
		ES					
			0.5	-0.5		Medium to coarse silty SAND, trace gravels; brown; moist; non-plastic.	
		ES					
		ES				Medium to fine SAND; gravels with cobbles; brown; moist; non-plastic.	
			1.0	-1.0		1.00m - End of test pit	
			1.5	-1.5			

Date Started:	17/07/2024	**Logged By:**	**Comments:**
Method:		**Contractor:**	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP23

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**



Environmental Test Pit Log

Test Pit ID: TP24

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate System:**	
		Northing:	
		Easting:	
		Vertical Datum:	
		Ground Level (mRL):	
		Location Method:	

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium to fine sandy SILT; dark brown; moist; non-plastic.	
		ES					
		ES	0.5	-0.5		Medium to coarse silty SAND, trace gravels; brown; moist; non-plastic.	
		ES				Medium to fine SAND; gravels with cobbles; brown; moist; non-plastic.	
		ES	1.0	-1.0		1.00m - End of test pit	
			1.5	-1.5			

Date Started:	17/07/2024	**Logged By:**	**Comments:**
Method:		**Contractor:**	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP24

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**



Environmental Test Pit Log

Test Pit ID: TP25

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Grassed area at intersection of SH1 and Rolleston Drive (North), approximately 5m south of Rolleston Drive sign	**Coordinate System:**	NZTM2000
		Northing:	5173566.6
		Easting:	1550282.6
		Vertical Datum:	
		Ground Level (mRL):	55.10
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES		55.0		Medium dense, fine sandy SILT, trace fine gravel, trace organics; dark brown; dry, non-plastic. Gravel: sub-angular, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
		ES					
		ES	0.5	54.5		Medium dense, fine sandy SILT, trace fine to coarse gravel, trace cobbles; light brown; dry, non-plastic. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES				Dense, silty fine SAND; light yellowish brown; dry.	
		ES	1.0			Dense, fine to coarse sandy fine to coarse GRAVEL, trace cobbles, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				54.0		1.05m - End of test pit, target depth.	
			1.5	53.5			

Date Started:	11/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP25

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Grassed area at intersection of SH1 and Rolleston Drive (North), approximately 5m south of Rolleston Drive sign	**Coordinate system:**	NZTM2000
		Northing:	5173566.6
		Easting:	1550282.6
		Vertical datum:	
		Ground level (mRL):	55.10
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP26

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate System:**	
		Northing:	
		Easting:	
		Vertical Datum:	
		Ground Level (mRL):	
		Location Method:	

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium to fine sandy SILT; dark brown; moist; non-plastic.	
						Brick and asphalt fragments from 0.1 to 0.2 m bgl..	
		ES					
		ES	0.5	-0.5		Medium to coarse silty SAND, trace gravels; brown; moist; non-plastic.	
		ES				Medium to fine SAND; gravels with cobbles; brown; moist; non-plastic.	
		ES	1.0	-1.0		1.00m - End of test pit	
			1.5	-1.5			

Date Started:	17/07/2024	**Logged By:**	**Comments:**
Method:		**Contractor:**	Groundwater not encountered
Face Orientation:		**Equipment:**	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP26

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**



Environmental Test Pit Log

Test Pit ID: TP27

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate System:**	**Vertical Datum:**
		Northing:	**Ground Level (mRL):**
		Easting:	**Location Method:**

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium to fine sandy SILT; dark brown; moist; non-plastic.	
		ES					
		ES	0.5	-0.5		Medium to coarse silty SAND, trace gravels; brown; moist; non-plastic.	
		ES				Medium to fine SAND; gravels with cobbles; brown; moist; non-plastic.	
		ES	1.0	-1.0		1.00m - End of test pit	
			1.5	-1.5			

Date Started:	17/07/2024	**Logged By:**	**Comments:**
Method:		**Contractor:**	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP27

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**



Environmental Test Pit Log

Test Pit ID: TP28

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate System:**	**Vertical Datum:**
		Northing:	**Ground Level (mRL):**
		Easting:	**Location Method:**

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium to fine sandy SILT; dark brown; moist; non-plastic. *Brick, glass, concrete fragments between 0.1 and 0.3 m bgl.*	
		ES				Medium to coarse silty SAND, trace gravels; brown; moist; non-plastic.	
		ES	0.5	-0.5			
		ES				Medium to fine SAND; gravels with cobbles; brown; moist; non-plastic.	
		ES	1.0	-1.0		1.00m - End of test pit	
			1.5	-1.5			

Date Started:	17/07/2024	**Logged By:**	**Comments:**
Method:		**Contractor:**	Groundwater not encountered
Face Orientation:		**Equipment:**	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP28

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**



Test Pit Log

Test Pit ID: TP29

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**

Groundwater (m)	In Situ Tests: Su (kPa)	In Situ Tests: Scala blows/50mm	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
			ES				Medium to fine sandy SILT; dark brown; moist; non-plastic.	
			ES					
			ES	0.5	-0.5		Medium to coarse silty SAND, trace gravels; brown; moist; non-plastic	
			ES				Medium to fine SAND; gravels with cobbles; brown; moist; non-plastic.	
			ES	1.0	-1.0		1.00m - End of test pit	
				1.5	-1.5			

Date started:	17/07/2024	**Logged by:**	**Comments:**
Vane ID:	N/A	**Contractor:**	Groundwater not encountered. No visual or olfactory evidence of contamination.
Vane type:	N/A	**Equipment:**	
Vane width:	N/A	**Method:**	
Face orientation:	N/A		

For Explanation of Symbols and Abbreviations See Key Sheet

Photo Log

Location ID: TP29

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**



Environmental Test Pit Log

Test Pit ID: TP30

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate System:**	**Vertical Datum:**
		Northing:	**Ground Level (mRL):**
		Easting:	**Location Method:**

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium to fine sandy SILT; dark brown; moist; non-plastic.	
						Small amounts of rubbish materials (plastic, bricks, wire) between 0.1 and 0.5 m bgl.	
		ES					
		ES	0.5	-0.5		Medium to coarse silty SAND, trace gravels; brown; moist; non-plastic.	
		ES				Medium to fine SAND; gravels with cobbles; brown; moist; non-plastic.	
		ES	1.0	-1.0		1.00m - End of test pit	
			1.5	-1.5			

Date Started:	17/07/2024	**Logged By:**	**Comments:**
Method:		**Contractor:**	Groundwater not encountered
Face Orientation:		**Equipment:**	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP30

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**



Environmental Test Pit Log

Test Pit ID: TP31

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On mounded area of vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate System:**	
		Northing:	
		Easting:	
		Vertical Datum:	
		Ground Level (mRL):	
		Location Method:	

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium to fine sandy SILT; dark brown; moist; non-plastic.	
		ES					
		ES					
			0.5	-0.5		Medium to coarse silty SAND, trace gravels; brown; moist; non-plastic.	
		ES					
		ES	1.0	-1.0		Medium to fine SAND; gravels with cobbles; brown; moist; non-plastic.	
			1.5	-1.5		1.50m - End of test pit	

Date Started:	17/07/2024	**Logged By:**	**Comments:**
Method:		**Contractor:**	Groundwater not encountered
Face Orientation:		**Equipment:**	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP31

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On mounded area of vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**



Environmental Test Pit Log

Test Pit ID: TP32

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate System:**	
		Northing:	
		Easting:	
		Vertical Datum:	
		Ground Level (mRL):	
		Location Method:	

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium to fine sandy SILT; dark brown; moist; non-plastic.	
		ES					
		ES	0.5	-0.5		Medium to coarse silty SAND, trace gravels; brown; moist; non-plastic.	
		ES				Medium to fine SAND; gravels with cobbles; brown; moist; non-plastic.	
		ES	1.0	-1.0		1.00m - End of test pit	
			1.5	-1.5			

Date Started:	17/07/2024	**Logged By:**	**Comments:**
Method:		**Contractor:**	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP32

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Vegetated berm area on corner of Rolleston Drive and SH1 (Main South Road).	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**



Environmental Test Pit Log

Test Pit ID: TP33

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Grassed area north of Kidman Road, west of Rolleston Drive and south of SH1	**Coordinate System:**	NZTM2000
		Northing:	5173484.0
		Easting:	1550253.0
		Vertical Datum:	
		Ground Level (mRL):	54.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium dense, silty fine SAND, some fine to coarse gravel, minor organics; dark brown; moist. Gravel: poorly graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES		54.0			
		ES	0.5			Medium dense, fine to coarse SAND, minor silt; light brown; dry.	
		ES		53.5		Dense, fine to medium sandy fine to coarse GRAVEL, some cobbles, trace organics, trace silt; light greyish brown; dry. Gravel/cobbles: well graded, sub-rounded to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	1.0			1.20m - End of test pit, target depth.	
				53.0			
			1.5				
				52.5			

Date Started:	27/06/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP33

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Grassed area north of Kidman Road, west of Rolleston Drive and south of SH1	**Coordinate system:**	NZTM2000
		Northing:	5173484.0
		Easting:	1550253.0
		Vertical datum:	
		Ground level (mRL):	54.30
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP34

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Grassed area north of Kidman Road, west of Rolleston Drive and south of SH1	**Coordinate System:**	NZTM2000
		Northing:	5173437.0
		Easting:	1550121.0
		Vertical Datum:	
		Ground Level (mRL):	54.40
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Dense, silty fine SAND, some fine to coarse gravel, minor organics; dark brown; moist. Gravel: poorly graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
		ES		54.0		'Dense', silty fine sandy fine to coarse GRAVEL, some cobbles, trace organics; light brown; dry. Gravel/cobbles: well graded, sub-rounded to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5			'Dense', fine to medium sandy fine to coarse GRAVEL, minor cobbles, trace organics, trace silt; light greyish brown; dry. Gravel/cobbles: well graded, sub-rounded to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES				*organics absent*	
		ES		53.5			
			1.0			1.05m - End of test pit, target depth.	
				53.0			
			1.5				
				52.5			

Date Started:	09/07/2024	**Logged By:**	NY
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	JCB Hydradig 110W

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP34

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Grassed area north of Kidman Road, west of Rolleston Drive and south of SH1	**Coordinate system:**	NZTM2000
		Northing:	5173437.0
		Easting:	1550121.0
		Vertical datum:	
		Ground level (mRL):	54.40
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: TP35
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Grassed area north of Kidman Road, west of Rolleston Drive and south of SH1	**Coordinate System:**	NZTM2000
		Northing:	5173521.0
		Easting:	1550236.0
		Vertical Datum:	
		Ground Level (mRL):	54.60
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, fine sandy SILT, some fine to coarse gravel, some organics, trace clay; dark brown; moist. Gravel: gap graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
				54.5		Medium dense, silty fine to medium SAND, some fine to coarse gravel, minor organics; light brown; moist, non-plastic. Gravel: poorly graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES				*becomes dense*	
		ES	0.5	54.0		Dense, fine to coarse SAND, minor silt; light greyish brown; dry.	
		ES				Medium dense, fine to medium sandy fine to coarse GRAVEL, minor cobbles, trace organics, trace silt; light greyish brown; dry. Gravel/gravel: well graded, sub-rounded to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	1.0	53.5		*becomes dense*	
						1.10m - End of test pit, target depth.	
			1.5	53.0			

Date Started:	27/06/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: TP35

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Grassed area north of Kidman Road, west of Rolleston Drive and south of SH1	**Coordinate system:**	NZTM2000
		Northing:	5173521.0
		Easting:	1550236.0
		Vertical datum:	
		Ground level (mRL):	54.60
		Location method:	GPS +/- 5m



Environmental Hand Auger Log

Hand Auger ID: UT12

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to intersection of Tennyson St and SH1 (Main South Rd) near BP service station.	**Coordinate System:**	NZTM2000
		Northing:	
		Easting:	
		Vertical Datum:	
		Ground Level (mRL):	
		Location Method:	

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Fine to medium sandy SILT, trace gravels; brown; moist; non-plastic.	
		ES					
		ES	0.5	-0.5			
		ES					
						0.70m - End of hand auger	
			1.0	-1.0			
			1.5	-1.5			

Date Started: 25/07/2024

Logged By:

Diameter:

Comments:

Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: UT12

6KHHW RI

Project:	5ROOHVWRQ ,PSURYHPHQWV	**Project number:**	&RQWDPLQDWHG /DQG
Site location:		**Client Name:**	1=7$: DND .RWDKL
Location:	2Q JUDVV YHUJH DGMDFHQW WR WKH 7HQQ\VRQ 6W DQG 6+ 0DLQ 6RXWK 5G %8 VHUYLFH VWDWLRQ	**Coordinate system:** 1=7/RI **Northing:** **Easting:**	**Vertical datum:** **Ground level (mRL):** **Location method:**



Environmental Hand Auger Log

Hand Auger ID: UT12A

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On sealed footpath adjacent to intersection of Tennyson St and SH1 (Main South Rd).	**Coordinate System:**	**Vertical Datum:**
		Northing:	**Ground Level (mRL):**
		Easting:	**Location Method:**

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				(BASECOURSE) Medium to coarse sandy GRAVELS; brown; moist; non-plastic.	
		ES	0.5	-0.5		Medium to coarse silty SAND; brown; moist; non-plastic. 0.50m - End of hand auger	
			1.0	-1.0			
			1.5	-1.5			

Date Started: 08/07/2024
Logged By:
Diameter:

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: UT12A

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On sealed footpath adjacent to intersection of Tennyson St and SH1 (Main South Rd).	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**



Environmental Hand Auger Log

Hand Auger ID: UT13

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 (Main South Rd) near entrance to BP service station.	**Coordinate System:**	
		Northing:	
		Easting:	
		Vertical Datum:	
		Ground Level (mRL):	
		Location Method:	

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Fine to medium sandy SILT, trace gravels; brown; moist; non-plastic.	
		ES					
		ES	0.5	-0.5			
						0.70m - End of hand auger	
			1.0	-1.0			
			1.5	-1.5			

Date Started: 29/07/2024
Logged By:
Diameter:

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: UT13

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 (Main South Rd) near entrance to BP service station.	**Coordinate system:**	**Vertical datum:**
		Northing:	**Ground level (mRL):**
		Easting:	**Location method:**



Environmental Machine Borehole Log

Borehole ID: BH02

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to exit from Rolleston Drive onto SH1 (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5173539.0
		Easting:	1550213.0
		Vertical Datum:	
		Ground Level (mRL):	55.40
		Location Method:	GPS +/- 5m

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		SNC		ES	0.0	55.4		Silty fine to medium SAND, trace fine gravel, trace organics; dark brown; dry, non plastic, 'insensitive'. Organics: rootlets. [TOPSOIL]	
				ES	0.5	55.0		'Dense', fine to coarse sandy fine to coarse GRAVEL, trace cobbles, trace silt; dark brown; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				ES	1.0	54.5		'Dense', silty fine to medium sandy fine to coarse GRAVEL, trace clay; light brown; dry, low plasticity matrix, 'insensitive'. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke.	
					1.5	54.0		*trace organics: root*	
		SNC		ES	2.0	53.5		'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; light brownish grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke.	
					2.5	53.0		*becomes grey*	
					3.0	52.5		Very dense, fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; greyish brown; dry. Gravel/cobbles: well graded, angular to sub-rounded, slightly weathered, greywacke.	
		SNC			3.5	52.0		*fines washed out during sonic drilling*	
					4.0	51.5		'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; grey; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
					4.5	51.0		*some cobbles, fines washed out during sonic drilling*	
		SNC			5.0	50.5			
					5.5	50.0		*some silt, trace clay, low plasticity matrix*	
		SNC			6.0	49.5			
					6.5	49.0			
		SNC			7.0	48.5			
					7.5	48.0		*fines washed out during sonic drilling*	
		SNC			8.0	47.5			
					8.5	47.0		*fines washed out during sonic drilling*	
		SNC			9.0	46.5			
					9.5	46.0		*some silt, trace clay, low plasticity matrix*	
						45.5		*becomes cobbly, fines washed out during sonic drilling*	

Date Started:	01/07/2024	**Date End:**	04/07/2024	Comments:
Logged By:	RO	**Drilled By:**	McMillan	GW measured at 13.75 m bgl. Elevation estimated from LINZ DEM maps. Hole finished with a standpipe installed and grouted allowing for downpipe shear wave velocity testing.
Inclination:		**Equipment:**	Geoprobe 8140LS	
Diameter:	114 mm	**Method:**	SNC	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Machine Borehole Log

Borehole ID: BH02

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to exit from Rolleston Drive onto SH1 (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5173539.0
		Easting:	1550213.0
		Vertical Datum:	
		Ground Level (mRL):	55.40
		Location Method:	GPS +/- 5m

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		SNC			10.5	45.0		'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; grey; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		SNC			11.0	44.5		Very dense, cobbly fine to coarse GRAVEL; grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
					11.5	44.0			
					12.0	43.5		Very dense, fine to coarse GRAVEL trace cobbles; grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
		SNC			12.5	43.0		Very dense, cobbly fine to coarse GRAVEL; grey; wet. Gravel/cobbles: well graded, angular to sub-rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
					13.0	42.5			
					13.5	42.0			
	▼	SNC			14.0	41.5		Very dense, fine to coarse GRAVEL some cobbles; grey; wet. Gravel/cobbles: well graded, angular to sub-rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
					14.5	41.0			
					15.0	40.5			
		SNC			15.5	40.0		Very dense, cobbly coarse GRAVEL, some fine to medium gravel; grey; wet. Gravel/ cobbles: well graded, angular to sub-rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
					16.0	39.5			
					16.5	39.0			
		SNC			17.0	38.5			
					17.5	38.0			
					18.0	37.5			
		SNC			18.5	37.0		Very dense, fine to coarse GRAVEL, minor cobbles; grey; wet. Gravel/cobbles: well graded, angular to sub-rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
					19.0	36.5		*fines washed out during sonic drilling* 'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; grey; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		SNC			19.5	36.0		Very dense, coarse gravelly COBBLES some fine to medium gravel, trace fine to coarse sand; grey; wet. Gravel/cobbles: well graded, angular to sub-rounded, slightly weathered, greywacke.	
						35.5			

				Comments:
Date Started:	01/07/2024	**Date End:**	04/07/2024	GW measured at 13.75 m bgl. Elevation estimated from LINZ DEM maps. Hole finished with a standpipe installed and grouted allowing for downpipe shear wave velocity testing.
Logged By:	RO	**Drilled By:**	McMillan	
Inclination:		**Equipment:**	Geoprobe 8140LS	
Diameter:	114 mm	**Method:**	SNC	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Machine Borehole Log

Borehole ID: BH02

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to exit from Rolleston Drive onto SH1 (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5173539.0
		Easting:	1550213.0
		Vertical Datum:	
		Ground Level (mRL):	55.40
		Location Method:	GPS +/- 5m

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		SNC			20.5	35.0		Very dense, coarse gravelly COBBLES some fine to medium gravel, trace fine to coarse sand; grey; wet. Gravel/cobbles: well graded, angular to sub-rounded, slightly weathered, greywacke.	
					21.0	34.5		*fines washed out during sonic drilling*	
		SNC			21.5	34.0			
					22.0	33.5			
		SNC			22.5	33.0			
					23.0	32.5			
		SNC			23.5	32.0			
					24.0	31.5			
		SNC			24.5	31.0		*fines washed out during sonic drilling*	
					25.0	30.5			
		SNC			25.5	30.0			
					26.0	29.5			
		SNC			26.5	29.0			
					27.0	28.5			
		SNC			27.5	28.0			
					28.0	27.5			
		SNC			28.5	27.0			
					29.0	26.5			
		SNC			29.5	26.0			
						25.5			

				Comments:
Date Started:	01/07/2024	**Date End:**	04/07/2024	GW measured at 13.75 m bgl. Elevation estimated from LINZ DEM maps. Hole finished with a standpipe installed and grouted allowing for downpipe shear wave velocity testing.
Logged By:	RO	**Drilled By:**	McMillan	
Inclination:		**Equipment:**	Geoprobe 8140LS	
Diameter:	114 mm	**Method:**	SNC	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Machine Borehole Log

Borehole ID: BH02

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to exit from Rolleston Drive onto SH1 (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5173539.0
		Easting:	1550213.0
		Vertical Datum:	
		Ground Level (mRL):	55.40
		Location Method:	GPS +/- 5m

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		SNC			30.5	25.0		Very dense, coarse gravelly COBBLES some fine to medium gravel, trace fine to coarse sand; grey; wet. Gravel/cobbles: well graded, angular to sub-rounded, slightly weathered, greywacke.	
					31.0	24.5			
					31.5	24.0			
					32.0	23.5			
					32.5	23.0			
					33.0	22.5			
					33.5	22.0			
					34.0	21.5			
					34.5	21.0			
					35.0	20.5			
					35.5	20.0			
					36.0	19.5			
					36.5	19.0			
					37.0	18.5			
					37.5	18.0			
					38.0	17.5			
					38.5	17.0			
					39.0	16.5			
					39.5	16.0			
						15.5			

Date Started:	01/07/2024	**Date End:**	04/07/2024	Comments:
Logged By:	RO	**Drilled By:**	McMillan	GW measured at 13.75 m bgl. Elevation estimated from LINZ DEM maps. Hole finished with a standpipe installed and grouted allowing for downpipe shear wave velocity testing.
Inclination:		**Equipment:**	Geoprobe 8140LS	
Diameter:	114 mm	**Method:**	SNC	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: BH02

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to exit from Rolleston Drive onto SH1 (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5173539.0
		Easting:	1550213.0
		Vertical datum:	
		Ground level (mRL):	55.40
		Location method:	GPS +/- 5m



Environmental Machine Borehole Log

Borehole ID: BH05

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road	**Coordinate System:**	NZTM2000
		Northing:	5173655.1
		Easting:	1550179.4
		Vertical Datum:	
		Ground Level (mRL):	56.00
		Location Method:	GPS +/- 5m

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		SNC		ES	0.0	56.0		Fine to coarse sandy fine to coarse GRAVEL, some silt trace cobbles; greyish brown; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				ES					
				ES					
				ES	0.5	55.5		'Dense', silty fine to coarse gravelly fine to medium SAND; dark grey; dry, non-plastic, 'insensitive'. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				ES				'Dense', fine to coarse gravelly fine to medium SAND, some silt; light brown; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				ES	1.0	55.0			
		SNC						Very dense, fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; greyish brown; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				ES	1.5	54.5		*fines washed out during sonic drilling*	
				ES	2.0	54.0			
					2.5	53.5			
		SNC			3.0	53.0		*fines washed out during sonic drilling*	
					3.5	52.5			
					4.0	52.0			
					4.5	51.5			
		SNC			5.0	51.0		*trace cobbles*	
					5.5	50.5			
					6.0	50.0			
		SNC			6.5	49.5		Very dense, fine to coarse sandy cobbly fine to coarse GRAVEL, minor silt; greyish brown; dry. Gravel/cobbles: well graded, angular to rounded, slightly weathered, greywacke.	
					7.0	49.0		Very dense, fine to coarse sandy fine to coarse GRAVEL, minor silt; greyish brown; dry. Gravel: well graded, angular to rounded, slightly weathered, greywacke.	
		SNC			7.5	48.5			
					8.0	48.0			
					8.5	47.5		Very dense, medium to coarse sandy, fine to coarse GRAVEL, minor cobbles; greyish brown; dry. Gravel: well graded, angular to rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
		SNC			9.0	47.0			
					9.5	46.5			

Date Started:	10/07/2024	**Date End:**	11/07/2024	Comments:
Logged By:	RO	**Drilled By:**	McMillan	GW measured at 11.4 m bgl. Elevation estimated from LINZ DEM maps. Piezometer completed with hole capped by cement and a flush mounted toby box was installed.
Inclination:		**Equipment:**	Geoprobe 8140LS	
Diameter:	114 mm	**Method:**	SNC	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Machine Borehole Log

Borehole ID: BH05
Sheet 2 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road	**Coordinate System:**	NZTM2000
		Northing:	5173655.1
		Easting:	1550179.4
		Vertical Datum:	
		Ground Level (mRL):	56.00
		Location Method:	GPS +/- 5m

Installations	Drilling: GWL	Drilling: Method	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		SNC			10.5	45.5		Very dense, medium to coarse sandy, fine to coarse GRAVEL, minor cobbles; greyish brown; dry. Gravel: well graded, angular to rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
		SNC			11.0	45.0		Very dense, fine to coarse GRAVEL, some cobbles, minor medium to coarse sand; greyish brown; dry. Gravel: well graded, angular to rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
		SNC			11.5	44.5			
		SNC			12.0	44.0			
		SNC			12.5	43.5			
	▼	SNC			13.0	43.0			
		SNC			13.5	42.5			
		SNC			14.0	42.0			
		SNC			14.5	41.5			
		SNC			15.0	41.0			
		SNC			15.5	40.5		Very dense, fine to coarse sandy fine to coarse GRAVEL, some silt; greyish brown; dry. Gravel: well graded, angular to rounded, slightly weathered, greywacke.	
		SNC			16.0	40.0		*Core baked due to insufficient drilling fluid.*	
		SNC			16.5	39.5		Very dense, fine to coarse GRAVEL, some cobbles; grey; wet. Gravel/cobbles: well graded, angular to rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
		SNC			17.0	39.0		Very dense, fine to coarse GRAVEL; greyish brown; wet. Gravel: well graded, angular to rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
		SNC			17.5	38.5		'Very dense', fine to coarse gravelly COBBLES; greyish brown; wet. Gravel: well graded, angular to rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
		SNC			18.0	38.0		Very dense, fine to coarse sandy fine to coarse GRAVEL, trace silt; greyish brown; wet. Gravel: well graded, angular to rounded, slightly weathered, greywacke. Fines washed out during sonic drilling.	
		SNC			18.5	37.5		Very dense, silty fine to coarse sandy fine to coarse GRAVEL; greyish brown; wet. Gravel: well graded, angular to rounded, slightly weathered, greywacke.	
		SNC			19.0	37.0		*Core baked due to insufficient drilling fluid.*	
					19.5	36.5			

				Comments:
Date Started:	10/07/2024	**Date End:**	11/07/2024	GW measured at 11.4 m bgl. Elevation estimated from LINZ DEM maps. Piezometer completed with hole capped by cement and a flush mounted toby box was installed.
Logged By:	RO	**Drilled By:**	McMillan	
Inclination:		**Equipment:**	Geoprobe 8140LS	
Diameter:	114 mm	**Method:**	SNC	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: BH05

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road	**Coordinate system:**	NZTM2000
		Northing:	5173655.1
		Easting:	1550179.4
		Vertical datum:	
		Ground level (mRL):	56.00
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: IP07

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Grassed area south of Kidman Road, west of Rolleston Drive and north of SDC building	**Coordinate System:**	NZTM2000
		Northing:	5173425.0
		Easting:	1550268.0
		Vertical Datum:	
		Ground Level (mRL):	54.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium dense, fine sandy SILT, some organics, minor fine to medium gravel; dark brown; moist. Gravel: gap graded, sub-rounded to rounded, slightly weathered, greywacke. [TOPSOIL]	
						Medium dense, silty fine SAND, minor organics, trace fine to medium gravel, trace clay; dark greyish brown; moist, non-plastic. Gravel: sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES		54.0		Very dense, fine to medium sandy fine to coarse GRAVEL, minor cobbles, trace silt, trace organics; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5				
		ES				*organics absent*	
				53.5			
		ES	1.0				
				53.0			
		ES	1.5				
						1.60m - End of test pit, target depth.	
				52.5			

Date Started:	25/06/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: IP07

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Grassed area south of Kidman Road, west of Rolleston Drive and north of SDC building	**Coordinate system:**	NZTM2000
		Northing:	5173425.0
		Easting:	1550268.0
		Vertical datum:	
		Ground level (mRL):	54.30
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: IP10
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 75m west of Rolleston rail station	**Coordinate System:**	NZTM2000
		Northing:	5173612.1
		Easting:	1550173.7
		Vertical Datum:	
		Ground Level (mRL):	55.60
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light brownish grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40.	
				55.5			
						'Very dense', medium GRAVEL, some fine to coarse sand, minor silt; black; dry. Gravel: uniformly graded, angular, slightly weathered, greywacke. Hydrocarbon odour. Broken faces. AP20.	
		ES				'Medium dense', fine to medium SAND, some silt, minor fine to coarse gravel; brownish black; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke.	
						Black staining of soil and strong hydrocarbon odour observed (0.3 to 0.5 m bgl.)	
		ES	0.5				
				55.0			
		ES					
		ES	1.0			'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace cobbles, trace silt; brownish grey; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				54.5			
		ES	1.5			'Very dense', cobbly fine to coarse GRAVEL, some fine to coarse sand, trace silt; brownish grey; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				54.0			
						1.80m - End of test pit, target depth.	
		ES					

Date Started:	24/07/2024	**Logged By:**	RO
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	DOOSAN DX140w

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: IP10

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Within rear access road between 799 Jones Road and 801 Jones Road, 75m west of Rolleston rail station	**Coordinate system:**	NZTM2000
		Northing:	5173612.1
		Easting:	1550173.7
		Vertical datum:	
		Ground level (mRL):	55.60
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: IP08

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Grassed area north of Kidman Road, west of Rolleston Drive and south of SH1	**Coordinate System:**	NZTM2000
		Northing:	5173493.1
		Easting:	1550213.2
		Vertical Datum:	
		Ground Level (mRL):	54.60
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, fine sandy SILT, some organics, minor fine to medium gravel; dark brown; moist. Gravel: gap graded, sub-rounded to rounded, slightly weathered, greywacke. [TOPSOIL]	
				54.5		Medium dense, silty fine SAND, minor organics, trace fine to medium gravel, trace clay; dark greyish brown; moist, non-plastic. Gravel: sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES				Dense, cobbly fine to medium sandy fine to coarse GRAVEL, minor organics, trace silt; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5				
				54.0			
		ES				*organics absent*	
		ES	1.0			*becomes very dense*	
				53.5			
		ES	1.5			1.50m - End of test pit, target depth.	
				53.0			

Date Started:	25/06/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: IP08

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Grassed area north of Kidman Road, west of Rolleston Drive and south of SH1	**Coordinate system:**	NZTM2000
		Northing:	5173493.1
		Easting:	1550213.2
		Vertical datum:	
		Ground level (mRL):	54.60
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: IP09

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	Grassed area on the corner of SH1 and Rolleston Drive (North)	**Coordinate System:**	NZTM2000
		Northing:	5173543.0
		Easting:	1550289.0
		Vertical Datum:	
		Ground Level (mRL):	54.80
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Very loose, fine sandy SILT, trace coarse gravel, trace organics; dark brown; moist. Gravel: gap graded, sub-rounded to rounded, unweathered, greywacke. [TOPSOIL]	
		ES		54.5		Very loose, silty fine SAND, minor fine to coarse gravel; light brown; moist, non-plastic. Gravel: sub-rounded, slightly weathered, greywacke.	
		ES	0.5				
		ES		54.0		Dense, fine to medium sandy cobbly fine to coarse GRAVEL, trace silt; light brownish grey; moist. Gravel/cobbles: well graded, sub-rounded to rounded, slightly weathered, greywacke.	
		ES	1.0				
		ES	1.5	53.5			
				53.0		1.80m - End of test pit, target depth.	

Date Started:	25/06/2024	**Logged By:**	CA	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: IP09

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	Grassed area on the corner of SH1 and Rolleston Drive (North)	**Coordinate system:**	NZTM2000
		Northing:	5173543.0
		Easting:	1550289.0
		Vertical datum:	
		Ground level (mRL):	54.80
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: IP11

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approximately 8m north of 42 Lignite Drive back fence line	**Coordinate System:**	NZTM2000
		Northing:	5172484.0
		Easting:	1548207.0
		Vertical Datum:	
		Ground Level (mRL):	58.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium dense, fine sandy SILT, some organics, trace fine gravel; dark brown; moist. Gravel: sub-angular, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
						Dense, fine to coarse gravelly SILT, some organics, minor fine sand, trace cobbles, trace bituminous asphalt; light brownish grey; dry. Gravel/cobbles: gap graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES		58.0			
						Very dense, silty fine to coarse GRAVEL, some fine sand, minor cobbles, trace organics; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5				
						Dense, fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES		57.5			
		ES	1.0				
				57.0		*becomes very dense*	
		ES	1.5				
				56.5			
		ES					

Date Started:	05/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Test Pit Log

Test Pit ID: IP11

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approximately 8m north of 42 Lignite Drive back fence line	**Coordinate System:**	NZTM2000
		Northing:	5172484.0
		Easting:	1548207.0
		Vertical Datum:	
		Ground Level (mRL):	58.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
				56.0		'Very dense', cobbly fine to coarse GRAVEL, some fine to coarse sand, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
			2.5	55.5		2.30m - End of test pit, target depth.	
			3.0	55.0			
			3.5	54.5			

Date Started:	05/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: IP11

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 approximately 8m north of 42 Lignite Drive back fence line	**Coordinate system:**	NZTM2000
		Northing:	5172484.0
		Easting:	1548207.0
		Vertical datum:	
		Ground level (mRL):	58.30
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: IP12

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 behind 21 Coleridge Street	**Coordinate System:**	NZTM2000
		Northing:	5173105.6
		Easting:	1549337.3
		Vertical Datum:	
		Ground Level (mRL):	56.10
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Medium dense, fine sandy SILT, some organics, minor fine to medium gravel; dark brown; moist. Gravel: gap graded, sub-rounded to rounded, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
				56.0		Dense, fine sandy SILT, some organics, trace fine to coarse gravel; dark brown; moist. Gravel: poorly graded, sub-angular, slightly weathered, greywacke. Organics: rootlets.	
		ES				'Dense', silty fine to coarse sandy fine to coarse GRAVEL, minor organics; light yellowish brown; dry. Gravel: well graded, sub-angular to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES	0.5				
				55.5		'Dense', fine to coarse GRAVEL, some cobbles, some fine to coarse sand, trace silt, trace organics; light brown; dry. Gravel/cobbles: poorly graded, sub-angular to rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES					
		ES	1.0			Dense, fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
				55.0			
		ES	1.5				
				54.5			
		ES					

Date Started:	15/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Test Pit Log

Test Pit ID: IP12

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 behind 21 Coleridge Street	**Coordinate System:**	NZTM2000
		Northing:	5173105.6
		Easting:	1549337.3
		Vertical Datum:	
		Ground Level (mRL):	56.10
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
				54.0		Dense, fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke. *trace boulders* *0.1m thick lens of fine to medium sand*	
			2.5	53.5			
						2.80m - End of test pit, target depth.	
			3.0	53.0			
			3.5	52.5			

Date Started:	15/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: IP12

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 behind 21 Coleridge Street	**Coordinate system:**	NZTM2000
		Northing:	5173105.6
		Easting:	1549337.3
		Vertical datum:	
		Ground level (mRL):	56.10
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: IP13

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 adjacent to swale north of 35 Seymour Drive	**Coordinate System:**	NZTM2000
		Northing:	5174046.5
		Easting:	1551238.7
		Vertical Datum:	
		Ground Level (mRL):	54.40
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				Loose, fine sandy SILT, some organics, minor fine to medium gravel; dark brown; moist. Gravel: gap graded, sub-rounded to rounded, slightly weathered, greywacke. Organics: rootlets. [TOPSOIL]	
						Very loose, fine sandy SILT, trace medium to coarse gravel, trace organics; light brown; dry. Gravel: gap graded, sub-rounded, slightly weathered, greywacke. Organics: rootlets.	
		ES					
				54.0		Medium dense, fine sandy SILT, trace fine to coarse gravel; light orange brown; dry. Gravel: poorly graded,sub-rounded, slightly weathered, greywacke. *mottled*	
		ES	0.5				
		ES					
				53.5		Medium dense, fine to medium SAND, trace silt; light orange brown; dry.	
			1.0				
				53.0			
			1.5			*loose*	
				52.5			

Date Started:	10/07/2024	**Logged By:**	NY
Method:	TP/VE	**Contractor:**	CORDE/Alliance
Face Orientation:		**Equipment:**	JCB Hydradig 110W/AirVac

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Environmental Test Pit Log

Test Pit ID: IP13

Sheet 2 of 2

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 adjacent to swale north of 35 Seymour Drive	**Coordinate System:**	NZTM2000
		Northing:	5174046.5
		Easting:	1551238.7
		Vertical Datum:	
		Ground Level (mRL):	54.40
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
						Medium dense, fine to medium SAND, trace silt; light orange brown; dry.	
						'Dense', fine to coarse sandy fine to coarse GRAVEL, some cobbles; light brown; dry. Gravel/ cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
						2.20m - End of test pit, target depth.	
				52.0			
			2.5				
				51.5			
			3.0				
				51.0			
			3.5				
				50.5			

Date Started:	10/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP/VE	**Contractor:**	CORDE/Alliance	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W/AirVac	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: IP13

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On grass verge adjacent to SH1 adjacent to swale north of 35 Seymour Drive	**Coordinate system:**	NZTM2000
		Northing:	5174046.5
		Easting:	1551238.7
		Vertical datum:	
		Ground level (mRL):	54.40
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP08

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	799 Jones Road (westbound)	**Coordinate System:**	NZTM2000
		Northing:	5173763.5
		Easting:	1550273.0
		Vertical Datum:	
		Ground Level (mRL):	55.90
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; grey; moist, Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES		55.5		'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor cobbles, minor silt; grey; moist, Gravel/cobbles: well graded, sub-rounded, slightly weathered, AP65. [SUB-BASE]	
		ES	0.5			Dense, fine to coarse sandy fine to coarse GRAVEL, some silt, minor cobbles; brownish grey; moist. Gravel/cobbles: well graded, sub-rounded to rounded, slightly weathered, greywacke.	
		ES	1.0	55.0		0.90m - End of test pit, target depth.	
			1.5	54.5			
				54.0			

Date Started:	18/06/2024	**Logged By:**	RO
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	JCB Hydradig 110W

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP08

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	799 Jones Road (westbound)	**Coordinate system:**	NZTM2000
		Northing:	5173763.5
		Easting:	1550273.0
		Vertical datum:	
		Ground level (mRL):	55.90
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP09
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 turning bay into Tennyson Street (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5173410.0
		Easting:	1549889.0
		Vertical Datum:	
		Ground Level (mRL):	55.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; light brownish grey; moist. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES		55.0		'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt, trace cobbles; greyish brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
		ES	0.5			Very dense, fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; greyish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke. [Holocene Alluvium]	
		ES					
				54.5		0.75m - End of test pit, target depth.	
			1.0				
				54.0			
			1.5				
				53.5			

Date Started:	25/07/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	DOOSAN DX140w	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP09

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 turning bay into Tennyson Street (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5173410.0
		Easting:	1549889.0
		Vertical datum:	
		Ground level (mRL):	55.30
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP10
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 turning bay into McDonalds Rolleston (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5173484.0
		Easting:	1550035.0
		Vertical Datum:	
		Ground Level (mRL):	55.00
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES					
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light brownish grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES					
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt, trace cobbles; greyish brown; dry. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
			0.5	54.5			
						'Very dense', fine to coarse sandy fine to coarse gravelly COBBLES, some refuse, minor silt; reddish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke. Refuse: Metal scraps, glass, bricks, wire.	
		ES					
			1.0	54.0			
		ES				'Very dense', fine to coarse sandy fine to coarse gravelly COBBLES, trace silt; reddish brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES					
						1.30m - End of test pit, target depth.	
			1.5	53.5			

Date Started:	25/07/2024	**Logged By:**	RO
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	DOOSAN DX140w

Comments:
Groundwater not encountered.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP10

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 turning bay into McDonalds Rolleston (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5173484.0
		Easting:	1550035.0
		Vertical datum:	
		Ground level (mRL):	55.00
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP11

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	29 Rolleston Drive (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5173325.8
		Easting:	1550342.1
		Vertical Datum:	
		Ground Level (mRL):	53.40
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; light greyish brown; moist. Gravel: well graded, angular to rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace cobbles, trace silt; light greyish brown; dry. Gravel/cobbles: well graded, angular to sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
		ES					
				53.0		Very dense, fine to coarse sandy fine to coarse GRAVEL, minor cobbles, trace silt; light greyish brown; dry. Gravel/cobbles: well graded, angular to rounded, slightly weathered, greywacke.	
		ES	0.5				
				52.5			
		ES					
			1.0			1.00m - End of test pit, target depth.	
				52.0			
			1.5				
				51.5			

Date Started:	20/06/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP11

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	29 Rolleston Drive (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5173325.8
		Easting:	1550342.1
		Vertical datum:	
		Ground level (mRL):	53.40
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP12
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	15m east of Kidman Street and Norman Kirk Drive intersection (westbound)	**Coordinate System:**	NZTM2000
		Northing:	5173430.7
		Easting:	1550157.2
		Vertical Datum:	
		Ground Level (mRL):	53.70
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				Concrete	
				53.5		'Dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; light greyish brown; moist. Gravel: well graded, sub-rounded slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES				Dense, fine to coarse sandy fine to coarse gravelly COBBLES, trace silt; greyish brown; dry. Gravel/cobbles: well graded sub-angular to rounded, slightly weathered, greywacke.	
		ES	0.5	53.0			
		ES	1.0			0.95m - End of test pit, target depth.	
			1.5	52.5			
				52.0			

Date Started:	20/06/2024	**Logged By:**	RO	**Comments:**	
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.	
Face Orientation:		**Equipment:**	JCB Hydradig 110W		

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP12

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	15m east of Kidman Street and Norman Kirk Drive intersection (westbound)	**Coordinate system:**	NZTM2000
		Northing:	5173430.7
		Easting:	1550157.2
		Vertical datum:	
		Ground level (mRL):	53.70
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP13
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	801 Jones Road (westbound)	**Coordinate System:**	NZTM2000
		Northing:	5173715.0
		Easting:	1550126.0
		Vertical Datum:	
		Ground Level (mRL):	56.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse GRAVEL, some fine to coarse sand, trace silt; grey; moist. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES		56.0		'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor cobbles, minor silt; grey; moist. Gravel/cobbles: well graded, sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
		ES	0.5				
		ES				Dense, fine to coarse sandy fine to coarse GRAVEL, some silt, minor cobbles; brownish grey; moist. Gravel/cobbles: well graded, sub-rounded to rounded, slightly weathered, greywacke.	
				55.5			
		ES	1.0			1.00m - End of test pit, target depth.	
				55.0			
			1.5				
				54.5			

Date Started:	19/06/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP13

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	801 Jones Road (westbound)	**Coordinate system:**	NZTM2000
		Northing:	5173715.0
		Easting:	1550126.0
		Vertical datum:	
		Ground level (mRL):	56.30
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP14
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	816 Jones Road (westbound)	**Coordinate System:**	NZTM2000
		Northing:	5173680.9
		Easting:	1550030.2
		Vertical Datum:	
		Ground Level (mRL):	56.60
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
				56.5			
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; grey; moist. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. Broken faces, AP40. [BASECOURSE]	
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt, trace cobbles; grey; moist, Gravel/cobbles: well graded, sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
		ES					
						Dense, fine to coarse gravelly fine to coarse SAND, trace cobbles, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-angular to rounded, slightly weathered, greywacke.	
		ES	0.5				
				56.0		*minor cobbles*	
						0.85m - End of test pit, target depth.	
		ES					
			1.0				
				55.5			
			1.5				
				55.0			

Date Started:	20/06/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP14

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	816 Jones Road (westbound)	**Coordinate system:**	NZTM2000
		Northing:	5173680.9
		Easting:	1550030.2
		Vertical datum:	
		Ground level (mRL):	56.60
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP15
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	790 Jones Road (westbound)	**Coordinate System:**	NZTM2000
		Northing:	5173779.0
		Easting:	1550296.0
		Vertical Datum:	
		Ground Level (mRL):	55.60
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
				55.5			
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; grey; moist, Gravel: well graded, sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor cobbles, minor silt; grey; moist. Gravel/cobbles: well graded, sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
		ES					
						'Dense', fine to coarse sandy fine to coarse GRAVEL, some silt, minor cobbles; brownish grey; moist. Gravel/cobbles: well graded, sub-rounded to rounded, slightly weathered, greywacke. [Holocene Alluvium]	
			0.5			0.50m - End of test pit, terminated early due to discovering unlabelled service.	
				55.0			
			1.0				
				54.5			
			1.5				
				54.0			

Date Started:	19/06/2024	**Logged By:**	RO	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP15

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	790 Jones Road (westbound)	**Coordinate system:**	NZTM2000
		Northing:	5173779.0
		Easting:	1550296.0
		Vertical datum:	
		Ground level (mRL):	55.60
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP19
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 11m north of 42 Lignite Drive back fence line (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172488.0
		Easting:	1548212.0
		Vertical Datum:	
		Ground Level (mRL):	58.60
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES		58.5		'Very dense', fine to coarse GRAVEL, some fine to coarse sand, minor silt; light grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES				BURIED CHIPSEAL	
						'Dense', silty fine to coarse gravelly fine SAND, trace bituminous asphalt, light grey; dry. Gravel: poorly graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES					
		ES	0.5			'Dense', silty fine to coarse GRAVEL, minor fine to medium sand, trace cobbles; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. AP65. [BURIED BASECOURSE]	
		ES		58.0		Dense, fine to coarse sandy fine to coarse GRAVEL, trace cobbles; light brown; dry. Gravel/ cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. [Late Pleistocene Alluvium]	
			1.0			0.85m - End of test pit, target depth.	
				57.5			
			1.5				
				57.0			

Date Started:	05/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP19

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 11m north of 42 Lignite Drive back fence line (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172488.0
		Easting:	1548212.0
		Vertical datum:	
		Ground level (mRL):	58.60
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP20
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 north of 39C Fairfield Way (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172582.0
		Easting:	1548385.0
		Vertical Datum:	
		Ground Level (mRL):	58.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light greyish brown; dry. Gravel: well graded, sub-rounded, slightly weathered, greywacke. AP40. [BASECOURSE]	
		ES				BUIRED CHIPSEAL	
		ES		58.0		'Very dense', fine to coarse sandy fine to coarse GRAVEL; light grey; dry. Gravel: uniformly graded, sub-rounded to rounded, slightly weathered, greywacke.	
		ES	0.5			'Very dense', silty fine SAND, trace fine to coarse gravel; light brown; dry. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES		57.5		'Very dense', fine to coarse sandy fine to coarse GRAVEL, some cobbles, trace silt; light brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
			1.0			0.75m - End of test pit, target depth.	
				57.0			
			1.5				
				56.5			

Date Started:	11/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP20

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 north of 39C Fairfield Way (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172582.0
		Easting:	1548385.0
		Vertical datum:	
		Ground level (mRL):	58.30
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP21
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 240m southbound of intersection of SH1 and Rolleston Drive (South) (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172671.0
		Easting:	1548550.0
		Vertical Datum:	
		Ground Level (mRL):	57.90
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; light grey; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. Broken faces. AP40. [BASECOURSE]	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light grey. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
		ES	0.5	57.5		0.50m - End of test pit, target depth.	
			1.0	57.0			
			1.5	56.5			
				56.0			

Date Started:	08/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP21

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 240m southbound of intersection of SH1 and Rolleston Drive (South) (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172671.0
		Easting:	1548550.0
		Vertical datum:	
		Ground level (mRL):	57.90
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP22

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	81 Main South Road (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5172953.0
		Easting:	1549036.0
		Vertical Datum:	
		Ground Level (mRL):	56.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light greyish brown; dry. Gravel: well graded, sub-rounded, slightly weathered, greywacke. AP40. [BASECOURSE]	
		ES					
		ES					
				56.0		BURIED CHIPSEAL	
						'Stiff', SILT, minor fine sand, trace medium gravel; light greyish brown; dry, non-plastic. Gravel: sub-angular, slightly weathered, greywacke.	
		ES	0.5			Very dense, silty fine to coarse GRAVEL, minor fine sand, trace cobbles; light brown; dry. Gravel/ cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES		55.5		0.80m - End of test pit, target depth.	
			1.0				
				55.0			
			1.5				
				54.5			

Date Started:	04/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP22

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	81 Main South Road (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5172953.0
		Easting:	1549036.0
		Vertical datum:	
		Ground level (mRL):	56.30
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP23
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 (southbound), approximately 20m north of 26 John Street back fence (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5173064.0
		Easting:	1549249.0
		Vertical Datum:	
		Ground Level (mRL):	56.00
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; light greyish brown; moist. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. AP40. [BASECOURSE]	
		ES				BURIED CHIPSEAL	
		ES				'Stiff', SILT, minor fine sand; light greyish brown; dry, non-plastic.	
		ES	0.5	55.5		Very dense, silty fine to coarse GRAVEL, trace cobbles, trace fine sand; light greyish brown; dry. Gravel/cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES				0.70m - End of test pit, target depth.	
			1.0	55.0			
			1.5	54.5			

Date Started:	04/07/2024	**Logged By:**	NY
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	JCB Hydradig 110W

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP23

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 (southbound), approximately 20m north of 26 John Street back fence (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5173064.0
		Easting:	1549249.0
		Vertical datum:	
		Ground level (mRL):	56.00
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP24

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	43 Main South Road (southbound)	**Coordinate System:**	NZTM2000
		Northing:	5173155.0
		Easting:	1549421.0
		Vertical Datum:	
		Ground Level (mRL):	56.00
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, minor silt; light greyish brown; moist. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. AP40. [BASECOURSE]	
		ES					
		ES				BURIED CHIPSEAL	
						'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light greyish brown; dry. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
						trace bituminous material	
		ES				*highly cemented*	
			0.5	55.5		Dense, fine to medium sandy cobbly fine to coarse GRAVEL, trace silt; light brown; dry. Gravel/ cobbles: well graded, sub-angular to sub-rounded, slightly weathered, greywacke.	
		ES					
			1.0	55.0		1.00m - End of test pit	
			1.5	54.5			

Date Started:	17/07/2024	**Logged By:**	NY
Method:	TP	**Contractor:**	CORDE
Face Orientation:		**Equipment:**	DOOSAN DX140w

Comments:
Groundwater not encountered. No visual or olfactory evidence of contamination.

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP24

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	43 Main South Road (southbound)	**Coordinate system:**	NZTM2000
		Northing:	5173155.0
		Easting:	1549421.0
		Vertical datum:	
		Ground level (mRL):	56.00
		Location method:	GPS +/- 5m



Environmental Test Pit Log

Test Pit ID: PP25
Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project Number:**	3338703 - Contaminated Land
Site Location:		**Client:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 200m southbound from Brookside Road turnoff	**Coordinate System:**	NZTM2000
		Northing:	5173253.0
		Easting:	1549607.0
		Vertical Datum:	
		Ground Level (mRL):	55.30
		Location Method:	GPS +/- 5m

Groundwater (m)	PID	Samples	Depth (m)	RL (m)	Graphic Log	Soil/ Rock Description	Geological Unit
		ES				ASPHALT	
		ES		55.0		'Very dense', fine to coarse sandy fine to coarse GRAVEL, some silt; light greyish brown; dry. Gravel: well graded, angular to sub-rounded, slightly weathered, greywacke. AP40. [BASECOURSE]	
		ES				'Very dense', fine to coarse sandy fine to coarse GRAVEL, trace silt; light grey. Gravel: well graded, sub-angular to sub-rounded, slightly weathered, greywacke. AP65. [SUB-BASE]	
		ES	0.5	54.5		Loose, SILT, some fine sand; light yellowish brown; dry, non-plastic. North end of pit encountered silt at 0.5m bgl, thickness of 350mm. *minor fine to coarse gravel. Gravel: well graded, sub-rounded, slightly weathered, greywacke.*	
		ES				Very dense, silty fine to coarse GRAVEL, some cobbles, minor fine to medium sand; light yellowish brown; dry. Gravel: well graded, sub-rounded, slightly weathered, greywacke.	
			1.0	54.0		0.95m - End of test pit	
			1.5	53.5			

Date Started:	16/07/2024	**Logged By:**	NY	**Comments:**
Method:	TP	**Contractor:**	CORDE	Groundwater not encountered. No visual or olfactory evidence of contamination.
Face Orientation:		**Equipment:**	JCB Hydradig 110W	

Note: These logs are for environmental purposes only and may not comply with NZGS geotechnical logging guidelines.

Photo Log

Location ID: PP25

Sheet 1 of 1

Project:	Rolleston Access Improvements	**Project number:**	3338703 - Contaminated Land
Site location:		**Client Name:**	NZTA - Waka Kotahi
Location:	On SH1 approximately 200m southbound from Brookside Road turnoff	**Coordinate system:**	NZTM2000
		Northing:	5173253.0
		Easting:	1549607.0
		Vertical datum:	
		Ground level (mRL):	55.30
		Location method:	GPS +/- 5m



F

Appendix F – Hills Laboratory Reports and Chain of Custody Forms

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **361 5826**
Date Recv: 27-Jun-24 13:54
Received by: Harsharan Kaur

Quote No 129425
Primary Contact Stuart Caird
Submitted By
Client Name Beca Limited
Address PO Box 13960, Christchurch 8141
Postcode
Phone *Mobile*
Email
Charge To Beca Limited
Client Reference 3338703/800
Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other Maisie.Liggins@beca.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 27.6.24
Name: S.CAIRD
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☑ Chilled ☐ Frozen
Temp: 13.8

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (If not as per Quote)
1	TP15_0.1	27.6.24		SOIL	HMHg, PAH, TPH, Asbestos (SQ)
2	TP15_0.3				Hold (OLD
3	TP15_0.5				HMHg, PAH, TPH, Asbestos (SQ)
4	TP15_0.7				Hold (OLD
5	TP15_1.0				Hold (OLD
6	TP15_1.5				Hold (OLD
7	TP15_1.9				Hold (OLD
8	DUP_D				HMHg, PAH, TPH
9	TP33_0.1				HMHg, PAH, TPH, Asbestos (SQ).
10	TP33_0.3				Hold (OLD
11	TP33_0.5				HMHg, PAH, TPH, Asbestos (SQ)
12	TP33_0.9	↓		↓	Hold (OLD

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP33_1.0	26.14		SOIL	HSID COLD
14	TP35_0.1	↓		↓	HM-Hg, PAH, TPH, Asbestos (SCR).
15	TP35_0.3				HSID COLD
16	TP35_0.5				HM-Hg, PAH, TPH, Asbestos (SCR),
17	TP35_0.7				HSID COLD
18	TP35_1.0				HSID COLD
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

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

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3615826
Contact:	Stuart Caird	**Date Registered:**	29-Jun-2024 8:34 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date*:	03-Jul-2024 4:30 pm

* As the samples require analysis at a Hill Labs location that is different to where they were received, the Target Date for reporting has been extended.

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP15_0.1 27-Jun-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
2	TP15_0.3 27-Jun-2024	Soil	cGSoil	Hold Cold
3	TP15_0.5 27-Jun-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	TP15_0.7 27-Jun-2024	Soil	cGSoil	Hold Cold
5	TP15_1.0 27-Jun-2024	Soil	cGSoil	Hold Cold
6	TP15_1.5 27-Jun-2024	Soil	cGSoil	Hold Cold
7	TP15_1.9 27-Jun-2024	Soil	cGSoil	Hold Cold
8	Dup_D 27-Jun-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
9	TP33_0.1 27-Jun-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
10	TP33_0.3 27-Jun-2024	Soil	cGSoil	Hold Cold
11	TP33_0.5 27-Jun-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
12	TP33_0.7 27-Jun-2024	Soil	cGSoil	Hold Cold
13	TP33_1.0 27-Jun-2024	Soil	cGSoil	Hold Cold
14	TP35_0.1 27-Jun-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
15	TP35_0.3 27-Jun-2024	Soil	cGSoil	Hold Cold
16	TP35_0.5 27-Jun-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
17	TP35_0.7 27-Jun-2024	Soil	cGSoil	Hold Cold
18	TP35_1.0 27-Jun-2024	Soil	cGSoil	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 8-9, 11, 14, 16
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	1, 3, 8-9, 11, 14, 16

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	1, 3, 8-9, 11, 14, 16
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from; Benzo(a) anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a) pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
Benzo[a]pyrene Toxic Equivalence (TEF)	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 8-9, 11, 14, 16
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 8-9, 11, 14, 16

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No. **361 5825**
Date Recv: 27-Jun-24 13:54
Received by: Harsharan Kaur

Quote No 129425
Primary Contact Stuart Caird
Submitted By
Client Name Beca Limited
Address PO Box 13960, Christchurch 8141
Postcode
Phone *Mobile*
Email
Charge To Beca Limited
Client Reference 3338703/800
Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other Maise.Liggins@beca.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 27.6.24
Name: S.CAIRD
☑ Tick if you require COC to be emailed back Signature:

Received at Hill Laboratories (Refer to Lab created Job No above) Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☑ Chilled ☐ Frozen Temp: 13.8

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP15_0.1	27.6.24		SOIL	Hmthg, PAH, TPH, Asbestos (SQ)
2	TP15_0.3				Hold cold
3	TP15_0.5				Hmthg, PAH, TPH, Asbestos (SQ)
4	TP15_0.7				Hold cold
5	TP15_1.0				Hold cold
6	TP15_1.5				Hold cold
7	TP15_2.0				Hold cold
8	DUP_D				Hmthg, PAH, TPH
9	TP33_0.1				Hmthg, PAH, TPH, Asbestos (SQ)
10	TP33_0.3				Hold cold
11	TP33_0.5				Hmthg, PAH, TPH, Asbestos (SQ)
12	TP33_0.9	↓		↓	Hold cold

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP33_1.0	27.6.14		SOIL	Metals cocD
14	TP35_0.1	↓		↓	Hg, PAH, TPH, Asbestos (SQ).
15	TP35_0.3				Metals cocD
16	TP35_0.5				Hg, PAH, TPH, Asbestos (SQ).
17	TP35_0.7				Metals cocD
18	TP35_1.0	↓		↓	Metals cocD
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

R J Hill Laboratories Limited
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0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3615825
Contact:	Stuart Caird	**Date Registered:**	27-Jun-2024 3:00 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	02-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP15_0.1 27-Jun-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
2	TP15_0.3 27-Jun-2024	Soil	PSoil500Asb	Hold Cold
3	TP15_0.5 27-Jun-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
4	TP15_0.7 27-Jun-2024	Soil	PSoil500Asb	Hold Cold
5	TP15_1.0 27-Jun-2024	Soil	PSoil500Asb	Hold Cold
6	TP33_0.1 27-Jun-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
7	TP33_0.3 27-Jun-2024	Soil	PSoil500Asb	Hold Cold
8	TP33_0.5 27-Jun-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
9	TP33_0.7 27-Jun-2024	Soil	PSoil500Asb	Hold Cold
10	TP33_1.0 27-Jun-2024	Soil	PSoil500Asb	Hold Cold
11	TP35_0.1 27-Jun-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
12	TP35_0.3 27-Jun-2024	Soil	PSoil500Asb	Hold Cold
13	TP35_0.5 27-Jun-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
14	TP35_0.7 27-Jun-2024	Soil	PSoil500Asb	Hold Cold
15	TP35_1.0 27-Jun-2024	Soil	PSoil500Asb	Hold Cold

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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8, 11, 13
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8, 11, 13
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 6, 8, 11, 13
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 6, 8, 11, 13
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 6, 8, 11, 13
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13
Asbestos in ACM as % of Total Sample	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13
Asbestos as Fibrous Asbestos as % of Total Sample	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13
Asbestos as Asbestos Fines as % of Total Sample	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13

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ANALYSIS REQUEST

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

T 0508 HILL LAB (44 555 22)
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W www.hill-laboratories.com

Job No. **361 2947**
Date Recv: 24-Jun-24 15:21
Received by: Michaela Conlan

Quote No 129425
Primary Contact Stuart Caird
Submitted By
Client Name Beca Limited
Address PO Box 13960, Christchurch 8141
Postcode
Phone *Mobile*
Email
Charge To Beca Limited
Client Reference 3338703/800
Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☑ Other Maria.Hopkins@beca.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 24.6.24
Name: S. CAIRD
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 13.3

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	IPOH_0.1	24.6.24		SOIL	HMs Hg, PAH, TPH
2	IPOH_0.3	↓		↓	Hold cold
3	IPOH_0.5				Hms Hg, PAH, TPH
4	IPOH_0.7				Hold cold
5	IPOH_1.0				Hold cold
6	DUP_C				Hms Hg, PAH, TPH
7	IPOH_1.5	↓		↓	Hold cold
8					
9					
10					
11					
12					

Continued on next page

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3612947
Contact:	Stuart Caird	**Date Registered:**	25-Jun-2024 9:32 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date*:	27-Jun-2024 4:30 pm

* As the samples require analysis at a Hill Labs location that is different to where they were received, the Target Date for reporting has been extended.

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	IP04_0.1 24-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
2	IP04_0.3 24-Jun-2024	Soil	GSoil300	Hold Cold
3	IP04_0.5 24-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	IP04_0.7 24-Jun-2024	Soil	GSoil300	Hold Cold
5	IP04_1.0 24-Jun-2024	Soil	GSoil300	Hold Cold
6	Dup_C 24-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
7	IP04_1.5 24-Jun-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 6
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	1, 3, 6
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	1, 3, 6
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	1, 3, 6
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	1, 3, 6

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 6
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 6
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 6
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 6
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 6

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ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street, Hamilton 3204
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Hamilton 3240, New Zealand

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Job No: 361 1080
Date Recv: 20-Jun-24 10:12
Received by: Brittney McLean

Quote No 129425
Primary Contact Stuart Caird
Submitted By Maddie Hopkins
Client Name Beca Limited
Address PO Box 13960, Christchurch 8141
Postcode
Phone *Mobile*
Email
Charge To Beca Limited
Client Reference 3338703/800
Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 20/6/24
Name: M Hopkins
☐ Tick if you require COC to be emailed back Signature: MJH

Received at Hill Laboratories (Refer to Lab created Job No above) Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 4.0

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP15_0.05	20/6/24		~~Asphalt~~	HM's+Hg, TPH+PAH
2	PP15_0.15			SOIL	HOLD COLD
3	PP15_0.3			↓	HM's+Hg, TPH+PAH
4	PP14_0.05			Asphalt	HM's+Hg, TPH+PAH
5	PP14_0.15			SOIL	HOLD COLD
6	PP14_0.3				~~HM's+Hg, TPH, SVOC~~ HOLD COLD
7	PP14_0.5				~~HOLD COLD~~ HM's+Hg +TPH+SVOC(trace)
8	PP14_1.0			↓	HOLD COLD
9	PP12_0.05			Asphalt	HOLD COLD
10	PP12_0.10			SOIL	HM's+Hg, TPH, SVOC(trace), BTEX
11	PP12_0.30				HOLD COLD
12	PP12_0.5			↓	~~HOLD COLD~~ HM's+Hg, BTEX TPH, SVOC(trace)

Continued on next page

PTO

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	PPR - 1.0	23/6/24		SOIL	HOLD COLD
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3611080
Contact:	Stuart Caird	**Date Registered:**	21-Jun-2024 9:47 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	Rolleston 338703/800
		Add. Client Ref:	
		Submitted By:	Maisie Hopkins
		Charge To:	Beca Limited
		Target Date:	02-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP15_0.05 20-Jun-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP15_0.15 20-Jun-2024	Soil	GSoil300	Hold Cold
3	PP15_0.3 20-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	PP14_0.05 20-Jun-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
5	PP14_0.15 20-Jun-2024	Soil	GSoil300	Hold Cold
6	PP14_0.3 20-Jun-2024	Soil	GSoil300	Hold Cold
7	PP14_0.5 20-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
8	PP14_1.0 20-Jun-2024	Soil	GSoil300	Hold Cold
9	PP12_0.05 20-Jun-2024	Roading Material	GSoil300	Hold Cold
10	PP12_0.1 20-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPHHS + BTEX profile, Soil, Semivolatile Organic Compounds Trace in Soil by GC-MS
11	PP12_0.3 20-Jun-2024	Soil	GSoil300	Hold Cold
12	PP12_0.5 20-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPHHS + BTEX profile, Soil, Semivolatile Organic Compounds Trace in Soil by GC-MS
13	PP12_1.0 20-Jun-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	3, 7, 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	3
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	3, 7, 10, 12

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	3
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	3
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	3
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	3, 7, 10, 12
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	10, 12
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	7, 10, 12
TPH Headspace in Soil			
C6 - C9	Solvent extraction, Headspace GC-MS analysis. In-house based on US EPA 8260 and 5021.	3 mg/kg dry wt	10, 12
Total hydrocarbons (C6 - C36)	Calculation: Sum of carbon bands from C6 to C36. In-house based on US EPA 8015 and US EPA 8260, 5021.	63 mg/kg dry wt	10, 12
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 7
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 7, 10, 12
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	3, 7, 10, 12
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	3, 7

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 4
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 4
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 4
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 4
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 4
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 4
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 4
Total Petroleum Hydrocarbons in Rock			

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3-4, 7, 10, 12
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 4
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 4

Hill Laboratories
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ANALYSIS REQUEST

R J Hill Laboratories Limited
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Private Bag 3205
Hamilton 3240, New Zealand

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W www.hill-laboratories.com

Job No. **361 1982**

Date Recv: 21-Jun-24 16:10

Received by: Eila-Rose Jones

Quote No 129425

Primary Contact Stuart Caird

Submitted By Maisie Hopkins

Client Name Beca Limited

Address PO Box 13960, Christchurch 8141

Postcode

Phone *Mobile*

Email

Charge To Beca Limited

Client Reference 3338703/800

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*

☑ *Email Other* ESdat_AU+BECA@ESdatLabSync.net

☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 21/6/24
Name: M-Hopkins
Signature: MH

☐ *Tick if you require COC to be emailed back*

Received at Hill Laboratories *(Refer to Lab created Job No above)*
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 6.8

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP06_0.05	21/6/24		Asphalt	HM's+Hg, TPH+PAH
2	PP06_0.15			SOIL	HOLD COLD
3	PP06_0.3				HM's+Hg, TPH+PAH
4	PP06_0.5				HOLD COLD
5	PP11_0.05			Asphalt	HM's+Hg, TPH+PAH
6	PP11_0.15			SOIL	HOLD COLD
7	PP11_0.3				ONOCP+HM's+Hg, TPH+PAH
8	PP11_0.5				ONOCP+HM's+Hg, TPH+PAH
9	PP11_1.0				HOLD COLD
10					
11					
12					

Continued on next page

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Hamilton 3240 New Zealand

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mail@hill-labs.co.nz
www.hill-labs.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3611982
Contact:	Stuart Caird	**Date Registered:**	22-Jun-2024 11:51 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Maisie Hopkins
		Charge To:	Beca Limited
		Target Date:	03-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP06_0.05 21-Jun-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP06_0.15 21-Jun-2024	Soil	GSoil300	Hold Cold
3	PP06_0.3 21-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	PP06_0.5 21-Jun-2024	Soil	GSoil300	Hold Cold
5	PP11_0.05 21-Jun-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
6	PP11_0.15 21-Jun-2024	Soil	GSoil300	Hold Cold
7	PP11_0.3 21-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen, Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS
8	PP11_0.5 21-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen, Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS
9	PP11_1.0 21-Jun-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	3, 7-8
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	3, 7-8
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	3, 7-8
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	3, 7-8

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	3, 7-8
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	3, 7-8
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	3, 7-8
Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS	Sonication extraction, GC-ECD and GC-MS analysis. In-house based on US EPA 8081 and US EPA 8270.	0.010 - 0.2 mg/kg dry wt	7-8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 7-8
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 7-8
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	3, 7-8
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	3, 7-8

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 5
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 5
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 5
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 5
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 5
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 5
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 5
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 5
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 5
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 5
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 5
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 5, 7-8
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 5
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 5
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 5
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 5

Hill Laboratories
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ANALYSIS REQUEST

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

Job No. **361 0093**

Date Recv: 19-Jun-24 16:23

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Received by: Michaela Conlan

Quote No 129425
Primary Contact Stuart Caird
Submitted By
Client Name Beca Limited
Address PO Box 13960, Christchurch 8141
Postcode
Phone *Mobile*
Email
Charge To Beca Limited
Client Reference 3338703/800
Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 19/6/24
Name: M. Hopkins
☐ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 9.8

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP08_0-05	19/6/24		Asphalt	HM's+Hg, TPH+PAH
2	PP08_0-15			SOIL	HOLD COLD
3	PP08_0-3				HM's+Hg, TPH+PAH
4	PP08_0-5				HOLD COLD
5	PP08_1-0				HOLD COLD
6	PP13_0-05			Asphalt	HM's+Hg, TPH+PAH
7	PP13_0-15			SOIL	HOLD COLD
8	PP13_0-3				HM's+Hg, TPH+PAH
9	PP13_0-45				HM's+Hg, TPH+PAH
10	PP13_0-55				HOLD COLD
11	PP13_1-0				HOLD COLD
12	DUP1				~~HOLD COLD~~ HM's+Hg, TPH+PAH

Continued on next page

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

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3610093
Contact:	Stuart Caird	**Date Registered:**	20-Jun-2024 10:30 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	01-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP08_0.05 19-Jun-2024 10:15 am	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP08_0.15 19-Jun-2024 10:30 am	Soil	GSoil300	Hold Cold
3	PP08_0.3 19-Jun-2024 10:40 am	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	PP08_0.5 19-Jun-2024 10:45 am	Soil	GSoil300	Hold Cold
5	PP08_1.0 19-Jun-2024 10:50 am	Soil	GSoil300	Hold Cold
6	PP13_0.05 19-Jun-2024 1:00 pm	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
7	PP13_0.15 19-Jun-2024 1:00 pm	Soil	GSoil300	Hold Cold
8	PP13_0.3 19-Jun-2024 1:10 pm	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
9	PP13_0.45 19-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
10	PP13_0.55 19-Jun-2024 1:20 pm	Soil	GSoil300	Hold Cold
11	PP13_1.0 19-Jun-2024 1:30 pm	Soil	GSoil300	Hold Cold
12	DUP1 19-Jun-2024 10:15 am	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	3, 8-9
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	3, 8-9
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	3, 8-9

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	3, 8-9
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	3, 8-9
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	3, 8-9
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	3, 8-9
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8-9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8-9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	3, 8-9
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	3, 8-9

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 6, 12
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6, 12
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 12
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6, 12
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 12
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 12
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6, 12
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6, 12
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 12
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6, 12
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6, 12
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 6, 8-9, 12
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 12
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 12
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6, 12

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6, 12

Hill Laboratories
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ANALYSIS REQUEST

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

Job No. **361 5000**

Date Recv: 26-Jun-24 16:02

T 0508 HILL LAB (44 555 2
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Received by: Eila-Rose Jones

Quote No 129425

Primary Contact Stuart Caird

Submitted By

Client Name Beca Limited

Address PO Box 13960, Christchurch 8141

Postcode

Phone *Mobile*

Email

Charge To Beca Limited

Client Reference 3338703/800

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☑ Other Maisie.hopkins@beca.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
☑ Tick if you require COC to be emailed back
Date & Time: 26.6.24
Name: S.CAIRD
Signature:

Received at Hill Laboratories
(Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 12.2

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP03_0.05	26.6.24		Asbestos	Asbestos, PAH, TPH
2	PP03_0.15			SOIL	Hold
3	PP03_0.3				Asbestos, PAH, TPH
4	PP03_0.7				Hold
5	PP03_1.0				Hold
6	PP02_0.05			Asbestos	Asbestos, PAH, TPH
7	PP02_0.15			SOIL	Hold
8	PP02_0.3				Asbestos, PAH, TPH
9	PP02_0.5				Hold
10	PP02_0.8				Hold
11					
12					

Continued on next page

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

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

Job Information Summary

Client:	Beca Limited	**Lab No:**	3615000
Contact:	Stuart Caird	**Date Registered:**	27-Jun-2024 9:47 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	08-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP03_0.05 26-Jun-2024	Roading Material	cGSoil	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP03_0.15 26-Jun-2024	Soil	cGSoil	Hold Cold
3	PP03_0.3 26-Jun-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	PP03_0.7 26-Jun-2024	Soil	cGSoil	Hold Cold
5	PP03_1.0 26-Jun-2024	Soil	cGSoil	Hold Cold
6	PP02_0.05 26-Jun-2024	Roading Material	cGSoil	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
7	PP02_0.15 26-Jun-2024	Soil	cGSoil	Hold Cold
8	PP02_0.3 26-Jun-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
9	PP02_0.5 26-Jun-2024	Soil	cGSoil	Hold Cold
10	PP02_0.8 26-Jun-2024	Soil	cGSoil	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	3, 8
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	3, 8
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	3, 8
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	3, 8

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	3, 8
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	3, 8
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	3, 8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	3, 8
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	3, 8

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 6
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 6, 8
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6

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ANALYSIS REQUEST

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Private Bag 3205
Hamilton 3240, New Zealand

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W www.hill-laboratories.com

Job No. **361 7400**

Date Recv: 01-Jul-24 15:57

Received by: Megan Cambus

3136174066

Quote No 129425

Primary Contact Stuart Caird

Submitted By

Client Name Beca Limited

Address PO Box 13960, Christchurch 8141

Postcode

Phone *Mobile*

Email

Charge To Beca Limited

Client Reference 3338703/800

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☑ Other Meabe.Watkins@beca.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 1.7.24
Name: S. CAIRD
Signature:

☑ Tick if you require COC to be emailed back

Received at Hill Laboratories
(Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 13.3

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP06-0.1	1.7.24		Soil	HMHg, TPH, PAH
2	TP06-0.3				Hold Cold
3	TP06-0.5				HMHg, TPH, PAH
4	TP06-0.7				Hold Cold
5	TP06-1.0				
6	TP06-1.5				
7	TP06-2.0				
8	TP06-3.0				
9	TP06-4.0				
10	TP08-0.1				HMHg, TPH, PAH
11	TP08-0.3				Hold Cold
12	TP08-0.5				HMHg, TPH, PAH

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP08_0.7	1.7.24		SOIL	HAND CBD
14	TP08_1.0				
15	TP08_1.5				
16	TP08_2.0				
17	TP03_01				AMIANTH, TPH, PAH
18	TP03_0.3				HAND CBD
19	TP03_05				AMIANTH, TPH, PAH
20	TP03_0.7				HAND CBD
21	TP03_1.0				
22	TP03_1.5				
23	TP03_2.0				
24	DUP_E				AMIANTH, TPH, PAH
25	BH02_0.1-0.2				AMIANTH, TPH, PAH
26	BH02_0.3-0.4				HAND CBD
27	BH02_0.5-0.7				AMIANTH, TPH, PAH
28	BH02_0.8-1.0				HAND CBD
29	BH02_1.5-1.7				HAND CBD
30	TP02_01				AMIANTH, TPH, PAH
31	TP02_0.3				HAND CBD
32	TP02_05				AMIANTH, TPH, PAH
33	TP02_0.7				HAND CBD
34	TP02_1.0				
35	TP02_1.5				
36	TP02_2.0				
37					
38					
39					
40					

R J Hill Laboratories Limited
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Private Bag 3205
Hamilton 3240 New Zealand

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www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3617400
Contact:	Stuart Caird	**Date Registered:**	02-Jul-2024 10:00 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	338703/800
		Add. Client Ref:	
		Submitted By:	Maisie Hopkins
		Charge To:	Beca Limited
		Target Date*:	04-Jul-2024 4:30 pm

* As the samples require analysis at a Hill Labs location that is different to where they were received, the Target Date for reporting has been extended.

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP06_0.1 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
2	TP06_0.3 01-Jul-2024	Soil	GSoil300	Hold Cold
3	TP06_0.5 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	TP06_0.7 01-Jul-2024	Soil	GSoil300	Hold Cold
5	TP06_1.0 01-Jul-2024	Soil	GSoil300	Hold Cold
6	TP06_1.5 01-Jul-2024	Soil	GSoil300	Hold Cold
7	TP06_2.0 01-Jul-2024	Soil	GSoil300	Hold Cold
8	TP06_3.0 01-Jul-2024	Soil	GSoil300	Hold Cold
9	TP06_4.0 01-Jul-2024	Soil	GSoil300	Hold Cold
10	TP08_0.1 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
11	TP08_0.3 01-Jul-2024	Soil	GSoil300	Hold Cold
12	TP08_0.5 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
13	TP08_0.7 01-Jul-2024	Soil	GSoil300	Hold Cold
14	TP08_1.0 01-Jul-2024	Soil	GSoil300	Hold Cold
15	TP08_1.5 01-Jul-2024	Soil	GSoil300	Hold Cold
16	TP08_2.0 01-Jul-2024	Soil	GSoil300	Hold Cold
17	TP03_0.1 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
18	TP03_0.3 01-Jul-2024	Soil	GSoil300	Hold Cold
19	TP03_0.5 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
20	TP03_0.7 01-Jul-2024	Soil	GSoil300	Hold Cold
21	TP03_1.0 01-Jul-2024	Soil	GSoil300	Hold Cold
22	TP03_1.5 01-Jul-2024	Soil	GSoil300	Hold Cold
23	TP03_2.0 01-Jul-2024	Soil	GSoil300	Hold Cold
24	DUP_E 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
25	BH02_0.1-0.2 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
26	BH02_0.3-0.4 01-Jul-2024	Soil	GSoil300	Hold Cold
27	BH02_0.5-0.7 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
28	BH02_0.8-1.0 01-Jul-2024	Soil	GSoil300	Hold Cold
29	BH02_1.5-1.7 01-Jul-2024	Soil	GSoil300	Hold Cold
30	IP02_0.1 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
31	IP02_0.3 01-Jul-2024	Soil	GSoil300	Hold Cold
32	IP02_0.5 01-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
33	IP02_0.7 01-Jul-2024	Soil	GSoil300	Hold Cold
34	IP02_1.0 01-Jul-2024	Soil	GSoil300	Hold Cold
35	IP02_1.5 01-Jul-2024	Soil	GSoil300	Hold Cold
36	IP02_2.0 01-Jul-2024	Soil	cGSoil	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32

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ANALYSIS REQUEST

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

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E mail@hill-labs.co.nz
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Job No. **361 3940**

Date Recv: 25-Jun-24 15:58

Received by: Brittney McLean

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☐ Other Maise.hopkins@beca.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 25.6.24
Name: S Caird
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories *(Refer to Lab created Job No above)*
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 13.3

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	IB07_0.1	25.6.24		SOIL	HM+Hg, PAH
2	IB07-0.3	↓	↓	↓	Hold
3	IB07-0.5				HM+Hg, PAH
4	IB07_1.0				Hold
5	IB07_1.5				Hold
6	IB07_07				Hold
7	IB08_0.1				HM+Hg, PAH
8	IB08_0.3				Hold
9	IB08-0.5				HM+Hg, PAH
10	IB08_0.7				Hold
11	IB08_1.0				Hold
12	IB08_1.5	↓		↓	Hold

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	IP04_0.1	25.6.24		SOIL	HM+Hg, PAH
14	IP04_0.3	↓		↓	Hold (QD
15	IP04_0.5				HM+Hg, PAH
16	IP04_0.7				Hold (QD
17	IP04_1.0				Hold (QD
18	IP04_1.5	↓		↓	Hold (QD
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

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Private Bag 3205
Hamilton 3240 New Zealand

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

Job Information Summary

Client:	Beca Limited	**Lab No:**	3613940
Contact:	Stuart Caird	**Date Registered:**	26-Jun-2024 10:16 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	Rolleston 338703
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date*:	01-Jul-2024 4:30 pm

* As the samples require analysis at a Hill Labs location that is different to where they were received, the Target Date for reporting has been extended.

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	IP07_0.1 25-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Polycyclic Aromatic Hydrocarbons Screening in Soil
2	IP07_0.3 25-Jun-2024	Soil	GSoil300	Hold Cold
3	IP07_0.5 25-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Polycyclic Aromatic Hydrocarbons Screening in Soil
4	IP07_1.0 25-Jun-2024	Soil	GSoil300	Hold Cold
5	IP07_1.5 25-Jun-2024	Soil	GSoil300	Hold Cold
6	IP07_0.7 25-Jun-2024	Soil	GSoil300	Hold Cold
7	IP08_0.1 25-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Polycyclic Aromatic Hydrocarbons Screening in Soil
8	IP08_0.3 25-Jun-2024	Soil	GSoil300	Hold Cold
9	IP08_0.5 25-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Polycyclic Aromatic Hydrocarbons Screening in Soil
10	IP08_0.7 25-Jun-2024	Soil	GSoil300	Hold Cold
11	IP08_1.0 25-Jun-2024	Soil	GSoil300	Hold Cold
12	IP08_1.5 25-Jun-2024	Soil	GSoil300	Hold Cold
13	IP09_0.1 25-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Polycyclic Aromatic Hydrocarbons Screening in Soil
14	IP09_0.3 25-Jun-2024	Soil	GSoil300	Hold Cold
15	IP09_0.5 25-Jun-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Polycyclic Aromatic Hydrocarbons Screening in Soil
16	IP09_0.7 25-Jun-2024	Soil	GSoil300	Hold Cold
17	IP09_1.0 25-Jun-2024	Soil	GSoil300	Hold Cold
18	IP09_1.5 25-Jun-2024	Soil	GSoil300	Hold Cold

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%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 7, 9, 13, 15
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	1, 3, 7, 9, 13, 15

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 7, 9, 13, 15
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	1, 3, 7, 9, 13, 15
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	1, 3, 7, 9, 13, 15
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	1, 3, 7, 9, 13, 15
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	1, 3, 7, 9, 13, 15

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32

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ANALYSIS REQUEST

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

Job No: **362 0180**

Date Recv: 04-Jul-24 14:28

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Received by: Courtney Case

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☑ Other Maisie.Hopkins@beca.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 4.7.24
Name: S.CAIRD
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 17.6

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP23_0.05	4.7.24		Asphalt	Hmthg, TPH, PAH
2	PP23_0.15	↓		Soil	Hmthg, TPH, PAH
3	PP23_0.3			Soil	Hold cold
4	PP23_0.35			Asphalt	Hmthg, TPH, PAH
5	PP23_0.45			Soil	Hold cold
6	PP23_0.7			Soil	Hold cold
7	PP22_0.05			Asphalt	Hmthg, TPH, PAH
8	PP22_0.15			Soil	Hmthg, TPH, PAH
9	PP22_0.25			Asphalt	Hmthg, TPH, PAH
10	PP22_0.3			Soil	Hold cold
11	PP22_0.5			Soil	Hold cold
12	PP22_0.8	↓		Soil	Hold cold

Continued on next page

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

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3620180
Contact:	Stuart Caird	**Date Registered:**	05-Jul-2024 10:36 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Maisie Hopkins
		Charge To:	Beca Limited
		Target Date:	18-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP23_0.05 04-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP23_0.15 04-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
3	PP23_0.3 04-Jul-2024	Soil	GSoil300	Hold Cold
4	PP23_0.35 04-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
5	PP23_0.45 04-Jul-2024	Soil	GSoil300	TPH Oil Industry Profile + PAHscreen
6	PP23_0.7 04-Jul-2024	Soil	GSoil300	Hold Cold
7	PP22_0.05 04-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
8	PP22_0.15 04-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
9	PP22_0.25 04-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
10	PP22_0.3 04-Jul-2024	Soil	GSoil300	TPH Oil Industry Profile + PAHscreen
11	PP22_0.5 04-Jul-2024	Soil	GSoil300	Hold Cold
12	PP22_0.8 04-Jul-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 8
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	2, 5, 8, 10
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	2, 5, 8, 10

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	2, 5, 8, 10
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	2, 5, 8, 10
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 5, 8, 10
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 5, 8, 10
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 5, 8, 10
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 5, 8, 10
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 5, 8, 10

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 4, 7, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 4, 7, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 4, 7, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 4, 7, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 4, 7, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 4-5, 7, 9-10
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 7, 9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 7, 9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 4, 7, 9
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 4, 7, 9

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ANALYSIS REQUEST

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

Job No. **362 1255**

Date Recv: 05-Jul-24 14:17

Received by: Eila-Rose Jones

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

3136212554

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other Marie.hooks@beca.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
☑ Tick if you require COC to be emailed back
Date & Time: 5.7.24
Name: S. CAIRD
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 14.1

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP11_0.1	5.7.24		SOIL	HMHg, PAH, TPH
2	TP11_0.3				Hold (20
3	TP11_0.5				HMHg, PAH, TPH
4	TP11_0.7				Hold (20
5	TP11_1.0				
6	TP11_1.5				
7	TP11_2.0				
8	PP19_0.05			Asphalt	HMHg, PAH, TPH
9	PP19_0.15			Soil	HMHg, PAH, TPH
10	PP19_0.25			Asphalt	HMHg, PAH, TPH
11	PP19_0.35			Soil	Hold (20
12	TP19_0.45			Soil	Hold (20

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	PPK_065	5.7.24		SOIL	1AH LAD
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Job Information Summary

Client:	Beca Limited	**Lab No:**	3621255
Contact:	Stuart Caird	**Date Registered:**	06-Jul-2024 9:27 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	16-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	IP11_0.1 05-Jul-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
2	IP11_0.3 05-Jul-2024	Soil	cGSoil	Hold Cold
3	IP11_0.5 05-Jul-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	IP11_0.7 05-Jul-2024	Soil	cGSoil	Hold Cold
5	IP11_1.0 05-Jul-2024	Soil	cGSoil	Hold Cold
6	IP11_1.5 05-Jul-2024	Soil	cGSoil	Hold Cold
7	IP11_2.0 05-Jul-2024	Soil	cGSoil	Hold Cold
8	PP19_0.05 05-Jul-2024	Roading Material	cGSoil	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
9	PP19_0.15 05-Jul-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
10	PP19_0.25 05-Jul-2024	Roading Material	cGSoil	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
11	PP19_0.35 05-Jul-2024	Soil	cGSoil	Hold Cold
12	PP19_0.45 05-Jul-2024	Soil	cGSoil	Hold Cold
13	PP19_0.65 05-Jul-2024	Soil	cGSoil	Hold Cold
14	DUP_F 05-Jul-2024	Soil	cGSoil	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 9, 14
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	1, 3, 9, 14
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	1, 3, 9, 14

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	1, 3, 9, 14
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	1, 3, 9, 14
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 9, 14
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 9, 14
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 8-10, 14
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 9, 14
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 9, 14
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 9, 14
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 9, 14

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	8, 10
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	8, 10
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	8, 10
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	8, 10
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	8, 10
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	8, 10
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	8, 10
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	8, 10
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	8, 10
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	8, 10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	8, 10
Total Petroleum Hydrocarbons in Rock			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	8, 10
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	8, 10
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	8, 10

Hill Laboratories
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ANALYSIS REQUEST

R J Hill Laboratories Limited
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Private Bag 3205
Hamilton 3240, New Zealand

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Job No: **362 5445**
Date Recv: 11-Jul-24 15:01
Received by: Eila-Rose Jones

Quote No 129425
Primary Contact Stuart Caird
Submitted By Stuart Caird
Client Name Beca Limited
Address PO Box 13960, Christchurch 8141
Postcode
Phone *Mobile*
Email
Charge To Beca Limited
Client Reference 3338703/800
Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 11-7-24
Name: S CAIRD
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 11.7

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP25-0.1	11-7-24		SOIL	HMHg, PAH, TPH, Asbestos (SQ)
2	TP25-0.3	↓	↓	↓	HOLD (CAD
3	TP25-0.5				HMHg, PAH, TPH, Asbestos (SQ)
4	TP25-0.7				HOLD (CAD
5	TP25-1.0				HOLD (CAD
6	TP29-0.1				HMHg, PAH, TPH, Asbestos (SQ)
7	TP29-0.3				HOLD (CAD
8	TP29-0.5				HMHg, PAH, TPH, Asbestos (SQ)
9	TP29-0.7				HOLD (CAD
10	TP29-1.0				HOLD (CAD
11	TP12-0.1				HMHg, PAH, TPH
12	TP12-0.3	↓	↓	↓	HOLD (CAD

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP12-0.5	11.7.24		SOIL	HM+Hg, PAH, TPH
14	TP12-0.7				Hold COLD
15	TP12-1.0				Hold COLD
16	TP12-1.5				Hold COLD
17	TP12-2.0				Hold COLD
18	PP20-0.05			Asbestos	HM+Hg, PAH, TPH
19	PP20-0.15			50:1	HM+Hg, PAH, TPH
20	PP20-0.2			Asbestos	HM+Hg, PAH, TPH
21	PP20-0.3			50:1	Hold COLD
22	PP20-0.5			50:1	Hold COLD
23	PP20-0.75			50:1	Hold COLD
24	BH05-0.1			50:1	HM+Hg, TPH, BTEX, SVOC
25	BH05-0.2-0.3			50:1	Hold COLD
26	BH05-0.4-0.5			50:1	
27	BH05-0.6				
28	BH05-1.0				
29	BH05-1.6				
30	BH05-2.0-2.2				
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

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

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3625445
Contact:	Stuart Caird	**Date Registered:**	11-Jul-2024 4:56 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	Rolleston 338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	15-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP25_0.1 11-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
2	TP25_0.3 11-Jul-2024	Soil	PSoil500Asb	Hold
3	TP25_0.5 11-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
4	TP25_0.7 11-Jul-2024	Soil	PSoil500Asb	Hold
5	TP25_1.0 11-Jul-2024	Soil	PSoil500Asb	Hold
6	TP29_0.1 11-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
7	TP29_0.3 11-Jul-2024	Soil	PSoil500Asb	Hold
8	TP29_0.5 11-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
9	TP29_0.7 11-Jul-2024	Soil	PSoil500Asb	Hold
10	TP29_1.0 11-Jul-2024	Soil	PSoil500Asb	Hold

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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 6, 8
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 6, 8
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 6, 8
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8
Asbestos in ACM as % of Total Sample	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8
Asbestos as Fibrous Asbestos as % of Total Sample	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8
Asbestos as Asbestos Fines as % of Total Sample	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8
Asbestos in Soil ESdat Electronic Transfer			
Amosite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 6, 8
Chrysotile	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 6, 8
Crocidolite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 6, 8

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ANALYSIS REQUEST

R J Hill Laboratories Limited
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Job No: **362 5446**
Date Recv: 11-Jul-24 15:01
Received by: Eila-Rose Jones

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 11.7.24
Name: S. CAIRD
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen — Temp: 11.7

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP25-0.1	11.7.24		SOIL	HMs Hg, PAH, TPH, Asbestos (SQ)
2	TP25_0.3				HOLD (SOIL)
3	TP25_0.5				HMs Hg, PAH, TPH, Asbestos (SQ)
4	TP25_0.7				HOLD (SOIL)
5	TP25_1.0				HOLD (SOIL)
6	TP29_0.1				HMs Hg, PAH, TPH, Asbestos (SQ)
7	TP29_0.3				HOLD (SOIL)
8	TP29_0.5				HMs Hg, PAH, TPH, Asbestos (SQ)
9	TP29_0.7				HOLD (SOIL)
10	TP29_1.0				HOLD (SOIL)
11	TP12_0.1				HMs Hg, PAH, TPH
12	TP12_0.3				HOLD (SOIL)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP12-0.5	11.7.24		SOIL	HMHg, PAH, TPH
14	TP12-0.7				LHOLD COLD
15	TP12-1.0				LHOLD COLD
16	TP12-1.5				HOLD COLD
17	TP12-2.0				LHOLD COLD
18	PP20-0.05			ASPHALT	HMHg PAH, TPH
19	PP20-0.15			SOIL	HMHg, PAH, TPH
20	PP20-0.7			ASPHALT	HMHg, PAH, TPH
21	PP20-0.3			SOIL	HOLD COLD
22	PP20-0.5			SOIL	HOLD COLD
23	PP20-0.75			SOIL	HOLD COLD
24	BH05-0.1			SOIL	HMHg, TPH, BTEX, SVOC
25	BH05-0.2-0.3			SOIL	HOLD COLD
26	BH05-0.4-0.5			SOIL	
27	BH05-0.6				
28	BH05-1.0				
29	BH05-1.6				
30	BH05-2.0-2.2				
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3625446
Contact:	Stuart Caird	**Date Registered:**	12-Jul-2024 10:46 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	22-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP25_0.1 11-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
2	TP25_0.3 11-Jul-2024	Soil	GSoil300	Hold Cold
3	TP25_0.5 11-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	TP25_0.7 11-Jul-2024	Soil	GSoil300	Hold Cold
5	TP25_1.0 11-Jul-2024	Soil	GSoil300	Hold Cold
6	TP29_0.1 11-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
7	TP29_0.3 11-Jul-2024	Soil	GSoil300	Hold Cold
8	TP29_0.5 11-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
9	TP29_0.7 11-Jul-2024	Soil	GSoil300	Hold Cold
10	TP29_1.0 11-Jul-2024	Soil	GSoil300	Hold Cold
11	TP12_0.1 11-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen, Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS
12	TP12_0.3 11-Jul-2024	Soil	GSoil300	Hold Cold
13	TP12_0.5 11-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen, Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS
14	TP12_0.7 11-Jul-2024	Soil	GSoil300	Hold Cold
15	TP12_1.0 11-Jul-2024	Soil	GSoil300	Hold Cold
16	TP12_1.5 11-Jul-2024	Soil	GSoil300	Hold Cold
17	TP12_2.0 11-Jul-2024	Soil	GSoil300	Hold Cold
18	PP20_0.05 11-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn
19	PP20_0.15 11-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
20	PP20_0.2 11-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn
21	PP20_0.3 11-Jul-2024	Soil	GSoil300	Hold Cold
22	PP20_0.5 11-Jul-2024	Soil	GSoil300	Hold Cold
23	PP20_0.75 11-Jul-2024	Soil	GSoil300	Hold Cold
24	BH05_0.1 11-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH + BTEX profile, Soil, Semivolatile Organic Compounds Trace in Soil by GC-MS
25	BH05_0.2-0.3 11-Jul-2024	Soil	GSoil300	Hold Cold
26	BH05_0.4-0.5 11-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
27	BH05_0.6 11-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
28	BH05_1.0 11-Jul-2024	Soil	GSoil300	Hold Cold
29	BH05_1.6 11-Jul-2024	Soil	GSoil300	Hold Cold
30	BH05_2.0-2.2 11-Jul-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 6, 8, 11, 13, 19, 24, 26-27
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	1, 3, 6, 8, 11, 13, 19
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	1, 3, 6, 8, 11, 13, 19, 24, 26-27
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	1, 3, 6, 8, 11, 13, 19
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	1, 3, 6, 8, 11, 13, 19
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19, 24, 26-27
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	24, 26-27
Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS	Sonication extraction, GC-ECD and GC-MS analysis. In-house based on US EPA 8081 and US EPA 8270.	0.010 - 0.2 mg/kg dry wt	11, 13
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	24, 26-27
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 6, 8, 11, 13, 18-20, 24, 26-27
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19, 24, 26-27
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19, 24, 26-27
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19, 24, 26-27

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19, 24, 26-27

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	18, 20
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	18, 20
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	18, 20
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	18, 20
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	18, 20
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	18, 20
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	18, 20
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	18, 20
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	18, 20
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	18, 20
Total Petroleum Hydrocarbons in Rock			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	18, 20
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	18, 20
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	18, 20
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	18, 20

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	8, 10

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ANALYSIS REQUEST

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

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W www.hill-laboratories.com

Job No: **362 9427**
Date Recv: 17-Jul-24 15:34
Received by: Harsharan Kaur

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*
☑ *Email Other* ESdat_AU+BECA@ESdatLabSync.net
☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:* 17-7-24
Name: S. CAIRD
☑ *Tick if you require COC to be emailed back* *Signature:* Stuart

Received at Hill Laboratories *(Refer to Lab created Job No above)*
Date & Time:
Name:
Signature:

Condition ☑ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 9.5

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ **Low** ☐ **Normal** ☑ **High**
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP24_0.1	17.7.24		SOIL	HMWHg, PAH, TPH, Asbestos (SQ)
2	TP24_0.3				Hold (cold)
3	TP24_0.5				HMWHg, PAH, TPH, Asbestos (SQ)
4	TP24_0.7				Hold (cold)
5	TP24_1.0				Hold (cold)
6	TP26_0.1				HMWHg, PAH, TPH, Asbestos (SQ)
7	TP26_0.3				Hold (cold)
8	TP26_0.5				HMWHg, PAH, TPH, Asbestos (SQ)
9	TP26_0.7				Hold (cold)
10	TP26_1.0				Hold (cold)
11	DUP_1				HMWHg, PAH, TPH
12	TP28_0.1				HMWHg, PAH, TPH, Asbestos (SQ)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP28_0.3	17.7.24		SOIL	[illegible] & Hold (old)
14	TP28_0.5				Hold, PAH, TPH, Asbestos (SQ).
15	TP28_0.7				Hold (old)
16	TP28_1.0				Hold (old)
17	TP32_0.1				Hold, PAH, TPH, Asbestos (SQ.)
18	TP32_0.3				Hold (old)
19	TP32_0.5				Hold, PAH, TPH, Asbestos (SQ.)
20	TP32_0.7				Hold (old)
21	TP32_1.0				Hold (old)
22	TP31_0.1				Hold, PAH, TPH, Asbestos (SQ)
23	TP31_0.3				Hold (old)
24	TP31_0.5				Hold, PAH, TPH, Asbestos (SQ).
25	TP31_0.7				Hold (old)
26	TP31_1.0				Hold (old)
27	TP31_1.5				Hold (old)
28	TP30_0.1				Hold, PAH, TPH, Asbestos (SQ).
29	TP30_0.3				Hold (old)
30	TP30_0.5				Hold, PAH, TPH, Asbestos (SQ.)
31	TP30_0.7				Hold (old)
32	TP30_1.0				Hold (old)
33	TP27_0.1				Hold, PAH, TPH, Asbestos (SQ).
34	TP27_0.3				Hold (old)
35	TP27_0.5				Hold, PAH, TPH, Asbestos (SQ).
36	TP27_0.7				Hold (old)
37	TP27_1.0				Hold (old)
38	TP23_0.1				Hold, PAH, TPH, Asbestos (SQ.)
39	TP23_0.3				Hold (old)
40	TP23_0.5				Hold, PAH, TPH, Asbestos (SQ.)
41	TP23_0.7				Hold (old)
42	TP23_1.0				Hold (old)

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www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3629427
Contact:	Stuart Caird	**Date Registered:**	18-Jul-2024 10:14 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date*:	22-Jul-2024 4:30 pm

* As the samples require analysis at a Hill Labs location that is different to where they were received, the Target Date for reporting has been extended.

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP24_0.1 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
2	TP24_0.3 17-Jul-2024	Soil	GSoil300	Hold Cold
3	TP24_0.5 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	TP24_0.7 17-Jul-2024	Soil	GSoil300	Hold Cold
5	TP24_1.0 17-Jul-2024	Soil	GSoil300	Hold Cold
6	TP26_0.1 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
7	TP26_0.3 17-Jul-2024	Soil	GSoil300	Hold Cold
8	TP26_0.5 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
9	TP26_0.7 17-Jul-2024	Soil	GSoil300	Hold Cold
10	TP26_1.0 17-Jul-2024	Soil	GSoil300	Hold Cold
11	DUP_I 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
12	TP28_0.1 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
13	TP28_0.3 17-Jul-2024	Soil	GSoil300	Hold Cold
14	TP28_0.5 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
15	TP28_0.7 17-Jul-2024	Soil	GSoil300	Hold Cold
16	TP28_1.0 17-Jul-2024	Soil	GSoil300	Hold Cold
17	TP32_0.1 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
18	TP32_0.3 17-Jul-2024	Soil	GSoil300	Hold Cold
19	TP32_0.5 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
20	TP32_0.7 17-Jul-2024	Soil	GSoil300	Hold Cold
21	TP32_1.0 17-Jul-2024	Soil	GSoil300	Hold Cold
22	TP31_0.1 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
23	TP31_0.3 17-Jul-2024	Soil	GSoil300	Hold Cold
24	TP31_0.5 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
25	TP31_0.7 17-Jul-2024	Soil	GSoil300	Hold Cold
26	TP31_1.0 17-Jul-2024	Soil	GSoil300	Hold Cold
27	TP31_1.5 17-Jul-2024	Soil	GSoil300	Hold Cold
28	TP30_0.1 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
29	TP30_0.3 17-Jul-2024	Soil	GSoil300	Hold Cold
30	TP30_0.5 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
31	TP30_0.7 17-Jul-2024	Soil	GSoil300	Hold Cold
32	TP30_1.0 17-Jul-2024	Soil	GSoil300	Hold Cold
33	TP27_0.1 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
34	TP27_0.3 17-Jul-2024	Soil	GSoil300	Hold Cold
35	TP27_0.5 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
36	TP27_0.7 17-Jul-2024	Soil	GSoil300	Hold Cold
37	TP27_1.0 17-Jul-2024	Soil	GSoil300	Hold Cold
38	TP23_0.1 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
39	TP23_0.3 17-Jul-2024	Soil	GSoil300	Hold Cold
40	TP23_0.5 17-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
41	TP23_0.7 17-Jul-2024	Soil	GSoil300	Hold Cold
42	TP23_1.0 17-Jul-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
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	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
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	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
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	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
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	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40

Hill Laboratories
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ANALYSIS REQUEST

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

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Job No: **362 9426**
Date Recv: 17-Jul-24 15:34
Received by: Harsharan Kaur
3136264265

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 17-7-24
Name: S. CAIRD
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories *(Refer to Lab created Job No above)*
Date & Time:
Name:
Signature:

Condition ☑ Room Temp ☐ Chilled ☐ Frozen
Temp: 9.5

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP24_0.1	17.7.24		SOIL	HMHg, PAH, TPH, Asbestos (SQ).
2	TP24_0.3	↓		↓	Hold (cold)
3	TP24_0.5				HMHg, PAH, TPH, Asbestos (SQ).
4	TP24_0.7				Hold (cold)
5	TP24_1.0				Hold (cold)
6	TP26_0.1				HMHg, PAH, TPH, Asbestos (SQ).
7	TP26_0.3				Hold (cold)
8	TP26_0.5				HMHg, PAH, TPH, Asbestos (SQ).
9	TP26_0.7				Hold (cold)
10	TP26_1.0				Hold (cold)
11	DUP_1				HMHg, PAH, TPH
12	TP28_0.1	↓		↓	HMHg, PAH, TPH, Asbestos (SQ).

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP28_0.3	17.7.24		SOIL	[illegible] & Lead (soil)
14	TP28_0.5				Lead, PAH, TPH, Asbestos (SOIL)
15	TP28_0.7				Lead (soil)
16	TP28_1.0				Lead (soil)
17	TP32_0.1				Lead, PAH, TPH, Asbestos (SOIL)
18	TP32_0.3				Lead (soil)
19	TP32_0.5				Lead, PAH, TPH, Asbestos (SOIL)
20	TP32_0.7				Lead (soil)
21	TP32_1.0				Lead (soil)
22	TP31_0.1				Lead, PAH, TPH, Asbestos (SOIL)
23	TP31_0.3				Lead (soil)
24	TP31_0.5				Lead, PAH, TPH, Asbestos (SOIL)
25	TP31_0.7				Lead (soil)
26	TP31_1.0				Lead (soil)
27	TP31_1.5				Lead (soil)
28	TP30_0.1				Lead, PAH, TPH, Asbestos (SOIL)
29	TP30_0.3				Lead (soil)
30	TP30_0.5				Lead, PAH, TPH, Asbestos (SOIL)
31	TP30_0.7				Lead (soil)
32	TP30_1.0				Lead (soil)
33	TP27_0.1				Lead, PAH, TPH, Asbestos (SOIL)
34	TP27_0.3				Lead (soil)
35	TP27_0.5				Lead, PAH, TPH, Asbestos (SOIL)
36	TP27_0.7				Lead (soil)
37	TP27_1.0				Lead (soil)
38	TP23_0.1				Lead, PAH, TPH, Asbestos (SOIL)
39	TP23_0.3				Lead (soil)
40	TP23_0.5				Lead, PAH, TPH, Asbestos (SOIL)
41	TP23_0.7				Lead (soil)
42	TP23_1.0				Lead (soil)

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3629426
Contact:	Stuart Caird	**Date Registered:**	17-Jul-2024 4:19 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	19-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP24_0.1 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
2	TP24_0.3 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
3	TP24_0.5 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
4	TP24_0.7 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
5	TP24_1.0 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
6	TP26_0.1 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
7	TP26_0.3 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
8	TP26_0.5 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
9	TP26_0.7 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
10	TP26_1.0 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
11	TP28_0.1 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
12	TP28_0.3 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
13	TP28_0.5 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
14	TP28_0.7 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
15	TP28_1.0 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
16	TP32_0.1 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
17	TP32_0.3 17-Jul-2024	Soil	cPSoil500Asb	Hold Cold
18	TP32_0.5 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
19	TP32_0.7 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
20	TP32_1.0 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
21	TP31_0.1 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
22	TP31_0.3 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
23	TP31_0.5 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
24	TP31_0.7 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
25	TP31_1.0 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
26	TP31_1.5 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
27	TP30_0.1 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
28	TP30_0.3 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
29	TP30_0.5 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
30	TP30_0.7 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
31	TP30_1.0 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
32	TP27_0.1 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
33	TP27_0.3 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
34	TP27_0.5 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
35	TP27_0.7 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
36	TP27_1.0 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
37	TP23_0.1 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
38	TP23_0.3 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
39	TP23_0.5 17-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
40	TP23_0.7 17-Jul-2024	Soil	PSoil500Asb	Hold Cold
41	TP23_1.0 17-Jul-2024	Soil	PSoil500Asb	Hold Cold

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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Asbestos in ACM as % of Total Sample	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Asbestos as Fibrous Asbestos as % of Total Sample	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Asbestos as Asbestos Fines as % of Total Sample	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40

Hill Laboratories
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ANALYSIS REQUEST

R J Hill Laboratories Limited
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Job No: **362 8493**
Date Recv: 16-Jul-24 14:54
Received by: Brittney McLean

Quote No 129425
Primary Contact Stuart Caird
Submitted By Maisie Hopkins
Client Name Beca Limited
Address PO Box 13960, Christchurch 8141
Postcode
Phone *Mobile*
Email
Charge To Beca Limited
Client Reference 3338703/800
Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 16/7/24
Name: M. Hopkins
☐ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 7.0

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP25_0.1	16/7/24		ASPHALT	HM's+Hg, TPH, PAH
2	PP25_0.2			SOIL	HM's+Hg, TPH+PAH
3	PP25_0.35				HOLD COLD
4	PP25_0.5				" "
5	PP25_0.9				" "
6	PP01_0.05			Asphalt	HM's+Hg, TPH+PAH
7	PP01_0.1			SOIL	HM's+Hg, TPH+PAH
8	PP01_0.35			SOIL	HOLD COLD
9	PP01_0.40			Asphalt	HM's+Hg, TPH+PAH
10	PP01_0.50			SOIL	HOLD COLD
11	PP01_0.80			SOIL	HOLD COLD
12	TP12_0.05	15/7/24		SOIL	HM's+Hg, TPH+PAH

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	IP12_0.3	15/7/24		Soil	HOLD COLD
14	IP12_0.5				HM's+Hg, TPH+PAH
15	IP12_0.7				HOLD COLD
16	IP12_1.0				
17	IP12_1.5				
18	IP12_2.0				
19					
20					
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39					
40					

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

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mail@hill-labs.co.nz
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Job Information Summary

Client:	Beca Limited	**Lab No:**	3628493
Contact:	Stuart Caird	**Date Registered:**	17-Jul-2024 9:26 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Maisie Hopkins
		Charge To:	Beca Limited
		Target Date:	25-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP25_0.1 16-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP25_0.2 16-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
3	PP25_0.35 16-Jul-2024	Soil	GSoil300	Hold Cold
4	PP25_0.5 16-Jul-2024	Soil	GSoil300	Hold Cold
5	PP25_0.9 16-Jul-2024	Soil	GSoil300	Hold Cold
6	PP01_0.05 16-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
7	PP01_0.1 16-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
8	PP01_0.35 16-Jul-2024	Soil	GSoil300	Hold Cold
9	PP01_0.40 16-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
10	PP01_0.50 16-Jul-2024	Soil	GSoil300	Hold Cold
11	PP01_0.80 16-Jul-2024	Soil	GSoil300	Hold Cold
12	IP12_0.05 15-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
13	IP12_0.3 15-Jul-2024	Soil	GSoil300	Hold Cold
14	IP12_0.5 15-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
15	IP12_0.7 15-Jul-2024	Soil	GSoil300	Hold Cold
16	IP12_1.0 15-Jul-2024	Soil	GSoil300	Hold Cold
17	IP12_1.5 15-Jul-2024	Soil	GSoil300	Hold Cold
18	IP12_2.0 15-Jul-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 7, 12, 14

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	2, 7, 12, 14
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	2, 7, 12, 14
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	2, 7, 12, 14
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	2, 7, 12, 14
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 7, 12, 14
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 7, 12, 14
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7, 12, 14
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7, 12, 14
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 7, 12, 14
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 7, 12, 14

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 6, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6, 9
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1-2, 6-7, 9, 12, 14

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ANALYSIS REQUEST

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Hamilton 3240, New Zealand

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Job No: **362 3104**
Date Recv: 09-Jul-24 15:17
Received by: Harsharan Kaur

Quote No 129425
Primary Contact Stuart Caird
Submitted By Stuart Caird
Client Name Beca Limited
Address PO Box 13960, Christchurch 8141
Postcode
Phone *Mobile*
Email
Charge To Beca Limited
Client Reference 3338703/800
Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 9.7.24
Name: S. Caird
Signature:
☑ Tick if you require COC to be emailed back

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☑ Room Temp ☐ Chilled ☐ Frozen Temp: 14.2

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP14_0.1	9.7.24		SOIL	HMHg, PAH, TPH
2	TP14_0.3				Hold
3	TP14_0.6				HMHg, PAH, TPH
4	TP34_0.1				HMHg, PAH, TPH
5	TP34_0.3				Hold
6	TP34_0.5				HMHg, PAH, TPH
7	TP34_0.7				Hold
8	TP34_1.0				Hold
9	DUP_G				HMHg, PAH, TPH
10					
11					
12					

Continued on next page

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3623104
Contact:	Stuart Caird	**Date Registered:**	10-Jul-2024 9:38 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date*:	12-Jul-2024 4:30 pm

* As the samples require analysis at a Hill Labs location that is different to where they were received, the Target Date for reporting has been extended.

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP14_0.1 09-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
2	TP14_0.3 09-Jul-2024	Soil	GSoil300	Hold Cold
3	TP14_0.6 09-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	TP34_0.1 09-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
5	TP34_0.3 09-Jul-2024	Soil	GSoil300	Hold Cold
6	TP34_0.5 09-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
7	TP34_0.7 09-Jul-2024	Soil	GSoil300	Hold Cold
8	TP34_1.0 09-Jul-2024	Soil	GSoil300	Hold Cold
9	DUP_G 09-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3-4, 6, 9
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	1, 3-4, 6, 9
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	1, 3-4, 6, 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	1, 3-4, 6, 9

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	1, 3-4, 6, 9
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3-4, 6, 9
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3-4, 6, 9
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3-4, 6, 9
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3-4, 6, 9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3-4, 6, 9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3-4, 6, 9
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3-4, 6, 9

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6, 9
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6, 9

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ANALYSIS REQUEST

R J Hill Laboratories Limited
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Private Bag 3205
Hamilton 3240, New Zealand

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W www.hill-laboratories.com

Job No: **362 4497**
Date Recv: 10-Jul-24 15:33
Received by: Jack Boyd
3136244979 13.7

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart (via)
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 10.7.24
Name: S.CAIRD
☑ Tick if you require COC to be emailed back
Signature: Stuart

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp:

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP13_0.1	10.7.24		SOIL	HMWS, PAH, TPH
2	TP13_0.3	↓		↓	Hold (CO)
3	TP13_0.5				HMWS, PAH, TPH
4	TP13_0.7				Hold (CO)
5	TP13_1.0				Hold (CO)
6	DUP_4				HMWS, PAH, TPH
7	TP13_0.1				HMWS, PAH, TPH
8	TP13_0.3				Hold (CO)
9	TP13_0.5				HMWS, PAH, TPH
10	TP13_0.7				Hold (CO)
11	TP13_0.7	↓		↓	Hold (CO)
12					

Continued on next page

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Hamilton 3240 New Zealand

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3624497
Contact:	Stuart Caird	**Date Registered:**	11-Jul-2024 10:15 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date*:	15-Jul-2024 4:30 pm

* As the samples require analysis at a Hill Labs location that is different to where they were received, the Target Date for reporting has been extended.

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	IP13_0.1 10-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
2	IP13_0.3 10-Jul-2024	Soil	GSoil300	Hold Cold
3	IP13_0.5 10-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
4	IP13_0.7 10-Jul-2024	Soil	GSoil300	Hold Cold
5	IP13_1.0 10-Jul-2024	Soil	GSoil300	Hold Cold
6	DUP_H 10-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
7	TP13_0.1 10-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
8	TP13_0.3 10-Jul-2024	Soil	GSoil300	Hold Cold
9	TP13_0.5 10-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
10	TP13_0.7 10-Jul-2024	Soil	GSoil300	Hold Cold
11	TP13_1.0 10-Jul-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 6-7, 9
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	1, 3, 6-7, 9
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	1, 3, 6-7, 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	1, 3, 6-7, 9

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	1, 3, 6-7, 9
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 6-7, 9
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 6-7, 9
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 6-7, 9
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6-7, 9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6-7, 9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 6-7, 9
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 6-7, 9

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ANALYSIS REQUEST

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

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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: 362 6395
Date Recv: 12-Jul-24 13:38
Received by: Eila-Rose Jones

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories	*Date & Time:* 12.7.24
☑ *Tick if you require COC to be emailed back*	*Name:* S. CAIRD
	Signature:
Received at Hill Laboratories *(Refer to Lab created Job No above)*	*Date & Time:*
	Name:
	Signature:
Condition ☐ Room Temp ☐ Chilled ☐ Frozen	Temp: 11.9

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP18_0.05	12.7.24		Asphalt	HMWy, PAH, TPH
2	PP18_0.15			SOIL	HMWy, PAH, TPH
3	PP18_0.25			SOIL	Hold
4	PP18_0.35			Asphalt	HMWy, PAH, TPH
5	PP18_0.4			SOIL	Hold
6	PP18_0.6			SOIL	Hold
7	PP04_0.05			Asphalt	HMWy, PAH, TPH
8	PP04_0.1			Soil	Hold HMWy, TPH, PAH
9	PP04_0.15			Asphalt	HMWy, PAH, TPH
10	PP04_0.3			Soil	Hold
11	PP04_0.5			Soil	Hold
12	PP04_0.7			Soil	Hold

Continued on next page

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3626395
Contact:	Stuart Caird	**Date Registered:**	13-Jul-2024 12:01 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	3338703/800
		Client Reference:	Rolleston 338703
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	23-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP18_0.05 12-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP18_0.15 12-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
3	PP18_0.25 12-Jul-2024	Soil	GSoil300	Hold Cold
4	PP18_0.35 12-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
5	PP18_0.4 12-Jul-2024	Soil	GSoil300	Hold Cold
6	PP18_0.6 12-Jul-2024	Soil	GSoil300	Hold Cold
7	PP04_0.05 12-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
8	PP04_0.1 12-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
9	PP04_0.15 12-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
10	PP04_0.3 12-Jul-2024	Soil	GSoil300	Hold Cold
11	PP04_0.5 12-Jul-2024	Soil	GSoil300	Hold Cold
12	PP04_0.7 12-Jul-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 7-8
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	2, 7-8
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	2, 7-8

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	2, 7-8
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	2, 7-8
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 7-8
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 7-8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7-8
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7-8
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 7-8
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 7-8

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 4, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 4, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 9
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 4, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 4, 9
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 4, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 4, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 4, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1-2, 4, 7-9
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 4, 9

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 4, 9

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ANALYSIS REQUEST

Job No: **362 2315**
Date Recv: 08-Jul-24 15:36

R J Hill Laboratories Limited
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Received by: Emma Sapi

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☑ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 8.7.24
Name: S.CAIRD
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 19.9

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP05_0.05	8.7.24		Asphalt	Moisture, PAH, TRH
2	PP05_0.15			Soil	Moisture, PAH, TRH
3	PP05_0.3				Hold (Old)
4	PP05_0.5				
5	PP05_0.7				
6	PP21_0.05			Asphalt	Moisture, PAH, TRH
7	PP21_0.15			Soil	Moisture, PAH, TRH
8	PP21_0.3				Hold (Old)
9	PP21_0.5				Hold (Old)
10	UTI2A_0.1			Soil	Hold (Old)
11	UTI2A_0.5			Soil	Hold (Old)
12					

Continued on next page

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3622315
Contact:	Stuart Caird	**Date Registered:**	09-Jul-2024 9:37 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	17-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP05_0.05 08-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP05_0.15 08-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
3	PP05_0.3 08-Jul-2024	Soil	GSoil300	Hold Cold
4	PP05_0.5 08-Jul-2024	Soil	GSoil300	Hold Cold
5	PP05_0.7 08-Jul-2024	Soil	GSoil300	Hold Cold
6	PP21_0.05 08-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
7	PP21_0.15 08-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
8	PP21_0.3 08-Jul-2024	Soil	GSoil300	Hold Cold
9	PP21_0.5 08-Jul-2024	Soil	GSoil300	Hold Cold
10	UT12A_0.1 08-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, BTEX in Soil by Headspace GC-MS, Total Petroleum Hydrocarbons in Soil, Semivolatile Organic Compounds Trace in Soil by GC-MS
11	UT12A_0.5 08-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, BTEX in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 7, 10-11
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	2, 7
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	2, 7, 10-11

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	2, 7
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	2, 7
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 7
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 7, 10-11
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	10-11
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	10-11
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7, 10-11
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7, 10-11
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 7, 10-11
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 7, 10-11

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 6
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1-2, 6-7, 10-11
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

R J Hill Laboratories Limited
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Hamilton 3240, New Zealand

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Job No: **363 0077**
Date Recv: 18-Jul-24 11:01
Received by: Jack Boyd

Quote No 129425
Primary Contact Stuart Caird
Submitted By Stuart Caird
Client Name Beca Limited
Address PO Box 13960, Christchurch 8141
Postcode
Phone Mobile
Email
Charge To Beca Limited
Client Reference 3338703/800
Order No

Results To Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 18.7.24
Name: S-CAIRD
☑ Tick if you require COC to be emailed back
Signature: [signature]

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 10.1

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP24_0.05	18.7.24		ASHALT	Hmt Hg, PAH, TPH
2	PP24_0.15			SOIL	Hmt Hg, PAH, TPH
3	PP24_0.25			ASHALT	Hmt Hg, PAH, TPH
4	PP24_0.3			SOIL	Hmt (cd)
5	PP24_0.5				Hmt (cd)
6	PP24_0.7				Hmt (cd)
7	DUP_5				Hmt Hg, PAH, TPH
8					
9					
10					
11					
12					

Continued on next page

KB Item: 23775 Version: 7

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Private Bag 3205
Hamilton 3240 New Zealand

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www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3630077
Contact:	Stuart Caird	**Date Registered:**	19-Jul-2024 10:49 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	Rolleston 3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	29-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP24_0.05 18-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP24_0.15 18-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
3	PP24_0.25 18-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
4	PP24_0.3 18-Jul-2024	Soil	GSoil300	Hold Cold
5	PP24_0.5 18-Jul-2024	Soil	GSoil300	Hold Cold
6	PP24_0.8 18-Jul-2024	Soil	GSoil300	Hold Cold
7	DUP_J 18-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 7
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	2, 7
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	2, 7
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	2, 7
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	2, 7

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ANALYSIS REQUEST

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **363 3917**

Date Recv: 23-Jul-24 16:38

Received by: Michaela Conlan

3136339173

Quote No 129425

Primary Contact Stuart Caird

Submitted By Stuart Caird

Client Name Beca Limited

Address PO Box 13960, Christchurch 8141

Postcode

Phone *Mobile*

Email

Charge To Beca Limited

Client Reference 3338703/800

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time: 23.7.24

Name: S. CAIRD

☑ Tick if you require COC to be emailed back

Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)

Date & Time:

Name:

Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen

Temp: 16.5

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High

☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP16_0.05	23.7.24		Asbestos	Unsatisfy, PAH, TPH
2	TP16_0.1			Soil	Unsatisfy, TPH, Trace SVOC, VOC, Asbestos (ID)
3	TP16_0.3				Hold (COC)
4	TP16_0.5				Unsatisfy, TPH, Trace SVOC, VOC, Asbestos (ID)
5	TP16_0.7				Hold (COC)
6	TP16_1.0				
7	TP16_1.5				
8	TP16_2.0				
9	TP17_0.05			Asbestos	Unsatisfy, PAH, TPH
10	TP17_0.1			Soil	Unsatisfy, TPH, Trace SVOC, VOC, Asbestos (ID)
11	TP17_0.3				Hold (COC)
12	TP17_0.5				Unsatisfy, TPH, Trace SVOC, VOC, Asbestos (ID)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	1117-075	23.7.24		SOIL	HWDD (CD)
14	1117-10	↓		↓	HWDD (CD)
15					
16					
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38					
39					
40					

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

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3633917
Contact:	Stuart Caird	**Date Registered:**	24-Jul-2024 9:41 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	Rolleston 338703
		Add. Client Ref:	3338703/800
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	02-Aug-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP16_0.05 23-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	TP16_0.1 23-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Screening in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
3	TP16_0.3 23-Jul-2024	Soil	GSoil300	Hold Cold
4	TP16_0.5 23-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Screening in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
5	TP16_0.7 23-Jul-2024	Soil	GSoil300	Hold Cold
6	TP16_1.0 23-Jul-2024	Soil	GSoil300	Hold Cold
7	TP16_1.5 23-Jul-2024	Soil	GSoil300	Hold Cold
8	TP16_2.0 23-Jul-2024	Soil	GSoil300	Hold Cold
9	TP17_0.05 23-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
10	TP17_0.1 23-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Screening in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
11	TP17_0.3 23-Jul-2024	Soil	GSoil300	Hold Cold
12	TP17_0.5 23-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Screening in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
13	TP17_0.75 23-Jul-2024	Soil	GSoil300	Hold Cold
14	TP17_1.0 23-Jul-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 4, 10, 12

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	2, 4, 10, 12
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 4, 10, 12
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	2, 4, 10, 12
Volatile Organic Compounds Screening in Soil by Headspace GC-MS	Sonication extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.13 - 30 mg/kg dry wt	2, 4, 10, 12
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4, 10, 12
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4, 10, 12
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 4, 10, 12
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 4, 10, 12

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 9
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 9
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1-2, 4, 9-10, 12
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 9
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 9

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 7
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 7
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 7
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 7

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1, 3
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 3
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 3
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 3
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 3
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 3
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 3
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 3
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 3
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 3
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 3
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1-3, 7
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 3
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 3
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 3
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 3

Hill Laboratories
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ANALYSIS REQUEST

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **363 1688**
Date Recv: 19-Jul-24 13:36
Received by: Eila-Rose Jones

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*
☑ *Email Other* ESdat_AU+BECA@ESdatLabSync.net
☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 19.7.24
Name: S CAIRD
☑ *Tick if you require COC to be emailed back* Signature:

Received at Hill Laboratories *(Refer to Lab created Job No above)* Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 14.1

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ **Low** ☐ **Normal** ☑ **High**
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP02_0.1	19.7.24		SOIL	Hmetals, TRH, Trace SVOC, BTEX, Asbestos (QL)
2	TP02_0.3	↓		↓	Hold (old)
3	TP02_0.5				Hmetals, TRH, Trace SVOC, BTEX, Asbestos (QL)
4	TP02_0.7				Hold (old)
5	TP02_1.0				Hold (old)
6	TP02_1.5				Hold (old)
7	TP04_0.1				Hmetals, TRH, Trace SVOC, BTEX, Asbestos (QL)
8	TP04_0.5				↓ ↓ ↓
9	TP04_0.7				Hold (old)
10	TP04_1.0				Hmetals, TRH, Trace SVOC, BTEX, Asbestos (QL)
11	TP04_1.3				Hmetals, TRH, Trace SVOC, BTEX, Asbestos, Cyanide
12	TP04_1.5	↓		↓	↓ ↓ ↓ ↓

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP4_2.0	19.7.24		SOIL	HOLD COD
14	TP4_2.5	↓		↓	HOLD COD
15	TP4_3.0	↓		↓	HOLD COD
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29					
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31					
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34					
35					
36					
37					
38					
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40					

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

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3631688
Contact:	Stuart Caird	**Date Registered:**	19-Jul-2024 3:03 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	23-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP02_0.1 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
2	TP02_0.3 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
3	TP02_0.5 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
4	TP02_0.7 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
5	TP02_1.0 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
6	TP02_1.5 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
7	TP04_0.1 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
8	TP04_0.5 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
9	TP04_0.7 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
10	TP04_1.0 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
11	TP04_1.3 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
12	TP04_1.5 19-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
13	TP04_2.0 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
14	TP04_2.5 19-Jul-2024	Soil	PSoil500Asb	Hold Cold
15	TP04_3.0 19-Jul-2024	Soil	PSoil500Asb	Hold Cold

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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 7-8, 10-12
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 7-8, 10-12
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 7-8, 10-12
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12

Hill Laboratories
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ANALYSIS REQUEST

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **363 4747**

Date Recv: 24-Jul-24 16:09

Received by: Michaela Conlan

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

- ☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
- ☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
- ☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories	Date & Time: 24.7.24
	Name: S. Caird
☑ Tick if you require COC to be emailed back	Signature:
Received at Hill Laboratories (Refer to Lab created Job No above)	Date & Time:
	Name:
	Signature:
Condition ☐ Room Temp ☐ Chilled ☐ Frozen	Temp: 16.1

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High ☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP18_0.1	24.7.24		SOIL	Asbestos (SQ).
2	TP18_0.15				HM+Hg, TPH, Trace SVOC, VOC, Asbestos (SQ
3	TP18_0.3				~~HM+Hg~~, HOLD (COC)
4	TP18_0.5				Same as TP18_0.1
5	TP18_0.7				HOLD (COC)
6	TP18_1.0				
7	TP18_1.5				
8	TP18_2.0				
9	TP19_0.1				HM+Hg, TPH, Trace SVOC, VOC, Asbestos (SQ
10	TP19_0.3				HOLD (COC)
11	TP19_0.5				HM+Hg, TPH, Trace SVOC, VOC, Asbestos (SQ
12	TP19_0.7				HOLD (COC)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP19_1.0	24.7.24		SOIL	Hold COLD
14	TP19_1.5				
15	TP19_2.0				
16	TP10_0.1				Hm+Hg, TPH, Trace SVOC, VOC, Asbestos (ACM)
17	TP10_0.3				Hold COLD
18	TP10_0.5				Hm+Hg, TPH, Trace SVOC, VOC, Asbestos (ACM)
19	TP10_0.7				
20	TP10_1.0				Hold COLD
21	TP10_1.5				Hold COLD
22	TP10_2.0				Hold COLD
23					
24					
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39					
40					

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

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www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3634747
Contact:	Stuart Caird	**Date Registered:**	25-Jul-2024 9:05 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	3338703/800
		Client Reference:	Rolleston 338703
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	31-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP18_0.1 24-Jul-2024	Soil	GSoil300	Hold Cold
2	TP18_0.15 24-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Screening in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
3	TP18_0.3 24-Jul-2024	Soil	GSoil300	Hold Cold
4	TP18_0.5 24-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Screening in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
5	TP18_0.7 24-Jul-2024	Soil	GSoil300	Hold Cold
6	TP18_1.0 24-Jul-2024	Soil	GSoil300	Hold Cold
7	TP18_1.5 24-Jul-2024	Soil	GSoil300	Hold Cold
8	TP18_2.0 24-Jul-2024	Soil	GSoil300	Hold Cold
9	TP19_0.1 24-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Screening in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
10	TP19_0.3 24-Jul-2024	Soil	GSoil300	Hold Cold
11	TP19_0.5 24-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Screening in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
12	TP19_0.7 24-Jul-2024	Soil	GSoil300	Hold Cold
13	TP19_1.0 24-Jul-2024	Soil	GSoil300	Hold Cold
14	TP19_1.5 24-Jul-2024	Soil	GSoil300	Hold Cold
15	TP19_2.0 24-Jul-2024	Soil	GSoil300	Hold Cold
16	IP10_0.1 24-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Screening in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
17	IP10_0.3 24-Jul-2024	Soil	GSoil300	Hold Cold
18	IP10_0.5 24-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Screening in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
19	IP10_0.7 24-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Screening in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
20	IP10_1.0 24-Jul-2024	Soil	GSoil300	Hold Cold
21	IP10_1.5 24-Jul-2024	Soil	GSoil300	Hold Cold
22	IP10_2.0 24-Jul-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 4, 9, 11, 16, 18-19
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	2, 4, 9, 11, 16, 18-19
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
Volatile Organic Compounds Screening in Soil by Headspace GC-MS	Sonication extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.13 - 30 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	2, 4, 9, 11, 16, 18-19
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 4, 9, 11, 16, 18-19

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 7-8, 10-12
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 7-8, 10-12
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12
Asbestos in ACM as % of Total Sample	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 7-8, 10-12
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12
Asbestos as Fibrous Asbestos as % of Total Sample	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 7-8, 10-12
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12
Asbestos as Asbestos Fines as % of Total Sample	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 7-8, 10-12
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 7-8, 10-12
Asbestos in Soil ESdat Electronic Transfer			
Amosite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 7-8, 10-12
Chrysotile	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 7-8, 10-12
Crocidolite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 7-8, 10-12

Hill Laboratories
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ANALYSIS REQUEST

R J Hill Laboratories Limited
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Private Bag 3205
Hamilton 3240, New Zealand

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Job No: **363 1687**
Date Recv: 19-Jul-24 13:36
Received by: Ella-Rose Jones

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 19.7.24
Name: S CAIRD
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories *(Refer to Lab created Job No above)*
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 14.1

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP02_0.1	19.7.24		SOIL	Liquids, TRH, Trace SVOC, BTEX, Asbestos (SQ)
2	TP02_0.3	↓		↓	Hold (cold)
3	TP02_0.5				Liquids, TRH, Trace SVOC, BTEX, Asbestos (SQ)
4	TP02_0.7				Hold (cold)
5	TP02_1.0				Hold (cold)
6	TP02_1.5				Hold (cold)
7	TP04_0.1				Liquids, TRH, Trace SVOC, BTEX, Asbestos (SQ)
8	TP04_0.5				↓ ↓ ↓
9	TP04_0.7				Hold (cold)
10	TP04_0.10				Liquids, TRH, Trace SVOC, BTEX, Asbestos (SQ)
11	TP04_1.3				Liquids, TRH, Trace SVOC, BTEX, Asbestos, Cyanide
12	TP04_1.5	↓		↓	↓ ↓ ↓ ↓

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP4_2.0	19.7.24		SOIL	H2O2 COD
14	TP4_2.5	↓		↓	H2O2 COD
15	TP4_3.0	↓		↓	H2O2 COD
16					
17					
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Job Information Summary

Client:	Beca Limited	**Lab No:**	3631687
Contact:	Stuart Caird	**Date Registered:**	20-Jul-2024 12:13 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	26-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP02_0.1 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
2	TP02_0.3 19-Jul-2024	Soil	GSoil300	Hold Cold
3	TP02_0.5 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
4	TP02_0.7 19-Jul-2024	Soil	GSoil300	Hold Cold
5	TP02_1.0 19-Jul-2024	Soil	GSoil300	Hold Cold
6	TP02_1.5 19-Jul-2024	Soil	GSoil300	Hold Cold
7	TP04_0.1 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
8	TP04_0.5 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
9	TP04_0.7 19-Jul-2024	Soil	cGSoil	Hold Cold
10	TP04_1.0 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
11	TP04_1.3 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Cyanide, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil
12	TP04_1.5 19-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Semivolatile Organic Compounds Trace in Soil by GC-MS, TPH + BTEX profile, Soil, Total Cyanide
13	TP04_2.0 19-Jul-2024	Soil	GSoil300	Hold Cold
14	TP04_2.5 19-Jul-2024	Soil	GSoil300	Hold Cold
15	TP04_3.0 19-Jul-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 7-8, 10-12

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ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street, Hamilton 3204
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Hamilton 3240, New Zealand

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W www.hill-laboratories.com

Job No: **363 3918**
Date Recv: 23-Jul-24 16:38
Received by: Michaela Conlan

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
Postcode	
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

- ☑ Email Primary Contact
- ☐ Email Submitter
- ☐ Email Client
- ☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
- ☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 23.7.24
Name: S. CAIRD
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 16.5

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP16_0.05	23.7.24		Asbestos	Unsatisfy, PAH, TPH
2	TP16_0.1			Soil	Unsatisfy, TPH, Trace SVOC, VOC, Asbestos (ID).
3	TP16_0.3				Hold (CCD)
4	TP16_0.5				Unsatisfy, TPH, Trace SVOC, VOC, Asbestos (ID)
5	TP16_0.7				Hold (CCD)
6	TP16_1.0				
7	TP16_1.5				
8	TP16_2.0				
9	TP17_0.05			Asbestos	Unsatisfy, PAH, TPH
10	TP17_0.1			Soil	Unsatisfy, TPH, Trace SVOC, VOC, Asbestos (ID)
11	TP17_0.3				Hold (CCD)
12	TP17_0.5				Unsatisfy, TPH, Trace SVOC, VOC, Asbestos (ID)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	1117-075	23.1.24		soil	1400 (20)
14	1117-10	↓		↓	1400 (20)
15					
16					
17					
18					
19					
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22					
23					
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Job Information Summary

Client:	Beca Limited	**Lab No:**	3633918
Contact:	Stuart Caird	**Date Registered:**	23-Jul-2024 4:55 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	26-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP16-0.1 23-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
2	TP16-0.3 23-Jul-2024	Soil	PSoil500Asb	Hold
3	TP16-0.5 23-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
4	TP16-0.7 23-Jul-2024	Soil	PSoil500Asb	Hold
5	TP16-1.0 23-Jul-2024	Soil	PSoil500Asb	Hold
6	TP16-1.5 23-Jul-2024	Soil	PSoil500Asb	Hold
7	TP16-2.0 23-Jul-2024	Soil	PSoil500Asb	Hold
8	TP17-0.1 23-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
9	TP17-0.3 23-Jul-2024	Soil	PSoil500Asb	Hold
10	TP17-0.5 23-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
11	TP17-0.75 23-Jul-2024	Soil	PSoil500Asb	Hold
12	TP17-1.0 23-Jul-2024	Soil	PSoil500Asb	Hold

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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 8, 10
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 8, 10
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 8, 10
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10
Asbestos in ACM as % of Total Sample	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10
Asbestos as Fibrous Asbestos as % of Total Sample	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10
Asbestos as Asbestos Fines as % of Total Sample	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10
Asbestos in Soil ESdat Electronic Transfer			
Amosite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 8, 10
Chrysotile	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 8, 10
Crocidolite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1, 3, 8, 10

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ANALYSIS REQUEST

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **363 2808**
Date Recv: 22-Jul-24 14:08
Received by: Findabair Joynes

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*
☑ *Email Other* ESdat_AU+BECA@ESdatLabSync.net
☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 22.7.24
Name: S. CAIRD
Signature:
☑ *Tick if you require COC to be emailed back*

Received at Hill Laboratories
(Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:*

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ **Low** ☐ **Normal** ☑ **High**
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	MO7_0.05	22.7.24		Asphalt	HM+Hg, PAH, TPH
2	MO7_0.15	↓		SOIL	HM+Hg, PAH, TPH
3	MO7_0.3			↓	Hold (2d)
4	MO7_0.55				↓ ↓ ↓
5	MO7_0.7	↓		↓	
6					
7					
8					
9					
10					
11					
12					

Continued on next page

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Hamilton 3240 New Zealand

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www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3632808
Contact:	Stuart Caird	**Date Registered:**	23-Jul-2024 9:59 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	Rolleston 338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	31-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP07_0.05 22-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP07_0.15 22-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
3	PP07_0.3 22-Jul-2024	Soil	GSoil300	Hold Cold
4	PP07_0.55 22-Jul-2024	Soil	GSoil300	Hold Cold
5	PP07_0.7 22-Jul-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2
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	2
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	2
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from; Benzo(a) anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a) pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	2
Benzo[a]pyrene Toxic Equivalence (TEF)	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	2
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1-2
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1

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ANALYSIS REQUEST

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

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T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **363 6372**
Date Recv: 26-Jul-24 13:01
Received by: Iris Taramai

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Maisie Hopkins
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
Postcode	
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

- ☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
- ☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
- ☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 26/7/24
Name: M. Hopkins
☐ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 17.0

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.
*Samples may contain glass/sharp objects.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP10_0.05	26/7/24		ASPHALT	HM's+Hg, TPH+PAH
2	PP10_0.10			SOIL	HM's+Hg, TPH+PAH
3	PP10_0.30				HOLD COLD
4	PP10_0.70				HM's+Hg, TPH, SVOC+VOC (trace), Asbestos (semi-quant)
5	PP10_1.05				HM's+Hg, TPH, SVOC+VOC (trace), Asbestos (semi-quant)
6	PP10_1.3				HOLD COLD
7					
8					
9					
10					
11					
12					

Continued on next page

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3636372
Contact:	Stuart Caird	**Date Registered:**	26-Jul-2024 2:52 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Maisie Hopkins
		Charge To:	Beca Limited
		Target Date:	30-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP10_0.10 26-Jul-2024	Soil	PSoil500Asb	Hold Cold
2	PP10_0.30 26-Jul-2024	Soil	PSoil500Asb	Hold Cold
3	PP10_0.70 26-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
4	PP10_1.05 26-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil

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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	3-4
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	3-4
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	3-4
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	3-4
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	3-4
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	3-4
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	3-4
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	3-4
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3-4

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Asbestos in ACM as % of Total Sample	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-4
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3-4
Asbestos as Fibrous Asbestos as % of Total Sample	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-4
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3-4
Asbestos as Asbestos Fines as % of Total Sample	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-4
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-4

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ANALYSIS REQUEST

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **363 4746**
Date Recv: 24-Jul-24 16:08
Received by: Michaela Conlan

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 24.7.24
Name: S. Caird
☑ Tick if you require COC to be emailed back Signature: Scaird

Received at Hill Laboratories (Refer to Lab created Job No above) Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 16.1

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP18_0.1	24.7.24		SOIL	Asbestos (SQ).
2	TP18_0.15				HMs-Hg, TPH, Trace SVOC, VOC, Asbestos (SQ)
3	TP18_0.3				~~HMs-Hg~~, HOLD (COC)
4	TP18_0.5				Same as TP18_0.15
5	TP18_0.7				HOLD (COC)
6	TP18_1.0				
7	TP18_1.5				
8	TP18_2.0				
9	TP19_0.1				HMs-Hg, TPH, Trace SVOC, VOC, Asbestos (SQ)
10	TP19_0.3				HOLD (COC)
11	TP19_0.5				HMs-Hg, TPH, Trace SVOC, VOC, Asbestos (SQ)
12	TP19_0.7				HOLD (COC)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP19_1.0	24.7.24		SOIL	Hold Hold
14	TP19_1.5	↓		↓	↓ ↓
15	TP19_2.0				
16	TP10_0.1				Hold, TPH, Trace SVOC, VOC, Asbestos (SOIL)
17	TP10_0.3				Hold Hold
18	TP10_0.5				Hold, TPH, Trace SVOC, VOC, Asbestos (SOIL)
19	TP10_0.7				↓ ↓ ↓
20	TP10_1.0				Hold Hold
21	TP10_1.5				Hold Hold
22	TP10_2.0	↓		↓	Hold Hold
23					
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36					
37					
38					
39					
40					

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

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www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3634746
Contact:	Stuart Caird	**Date Registered:**	24-Jul-2024 5:10 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	26-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP18_0.1 24-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
2	TP18_0.15 24-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
3	TP18_0.3 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
4	TP18_0.5 24-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
5	TP18_0.7 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
6	TP18_1.0 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
7	TP18_1.5 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
8	TP18_2.0 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
9	TP19_0.1 24-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
10	TP19_0.3 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
11	TP19_0.5 24-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
12	TP19_0.7 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
13	TP19_1.0 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
14	TP19_1.5 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
15	TP19_2.0 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
16	IP10_0.1 24-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
17	IP10_0.3 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
18	IP10_0.5 24-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
19	IP10_0.7 24-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
20	IP10_1.0 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
21	IP10_1.5 24-Jul-2024	Soil	PSoil500Asb	Hold Cold
22	IP10_2.0 24-Jul-2024	Soil	PSoil500Asb	Hold Cold

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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1-2, 4, 9, 11, 16, 18-19

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1-2, 4, 9, 11, 16, 18-19
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1-2, 4, 9, 11, 16, 18-19
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2, 4, 9, 11, 16, 18-19
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2, 4, 9, 11, 16, 18-19
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2, 4, 9, 11, 16, 18-19
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-2, 4, 9, 11, 16, 18-19
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1-2, 4, 9, 11, 16, 18-19
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2, 4, 9, 11, 16, 18-19
Asbestos in ACM as % of Total Sample	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2, 4, 9, 11, 16, 18-19
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2, 4, 9, 11, 16, 18-19
Asbestos as Fibrous Asbestos as % of Total Sample	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2, 4, 9, 11, 16, 18-19
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2, 4, 9, 11, 16, 18-19
Asbestos as Asbestos Fines as % of Total Sample	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2, 4, 9, 11, 16, 18-19
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2, 4, 9, 11, 16, 18-19
Asbestos in Soil ESdat Electronic Transfer			
Amosite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1-2, 4, 9, 11, 16, 18-19
Chrysotile	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1-2, 4, 9, 11, 16, 18-19
Crocidolite	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0 Detect	1-2, 4, 9, 11, 16, 18-19

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	1, 3, 7-8, 10-12
Total Cyanide Distillation	Distillation of sample as received. APHA 4500-CN^- C (modified) : Online Edition.	-	11-12
Total Cyanide	Distillation, colorimetry. APHA 4500-CN^- C (modified) : Online Edition & Skalar Method I295-004(+P14). ISO 14403:2012(E).	0.10 mg/kg dry wt	11-12
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 7-8, 10-12
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	1, 3, 7-8, 10-12
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	1, 3, 7-8, 10-12
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 7-8, 10-12
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 7-8, 10-12
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 7-8, 10-12
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 7-8, 10-12
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 7-8, 10-12

Hill Laboratories
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ANALYSIS REQUEST

R J Hill Laboratories Limited
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Hamilton 3240, New Zealand

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Job No: **363 5582**
Date Recv: 25-Jul-24 14:17
Received by: Harsharan Kaur

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
Postcode	
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*
☑ *Email Other* ESdat_AU+BECA@ESdatLabSync.net
☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 25.7.24
Name: S.CAIRD
Signature:
☑ *Tick if you require COC to be emailed back*

Received at Hill Laboratories *(Refer to Lab created Job No above)*
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:*

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ **Low** ☐ **Normal** ☑ **High**
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	UT12_0.1	25.7.24		SOIL	HAHHg, PAH, TPH, BTEX
2	UT12_0.3				Hold
3	UT12_0.5				HAHHg, PAH, TPH, BTEX
4	UT12_0.7				Hold
5	PP09_0.05			Asphalt	HAHHg, PAH, TPH
6	PP09_0.15			Soil	HAHHg, PAH, TPH
7	PP09_0.3				Hold
8	PP09_0.5				Hold
9	PP09_0.7				Hold
10	DUP_K				HAHHg, PAH, TPH
11					
12					

Continued on next page

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Hamilton 3240 New Zealand

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Job Information Summary

Client:	Beca Limited	**Lab No:**	3635582
Contact:	Stuart Caird	**Date Registered:**	26-Jul-2024 9:55 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	05-Aug-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	UT12_0.1 25-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH + PAH + BTEX profile
2	UT12_0.3 25-Jul-2024	Soil	GSoil300	Hold Cold
3	UT12_0.5 25-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH + PAH + BTEX profile
4	UT12_0.7 25-Jul-2024	Soil	GSoil300	Hold Cold
5	PP09_0.05 25-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Rock, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
6	PP09_0.15 25-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
7	PP09_0.3 25-Jul-2024	Soil	GSoil300	Hold Cold
8	PP09_0.5 25-Jul-2024	Soil	GSoil300	Hold Cold
9	PP09_0.7 25-Jul-2024	Soil	GSoil300	Hold Cold
10	DUP_K 25-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 6, 10
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	1, 3, 6, 10
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	1, 3, 6, 10
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	1, 3, 6, 10

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	1, 3, 6, 10
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	6, 10
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 6, 10
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	1, 3
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	1, 3
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 5-6, 10
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 10
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 10
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 6, 10
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 6, 10

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	5
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	5
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	5
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	5
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	5
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	5
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	5
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	5
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	5
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	5
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	5
Total Petroleum Hydrocarbons in Rock			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	5
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	5
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	5
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	5

Hill Laboratories
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ANALYSIS REQUEST

Quote No 129425

Primary Contact Stuart Caird

Submitted By Maisie Hopkins

Client Name Beca Limited

Address PO Box 13960, Christchurch 8141

Postcode

Phone Mobile

Email

Charge To Beca Limited

Client Reference 3338703/800

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☐ Other

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Job No: **363 6373**

Date Recv: 26-Jul-24 13:01

Received by: Iris Taramai

3136363730

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 26/7/24
Name: M. Hopkins
☐ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 17.0

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.
*Samples may contain glass/sharp objects.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	PP10_0.05	26/7/24		ASPHALT	~~HM's+Hg~~, TPH+PAH
2	PP10_0.10	↓		SOIL	HM's+Hg, TPH+PAH
3	PP10_0.30			↓	HOLD COLD
4	PP10_0.70				HM's+Hg, TPH, SVOC+VOC (trace), Asbestos (semi-quant)
5	PP10_1.05				HM's+Hg, TPH, SVOC+VOC (trace), Asbestos (semi-quant)
6	PP10_1.3	↓		↓	HOLD COLD
7					
8					
9					
10					
11					
12					

Continued on next page

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Private Bag 3205
Hamilton 3240 New Zealand

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www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3636373
Contact:	Stuart Caird	**Date Registered:**	27-Jul-2024 11:40 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Maisie Hopkins
		Charge To:	Beca Limited
		Target Date:	07-Aug-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	PP10_0.05 26-Jul-2024	Roading Material	GSoil300	TPH Oil Industry Profile + PAHscreen, Misc, Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn, Total Recoverable Mercury
2	PP10_0.10 26-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
3	PP10_0.30 26-Jul-2024	Soil	GSoil300	Hold Cold
4	PP10_0.70 26-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Trace in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
5	PP10_1.05 26-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Trace in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
6	PP10_1.3 26-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 4-6
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	2
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	2, 4-5
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	2

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	2
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 4-6
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	4-5
Volatile Organic Compounds Trace in Soil by Headspace GC-MS	Sonication extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.010 - 3 mg/kg dry wt	4-5
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4-5
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4-5
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 4-5
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 4-5

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution		-	1
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Cadmium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1
Total Recoverable Mercury	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1
Total Petroleum Hydrocarbons, Misc			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 4
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1

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ANALYSIS REQUEST

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **363 7648**

Date Recv: 29-Jul-24 15:18

Received by: Michaela Conlan

313837646 86

Quote No 129425

Primary Contact Stuart Caird

Submitted By Stuart Caird

Client Name Beca Limited

Address PO Box 13960, Christchurch 8141

Postcode

Phone *Mobile*

Email

Charge To Beca Limited

Client Reference 3338703/800

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other ESdat_AU+BECA@ESdatLabSync.net

☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 29.7.24
Name: S.CAIRD
Signature:

☑ Tick if you require COC to be emailed back

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 18.8

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High ☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (If not as per Quote)
1	TP22_0.1	29.7.24		SOIL	HMW, TRI, Free SUCR, VOC, Asbestos (SQ)
2	TP22_0.3				HOLD (QD
3	TP22_0.5				HMW, TRI, Free SUCR, VOC, Asbestos (SQ)
4	TP22_0.7				HOLD (QD
5	TP22_1.0				HOLD (QD
6	TP22_1.5				HOLD (QD
7	TP22_2.0				HOLD (QD
8	TP22_3.0				HOLD (QD
9	TP23_0.1				HMW, TRI, TRI
10	TP23_0.3				HOLD (QD
11	TP23_0.5				HMW, TRI, TRI
12	TP23_0.7				HOLD (QD

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	VTB_1.0	29.7.24		Soil	U010 rad
14					
15					
16					
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18					
19					
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21					
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36					
37					
38					
39					
40					

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

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3637648
Contact:	Stuart Caird	**Date Registered:**	30-Jul-2024 7:59 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	05-Aug-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP22_0.1 29-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Trace in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
2	TP22_0.3 29-Jul-2024	Soil	GSoil300	Hold Cold
3	TP22_0.5 29-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Volatile Organic Compounds Trace in Soil by Headspace GC-MS, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
4	TP22_0.7 29-Jul-2024	Soil	GSoil300	Hold Cold
5	TP22_1.0 29-Jul-2024	Soil	GSoil300	Hold Cold
6	TP22_1.5 29-Jul-2024	Soil	GSoil300	Hold Cold
7	TP22_2.0 29-Jul-2024	Soil	GSoil300	Hold Cold
8	TP22_3.0 29-Jul-2024	Soil	GSoil300	Hold Cold
9	UT13_0.1 29-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
10	UT13_0.3 29-Jul-2024	Soil	GSoil300	Hold Cold
11	UT13_0.5 29-Jul-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, TPH Oil Industry Profile + PAHscreen
12	UT13_0.7 29-Jul-2024	Soil	GSoil300	Hold Cold
13	UT13_1.0 29-Jul-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 9, 11
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	9, 11
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	1, 3, 9, 11

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	9, 11
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	9, 11
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	9, 11
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 9, 11
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	1, 3
Volatile Organic Compounds Trace in Soil by Headspace GC-MS	Sonication extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.010 - 3 mg/kg dry wt	1, 3
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 9, 11
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 9, 11
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 9, 11
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 9, 11
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 9, 11

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ANALYSIS REQUEST

R J Hill Laboratories Limited
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Hamilton 3240, New Zealand

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W www.hill-laboratories.com

Job No: **364 0489**
Date Recv: 01-Aug-24 14:57
Received by: Brittney McLean

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*
☑ *Email Other* ESdat_AU+BECA@ESdatLabSync.net
☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:* 1.8.24
Name: S.CAIRD
☑ *Tick if you require COC to be emailed back* *Signature:*

Received at Hill Laboratories *(Refer to Lab created Job No above)* *Date & Time:* *Name:* *Signature:*

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 9.9

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	IP03_0.1	1.8.24		SOIL	Hmn Hg, TRH, Trace Slct, Antimony, Tin, Asbestos (SQ)
2	IP03_0.3				Hold (aD)
3	IP03_0.5				Hmn Hg, TRH, Trace Slct, Antimony, Tin, Asbestos (SQ)
4	IP03_0.7				Hold (aD)
5	IP03_1.0				Hold (aD)
6	IP03_1.5				Hold (aD)
7	IP03_2.0				Hold (aD)
8	DUP_L				Hmn Hg, TRH, Trace Slct, Antimony, Tin
9	TP11_0.1				Hmn Hg, TRH, Trace Slct, Antimony, Tin, Asbestos (SQ)
10	TP11_0.3				Hold (aD)
11	TP11_0.5				Hmn Hg, TRH, Trace Slct, Antimony, Tin, Asbestos (SQ)
12	TP11_0.7				Hold (aD)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (If not as per Quote)
13	TP11_1.0	1.8.24		SOIL	Hold
14	Dup_M				Mon Hg, TPH, Trace Suite, Antimony, Tin
15	TP10_0.1				Mon Hg, TPH, Trace Suite, Antimony, Tin, Asbestos (S
16	TP10_0.3				Hold
17	TP10_0.5				Mon Hg, TPH, Trace Suite, Antimony, Tin Asbestos (SR)
18	TP10_0.7				Hold
19	TP10_1.0				Hold
20					
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0508 HILL LAB (44 555 22)
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www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3640489
Contact:	Stuart Caird	**Date Registered:**	02-Aug-2024 8:25 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	Rolleston 338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	05-Aug-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	TP03_0.1 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
2	TP03_0.3 01-Aug-2024	Soil	PSoil500Asb	Hold
3	TP03_0.5 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
4	TP03_0.7 01-Aug-2024	Soil	PSoil500Asb	Hold
5	TP03_1.0 01-Aug-2024	Soil	PSoil500Asb	Hold
6	TP03_1.5 01-Aug-2024	Soil	PSoil500Asb	Hold
7	TP03_2.0 01-Aug-2024	Soil	PSoil500Asb	Hold
8	TP11_0.1 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
9	TP11_0.3 01-Aug-2024	Soil	PSoil500Asb	Hold
10	TP11_0.5 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
11	TP11_0.7 01-Aug-2024	Soil	PSoil500Asb	Hold
12	TP11_1.0 01-Aug-2024	Soil	PSoil500Asb	Hold
13	TP10_0.1 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
14	TP10_0.3 01-Aug-2024	Soil	PSoil500Asb	Hold
15	TP10_0.5 01-Aug-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
16	TP10_0.7 01-Aug-2024	Soil	PSoil500Asb	Hold
17	TP10_1.0 01-Aug-2024	Soil	PSoil500Asb	Hold

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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10, 13, 15
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10, 13, 15
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 8, 10, 13, 15
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10, 13, 15

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ANALYSIS REQUEST

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **364 0488**
Date Recv: 01-Aug-24 14:57
Received by: Brittney McLean

Quote No 129425
Primary Contact Stuart Caird
Submitted By
Client Name Beca Limited
Address PO Box 13960, Christchurch 8141
Postcode
Phone Mobile
Email
Charge To Beca Limited
Client Reference 3338703/800
Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client
☑ Email Other ESdat_AU+BECA@ESdatLabSync.net
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 1.8.24
Name: S.CAIRD
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories (Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 9.9

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	IP03_0.1	1.8.24		SOIL	Hmw Hg, TPH, Trace Suite, Antimony, Tin, Asbestos (SQ)
2	IP03_0.3				Hold (CO)
3	IP03_0.5				Hmw Hg, TPH, Trace Suite, Antimony, Tin, Asbestos (SQ)
4	IP03_0.7				Hold (CO)
5	IP03_1.0				Hold (CO)
6	IP03_1.5				Hold (CO)
7	IP03_2.0				Hold (CO)
8	Dup_L				Hmw Hg, TPH, Trace Suite, Antimony, Tin
9	TP11_0.1				Hmw Hg, TPH, Trace Suite, Antimony, Tin, Asbestos (SQ)
10	TP11_0.3				Hold (CO)
11	TP11_0.5				Hmw Hg, TPH, Trace Suite, Antimony, Tin, Asbestos (SQ)
12	TP11_0.7				Hold (CO)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	TP11_1.0	1.8.24		SOIL	Hold
14	Dup_M				Hold, TPH, Trace Sulf, Antimony, Tin
15	TP10_0.1				Hold, TPH, Trace Sulf, Antimony, Tin, Asbestos (S
16	TP10_0.3				Hold
17	TP10_0.5				Hold, TPH, Trace Sulf, Antimony, Tin, Asbestos (SQ)
18	TP10_0.7				Hold
19	TP10_1.0				Hold
20					
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Private Bag 3205
Hamilton 3240 New Zealand

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

Job Information Summary

Client:	Beca Limited	**Lab No:**	3640488
Contact:	Stuart Caird	**Date Registered:**	02-Aug-2024 10:07 am
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	08-Aug-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	IP03_0.1 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
2	IP03_0.3 01-Aug-2024	Soil	GSoil300	Hold Cold
3	IP03_0.5 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
4	IP03_0.7 01-Aug-2024	Soil	GSoil300	Hold Cold
5	IP03_1.0 01-Aug-2024	Soil	GSoil300	Hold Cold
6	IP03_1.5 01-Aug-2024	Soil	GSoil300	Hold Cold
7	IP03_2.0 01-Aug-2024	Soil	GSoil300	Hold Cold
8	Dup_L 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
9	TP11_0.1 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
10	TP11_0.3 01-Aug-2024	Soil	GSoil300	Hold Cold
11	TP11_0.5 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
12	TP11_0.7 01-Aug-2024	Soil	GSoil300	Hold Cold
13	TP11_1.0 01-Aug-2024	Soil	GSoil300	Hold Cold
14	DUP_M 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
15	TP10_0.1 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
16	TP10_0.3 01-Aug-2024	Soil	GSoil300	Hold Cold
17	TP10_0.5 01-Aug-2024	Soil	GSoil300	Heavy Metals with Mercury, Screen Level, Total Recoverable Antimony, Total Recoverable Tin, Semivolatile Organic Compounds Trace in Soil by GC-MS, Total Petroleum Hydrocarbons in Soil
18	TP10_0.7 01-Aug-2024	Soil	GSoil300	Hold Cold
19	TP10_1.0 01-Aug-2024	Soil	GSoil300	Hold Cold

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
Individual Tests			
Environmental Solids Sample Drying	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 8-9, 11, 14-15, 17
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	1, 3, 8-9, 11, 14-15, 17
Total Recoverable Antimony	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Total Recoverable Tin	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	1.0 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3, 8-9, 11, 14-15, 17
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

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

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T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **363 7649**

Date Recv: 29-Jul-24 15:18

Received by: Michaela Conlan

Quote No	129425
Primary Contact	Stuart Caird
Submitted By	Stuart Caird
Client Name	Beca Limited
Address	PO Box 13960, Christchurch 8141
	Postcode
Phone	*Mobile*
Email	
Charge To	Beca Limited
Client Reference	3338703/800
Order No	

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

- ☑ *Email Primary Contact*
- ☐ *Email Submitter*
- ☐ *Email Client*
- ☑ *Email Other* ESdat_AU+BECA@ESdatLabSync.net
- ☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 24.7.24
Name: S.CAIRD
Signature:

☑ *Tick if you require COC to be emailed back*

Received at Hill Laboratories
(Refer to Lab created Job No above)
Date & Time:
Name:
Signature:

Condition
☐ *Room Temp* ☐ *Chilled* ☐ *Frozen*
Temp: 18.8

ADDITIONAL INFORMATION / KNOWN HAZARDS

Please use client reference above as 'project ID' when providing results in ESdat format.

Priority ☐ Low ☐ Normal ☑ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TP22_0.1	24.7.24		SOIL	Hold, TAU, Trace Suite, VOC, Asbestos (SQ)
2	TP22_0.3				Hold (aS)
3	TP22_0.5				Hold, TAU, Trace suite, VOC, Asbestos (SQ)
4	TP22_0.7				Hold (aS)
5	TP22_1.0				Hold (aS)
6	TP22_1.5				Hold (aS)
7	TP22_2.0				Hold (aS)
8	TP22_3.0				Hold (aS)
9	UTP3_0.1				Hold, TAU, TAU
10	UTP3_0.3				Hold (aS)
11	UTP3_0.5				Hold, TAU, TAU
12	UTP4_0.7				Hold (aS)

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	VTB_1.0	29.7.24		Soil	Hold PAD
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

R J Hill Laboratories Limited
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Hamilton 3240 New Zealand

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mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Beca Limited	**Lab No:**	3637649
Contact:	Stuart Caird	**Date Registered:**	29-Jul-2024 4:13 pm
	C/- Beca Limited	**Priority:**	High
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	Rolleston 338703
		Add. Client Ref:	3338703/800
		Submitted By:	Stuart Caird
		Charge To:	Beca Limited
		Target Date:	31-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	T22_0.1 29-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
2	T22_0.3 29-Jul-2024	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
3	T22_0.5 29-Jul-2024	Soil	PSoil500Asb	Hold
4	T22_0.7 29-Jul-2024	Soil	PSoil500Asb	Hold
5	T22_1.0 29-Jul-2024	Soil	PSoil500Asb	Hold
6	T22_1.5 29-Jul-2024	Soil	PSoil500Asb	Hold

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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1-2
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1-2
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1-2
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-2
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1-2

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2
Asbestos in ACM as % of Total Sample	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2
Asbestos as Fibrous Asbestos as % of Total Sample	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2
Asbestos as Asbestos Fines as % of Total Sample	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3610093 SPv1
Contact:	Stuart Caird	**Date Received:**	19-Jun-2024
	C/- Beca Limited	**Date Reported:**	01-Jul-2024
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Submitted By:	Stuart Caird

Sample Type: Soil

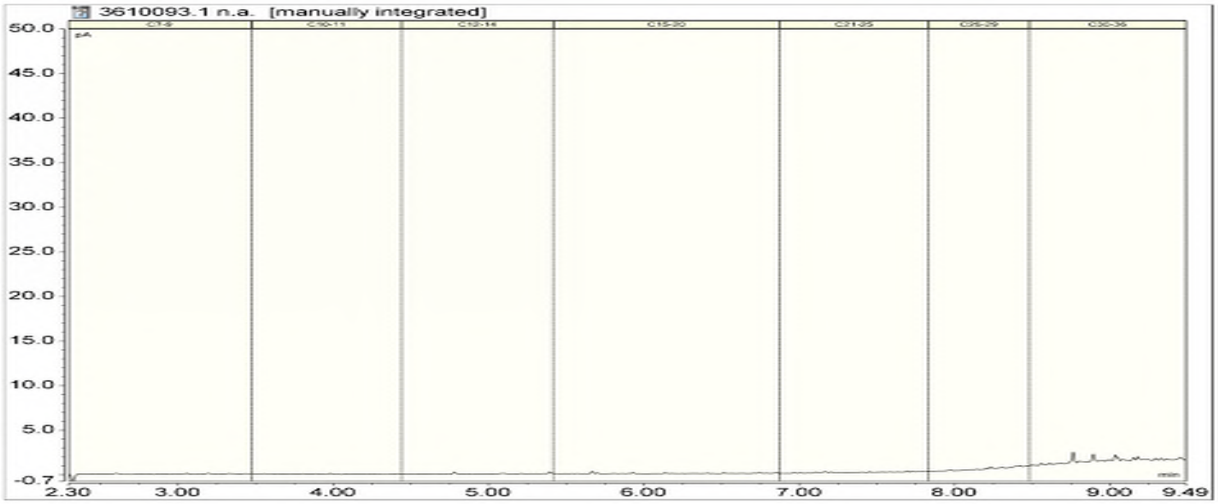
		Sample Name:	PP08_0.3 19-Jun-2024 10:40 am	PP13_0.3 19-Jun-2024 1:10 pm	PP13_0.45 19-Jun-2024
		Lab Number:	3610093.3	3610093.8	3610093.9
Individual Tests					
Dry Matter	g/100g as rcvd		94	94	82
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt		4	5	4
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		12	12	12
Total Recoverable Copper	mg/kg dry wt		7	8	8
Total Recoverable Lead	mg/kg dry wt		12.7	13.6	19.4
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		10	10	9
Total Recoverable Zinc	mg/kg dry wt		41	40	48
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.3	0.4	2.2
1-Methylnaphthalene	mg/kg dry wt		< 0.011	< 0.011	0.072
2-Methylnaphthalene	mg/kg dry wt		< 0.011	< 0.011	0.062
Acenaphthylene	mg/kg dry wt		< 0.011	< 0.011	0.029
Acenaphthene	mg/kg dry wt		< 0.011	< 0.011	< 0.012
Anthracene	mg/kg dry wt		< 0.011	< 0.011	0.067
Benzo[a]anthracene	mg/kg dry wt		< 0.011	0.027	0.152
Benzo[a]pyrene (BAP)	mg/kg dry wt		< 0.011	0.030	0.143
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.025	0.046	0.22
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.025	0.046	0.22
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		< 0.011	0.034	0.163
Benzo[e]pyrene	mg/kg dry wt		< 0.011	0.017	0.076
Benzo[g,h,i]perylene	mg/kg dry wt		< 0.011	0.017	0.072
Benzo[k]fluoranthene	mg/kg dry wt		< 0.011	0.015	0.075
Chrysene	mg/kg dry wt		< 0.011	0.024	0.145
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.011	< 0.011	0.023
Fluoranthene	mg/kg dry wt		< 0.011	0.056	0.33
Fluorene	mg/kg dry wt		< 0.011	< 0.011	0.038
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		< 0.011	0.022	0.086
Naphthalene	mg/kg dry wt		< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt		< 0.011	< 0.011	0.032
Phenanthrene	mg/kg dry wt		< 0.011	0.034	0.30
Pyrene	mg/kg dry wt		< 0.011	0.060	0.32

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

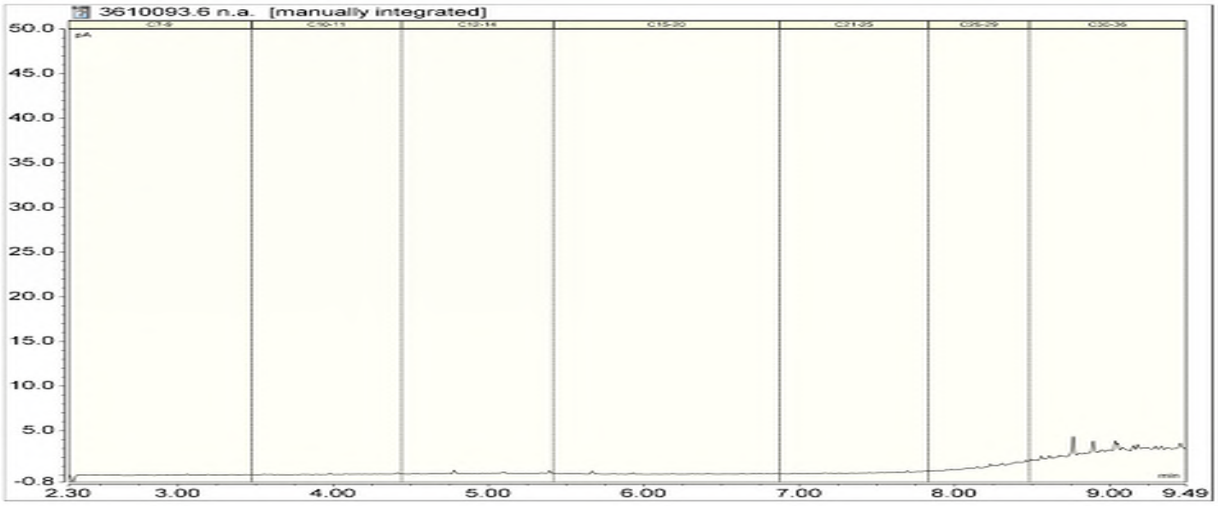
Sample Type: Soil				
Sample Name:		PP08_0.3 19-Jun-2024 10:40 am	PP13_0.3 19-Jun-2024 1:10 pm	PP13_0.45 19-Jun-2024
Lab Number:		3610093.3	3610093.8	3610093.9
Total Petroleum Hydrocarbons in Soil				
C7 - C9	mg/kg dry wt	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80

Sample Type: Roading Material				
Sample Name:		PP08_0.05 19-Jun-2024 10:15 am	PP13_0.05 19-Jun-2024 1:00 pm	DUP1 19-Jun-2024 10:15 am
Lab Number:		3610093.1	3610093.6	3610093.12
Individual Tests				
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*				
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	3	5	2
Total Recoverable Copper	mg/kg as rcvd	6	9	< 2
Total Recoverable Lead	mg/kg as rcvd	4.0	5.8	3.2
Total Recoverable Nickel	mg/kg as rcvd	5	8	2
Total Recoverable Zinc	mg/kg as rcvd	19	18	9
Polycyclic Aromatic Hydrocarbons Screening in Rock*				
1-Methylnaphthalene*	mg/kg as rcvd	< 0.10	0.39	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	< 0.15	0.39	< 0.15
Acenaphthylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	0.13	< 0.10	0.16
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	0.21	0.13	0.23
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	0.31	< 0.24	0.35
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	0.3	< 0.3	0.3
Benzo[b]fluoranthene + Benzo[j]fluoranthene*	mg/kg as rcvd	0.21	0.14	0.25
Benzo[e]pyrene*	mg/kg as rcvd	0.21	0.22	0.21
Benzo[g,h,i]perylene*	mg/kg as rcvd	0.21	0.17	0.21
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Chrysene*	mg/kg as rcvd	0.14	0.10	0.16
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Fluoranthene*	mg/kg as rcvd	0.23	0.12	0.30
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	0.14	< 0.10	0.14
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	0.13	< 0.10	0.20
Pyrene*	mg/kg as rcvd	0.37	0.27	0.41
Total of Reported PAHs*	mg/kg as rcvd	2	3	3
Total Petroleum Hydrocarbons in Rock*				
C7 - C9*	mg/kg as rcvd	< 140	< 140	< 140
C10 - C14*	mg/kg as rcvd	< 120	127	< 120
C15 - C36*	mg/kg as rcvd	1,090	1,920	1,300
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	1,100	2,100	1,330

3610093.1
PP08_0.05 19-Jun-2024 10:15 am
Client Chromatogram for TPH by FID



3610093.6
PP13_0.05 19-Jun-2024 1:00 pm
Client Chromatogram for TPH by FID



3610093.12
DUP1 19-Jun-2024 10:15 am
Client Chromatogram for TPH by FID



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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	3, 8-9
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	3, 8-9
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	3, 8-9
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	3, 8-9
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	3, 8-9
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	3, 8-9
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	3, 8-9
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8-9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8-9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	3, 8-9
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	3, 8-9

Sample Type: Roading Material

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 6, 12
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6, 12
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 12
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6, 12
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 12
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 12
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6, 12
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6, 12
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 12
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6, 12

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6, 12
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 6, 12
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 12
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 12
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6, 12
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6, 12

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

Testing was completed between 20-Jun-2024 and 01-Jul-2024. 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.

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Martin Cowell - BSc
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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3612947 SPv1
Contact:	Stuart Caird	**Date Received:**	24-Jun-2024
	C/- Beca Limited	**Date Reported:**	27-Jun-2024
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Submitted By:	Stuart Caird

Sample Type: Soil

		Sample Name:	IP04_0.1 24-Jun-2024	IP04_0.5 24-Jun-2024	Dup_C 24-Jun-2024
		Lab Number:	3612947.1	3612947.3	3612947.6
Individual Tests					
Dry Matter	g/100g as rcvd		79	93	79
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt		3	4	3
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		11	17	12
Total Recoverable Copper	mg/kg dry wt		5	5	5
Total Recoverable Lead	mg/kg dry wt		16.7	14.3	17.8
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		7	12	8
Total Recoverable Zinc	mg/kg dry wt		53	55	56
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.3	< 0.3	0.4
1-Methylnaphthalene	mg/kg dry wt		< 0.013	< 0.011	< 0.013
2-Methylnaphthalene	mg/kg dry wt		< 0.013	< 0.011	< 0.013
Acenaphthylene	mg/kg dry wt		< 0.013	< 0.011	< 0.013
Acenaphthene	mg/kg dry wt		< 0.013	< 0.011	< 0.013
Anthracene	mg/kg dry wt		< 0.013	< 0.011	< 0.013
Benzo[a]anthracene	mg/kg dry wt		0.014	< 0.011	0.025
Benzo[a]pyrene (BAP)	mg/kg dry wt		0.018	< 0.011	0.030
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.030	< 0.026	0.040
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.030	< 0.026	0.039
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		0.021	< 0.011	0.034
Benzo[e]pyrene	mg/kg dry wt		< 0.013	< 0.011	0.018
Benzo[g,h,i]perylene	mg/kg dry wt		0.014	< 0.011	0.019
Benzo[k]fluoranthene	mg/kg dry wt		< 0.013	< 0.011	0.014
Chrysene	mg/kg dry wt		0.015	< 0.011	0.025
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.013	< 0.011	< 0.013
Fluoranthene	mg/kg dry wt		0.034	< 0.011	0.058
Fluorene	mg/kg dry wt		< 0.013	< 0.011	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		0.014	< 0.011	0.020
Naphthalene	mg/kg dry wt		< 0.07	< 0.06	< 0.07
Perylene	mg/kg dry wt		< 0.013	< 0.011	< 0.013
Phenanthrene	mg/kg dry wt		0.031	< 0.011	0.046
Pyrene	mg/kg dry wt		0.035	< 0.011	0.058

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The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil				
Sample Name:		IP04_0.1 24-Jun-2024	IP04_0.5 24-Jun-2024	Dup_C 24-Jun-2024
Lab Number:		3612947.1	3612947.3	3612947.6
Total Petroleum Hydrocarbons in Soil				
C7 - C9	mg/kg dry wt	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80

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**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 6
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	1, 3, 6
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	1, 3, 6
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	1, 3, 6
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	1, 3, 6
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 6
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 6
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 6
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 6

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

Testing was completed between 25-Jun-2024 and 27-Jun-2024. 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.

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3611080 SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:**	20-Jun-2024
		Date Reported:	01-Jul-2024
		Quote No:	129425
		Order No:	
		Client Reference:	Rolleston 338703/800
		Submitted By:	Maisie Hopkins

Sample Type: Soil

Sample Name:		PP15_0.3 20-Jun-2024	PP14_0.5 20-Jun-2024	PP12_0.1 20-Jun-2024	PP12_0.5 20-Jun-2024
Lab Number:		3611080.3	3611080.7	3611080.10	3611080.12
Individual Tests					
Dry Matter	g/100g as rcvd	96	91	95	93
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	4	4	4	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	12	12	11	14
Total Recoverable Copper	mg/kg dry wt	7	4	15	5
Total Recoverable Lead	mg/kg dry wt	13.3	10.8	13.6	14.3
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	10	9	15	11
Total Recoverable Zinc	mg/kg dry wt	41	36	37	40
BTEX in Soil by Headspace GC-MS					
Benzene	mg/kg dry wt	-	-	< 0.05	< 0.05
Toluene	mg/kg dry wt	-	-	< 0.05	< 0.05
Ethylbenzene	mg/kg dry wt	-	-	< 0.05	< 0.05
m&p-Xylene	mg/kg dry wt	-	-	< 0.10	< 0.10
o-Xylene	mg/kg dry wt	-	-	< 0.05	< 0.05
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.011	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.011	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.011	-	-	-
Acenaphthene	mg/kg dry wt	< 0.011	-	-	-
Anthracene	mg/kg dry wt	< 0.011	-	-	-
Benzo[a]anthracene	mg/kg dry wt	0.010	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.014	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.025	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.025	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	0.015	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.011	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	-	-	-
Chrysene	mg/kg dry wt	0.011	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	-	-	-
Fluoranthene	mg/kg dry wt	0.018	-	-	-
Fluorene	mg/kg dry wt	< 0.011	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	-	-	-

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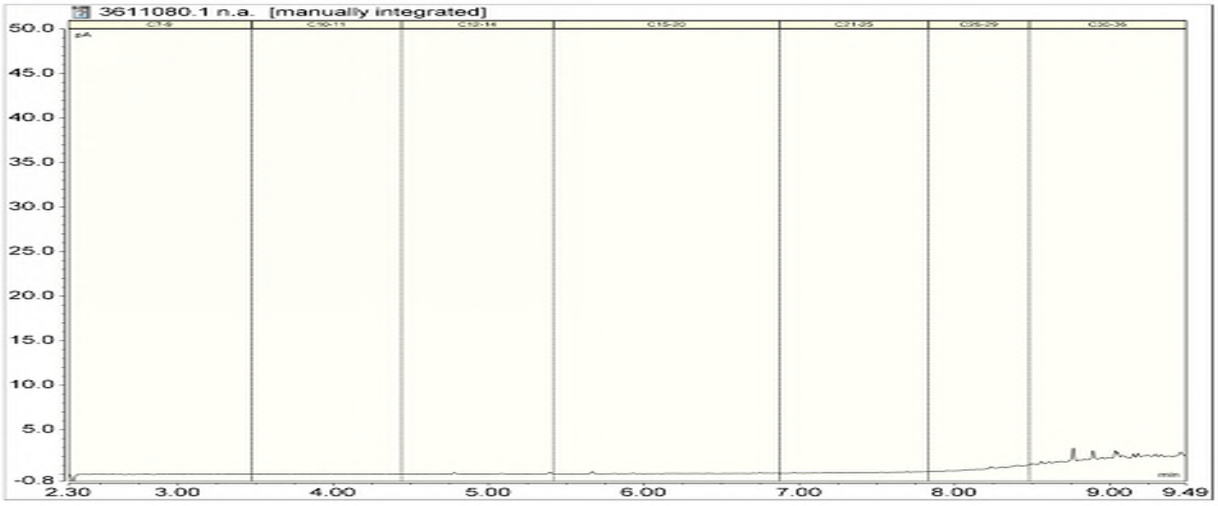
Sample Type: Soil					
Sample Name:		PP15_0.3 20-Jun-2024	PP14_0.5 20-Jun-2024	PP12_0.1 20-Jun-2024	PP12_0.5 20-Jun-2024
Lab Number:		3611080.3	3611080.7	3611080.10	3611080.12
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Naphthalene	mg/kg dry wt	< 0.06	-	-	-
Perylene	mg/kg dry wt	< 0.011	-	-	-
Phenanthrene	mg/kg dry wt	0.010	-	-	-
Pyrene	mg/kg dry wt	0.019	-	-	-
Haloethers Trace in SVOC Soil Samples by GC-MS					
Bis(2-chloroethoxy) methane	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Bis(2-chloroethyl)ether	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS					
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	-	< 0.12	< 0.12	< 0.12
2,4-Dinitrotoluene	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	-	< 0.12	< 0.12	< 0.12
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS					
Aldrin	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Dieldrin	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	-	< 0.5	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Endrin	mg/kg dry wt	-	< 0.12	< 0.12	< 0.12
Endrin ketone	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Heptachlor	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*					
Acenaphthene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
2-Methylnaphthalene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10

Sample Type: Soil					
Sample Name:		PP15_0.3 20-Jun-2024	PP14_0.5 20-Jun-2024	PP12_0.1 20-Jun-2024	PP12_0.5 20-Jun-2024
Lab Number:		3611080.3	3611080.7	3611080.10	3611080.12
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*					
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	< 0.25	< 0.25	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	< 0.25	< 0.25	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS					
4-Chloro-3-methylphenol	mg/kg dry wt	-	< 0.5	< 0.5	< 0.5
2-Chlorophenol	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	-	< 0.4	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	-	< 0.4	< 0.4	< 0.4
2-Methylphenol (o-cresol)	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	-	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	-	< 6	< 6	< 6
Phenol	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
2,4,5-Trichlorophenol	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Plasticisers Trace in SVOC Soil Samples by GC-MS					
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	-	< 0.5	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	-	< 0.2	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	-	< 0.12	< 0.12	< 0.12
1,3-Dichlorobenzene	mg/kg dry wt	-	< 0.12	< 0.12	< 0.12
1,4-Dichlorobenzene	mg/kg dry wt	-	< 0.12	< 0.12	< 0.12
Hexachlorobutadiene	mg/kg dry wt	-	< 0.12	< 0.12	< 0.12
Hexachloroethane	mg/kg dry wt	-	< 0.12	< 0.12	< 0.12
1,2,4-Trichlorobenzene	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Other SVOC Trace in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	-	< 1.0	< 1.0	< 1.0
Carbazole	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
Isophorone	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10
TPH Headspace in Soil					
C6 - C9	mg/kg dry wt	-	-	< 3	< 3
C10 - C14	mg/kg dry wt	-	-	< 20	< 20
C15 - C36	mg/kg dry wt	-	-	60	< 40
Total hydrocarbons (C6 - C36)	mg/kg dry wt	-	-	< 63	< 63
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 20	< 20	-	-
C10 - C14	mg/kg dry wt	< 20	< 20	-	-
C15 - C36	mg/kg dry wt	< 40	< 40	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	-	-

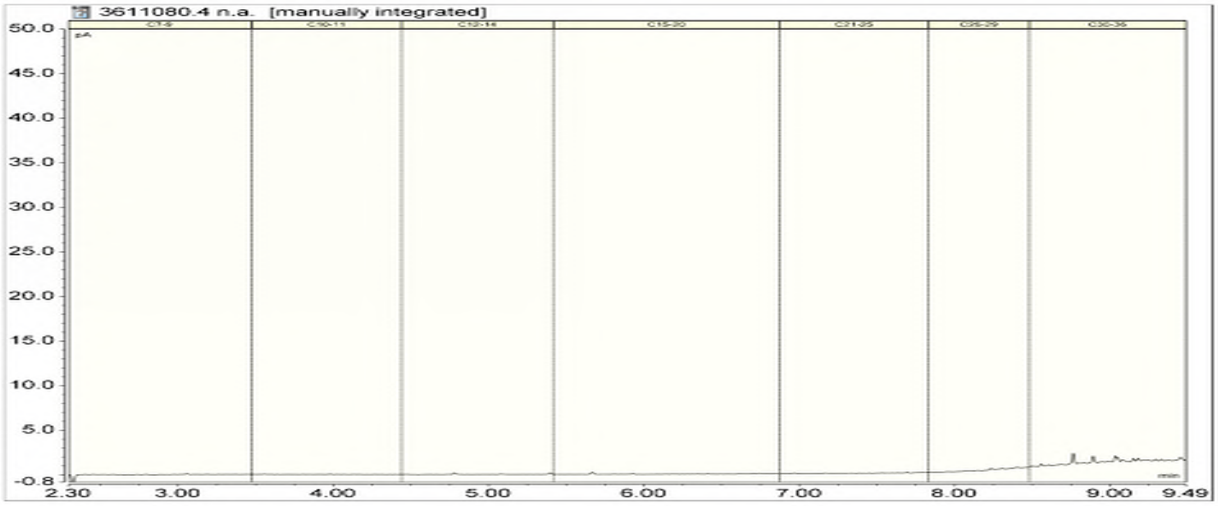
Sample Type: Roading Material			
Sample Name:		PP15_0.05 20-Jun-2024	PP14_0.05 20-Jun-2024
Lab Number:		3611080.1	3611080.4
Individual Tests			
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*			
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10

Sample Type: Roading Material			
Sample Name:		PP15_0.05 20-Jun-2024	PP14_0.05 20-Jun-2024
Lab Number:		3611080.1	3611080.4
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*			
Total Recoverable Chromium	mg/kg as rcvd	3	3
Total Recoverable Copper	mg/kg as rcvd	3	3
Total Recoverable Lead	mg/kg as rcvd	4.4	3.7
Total Recoverable Nickel	mg/kg as rcvd	3	2
Total Recoverable Zinc	mg/kg as rcvd	13	14
Polycyclic Aromatic Hydrocarbons Screening in Rock*			
1-Methylnaphthalene*	mg/kg as rcvd	< 0.10	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	< 0.15	< 0.15
Acenaphthylene*	mg/kg as rcvd	< 0.10	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	0.15	0.15
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	0.26	0.21
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	0.39	0.32
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	0.4	0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	0.25	0.23
Benzo[e]pyrene*	mg/kg as rcvd	0.25	0.21
Benzo[g,h,i]perylene*	mg/kg as rcvd	0.25	0.21
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	0.10
Chrysene*	mg/kg as rcvd	0.17	0.15
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Fluoranthene*	mg/kg as rcvd	0.28	0.26
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	0.18	0.15
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	0.12	0.10
Pyrene*	mg/kg as rcvd	0.48	0.40
Total of Reported PAHs*	mg/kg as rcvd	3	2
Total Petroleum Hydrocarbons in Rock*			
C7 - C9*	mg/kg as rcvd	< 140	< 140
C10 - C14*	mg/kg as rcvd	< 120	< 120
C15 - C36*	mg/kg as rcvd	1,250	970
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	1,280	990

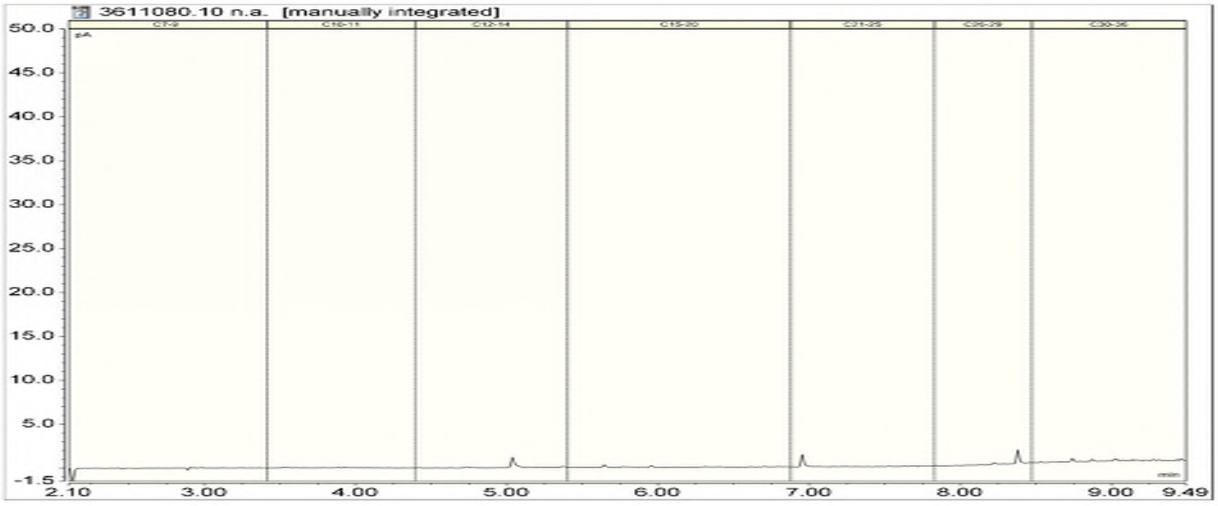
3611080.1
PP15_0.05 20-Jun-2024
Client Chromatogram for TPH by FID



3611080.4
PP14_0.05 20-Jun-2024
Client Chromatogram for TPH by FID



3611080.10
PP12_0.1 20-Jun-2024
Client Chromatogram for TPH by FID



Analyst's Comments

It was observed that the containers for samples {3611080. 10, 12} were not completely filled. Volatile loss may have occurred due to the headspace created in the containers.

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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	3, 7, 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	3
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	3, 7, 10, 12
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	3
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	3
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	3
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	3, 7, 10, 12
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	10, 12
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	7, 10, 12
TPH Headspace in Soil			
C6 - C9	Solvent extraction, Headspace GC-MS analysis. In-house based on US EPA 8260 and 5021.	3 mg/kg dry wt	10, 12
Total hydrocarbons (C6 - C36)	Calculation: Sum of carbon bands from C6 to C36. In-house based on US EPA 8015 and US EPA 8260, 5021.	63 mg/kg dry wt	10, 12
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 7
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 7, 10, 12
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	3, 7, 10, 12
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	3, 7

Sample Type: Roading Material

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 4
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 4
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 4
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 4
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 4
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 4
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 4
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 4, 10
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 4
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 4

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

Testing was completed between 21-Jun-2024 and 01-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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



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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3611982 SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	21-Jun-2024 01-Jul-2024 129425 3338703/800 Maisie Hopkins

Sample Type: Soil

		Sample Name:	PP06_0.3 21-Jun-2024	PP11_0.3 21-Jun-2024	PP11_0.5 21-Jun-2024
		Lab Number:	3611982.3	3611982.7	3611982.8
Individual Tests					
Dry Matter	g/100g as rcvd		95	97	96
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt		4	4	4
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		13	11	10
Total Recoverable Copper	mg/kg dry wt		8	6	5
Total Recoverable Lead	mg/kg dry wt		14.4	10.3	9.9
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		10	9	8
Total Recoverable Zinc	mg/kg dry wt		46	35	34
Organochlorine Pesticides Screening in Soil					
Aldrin	mg/kg dry wt		-	< 0.011	< 0.011
alpha-BHC	mg/kg dry wt		-	< 0.011	< 0.011
beta-BHC	mg/kg dry wt		-	< 0.011	< 0.011
delta-BHC	mg/kg dry wt		-	< 0.011	< 0.011
gamma-BHC (Lindane)	mg/kg dry wt		-	< 0.011	< 0.011
cis-Chlordane	mg/kg dry wt		-	< 0.011	< 0.011
trans-Chlordane	mg/kg dry wt		-	< 0.011	< 0.011
2,4'-DDD	mg/kg dry wt		-	< 0.011	< 0.011
4,4'-DDD	mg/kg dry wt		-	< 0.011	< 0.011
2,4'-DDE	mg/kg dry wt		-	< 0.011	< 0.011
4,4'-DDE	mg/kg dry wt		-	< 0.011	< 0.011
2,4'-DDT	mg/kg dry wt		-	< 0.011	< 0.011
4,4'-DDT	mg/kg dry wt		-	< 0.011	< 0.011
Total DDT Isomers	mg/kg dry wt		-	< 0.07	< 0.07
Dieldrin	mg/kg dry wt		-	< 0.011	< 0.011
Endosulfan I	mg/kg dry wt		-	< 0.011	< 0.011
Endosulfan II	mg/kg dry wt		-	< 0.011	< 0.011
Endosulfan sulphate	mg/kg dry wt		-	< 0.011	< 0.011
Endrin	mg/kg dry wt		-	< 0.011	< 0.011
Endrin aldehyde	mg/kg dry wt		-	< 0.011	< 0.011
Endrin ketone	mg/kg dry wt		-	< 0.011	< 0.011
Heptachlor	mg/kg dry wt		-	< 0.011	< 0.011
Heptachlor epoxide	mg/kg dry wt		-	< 0.011	< 0.011
Hexachlorobenzene	mg/kg dry wt		-	< 0.011	< 0.011
Methoxychlor	mg/kg dry wt		-	< 0.011	< 0.011

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

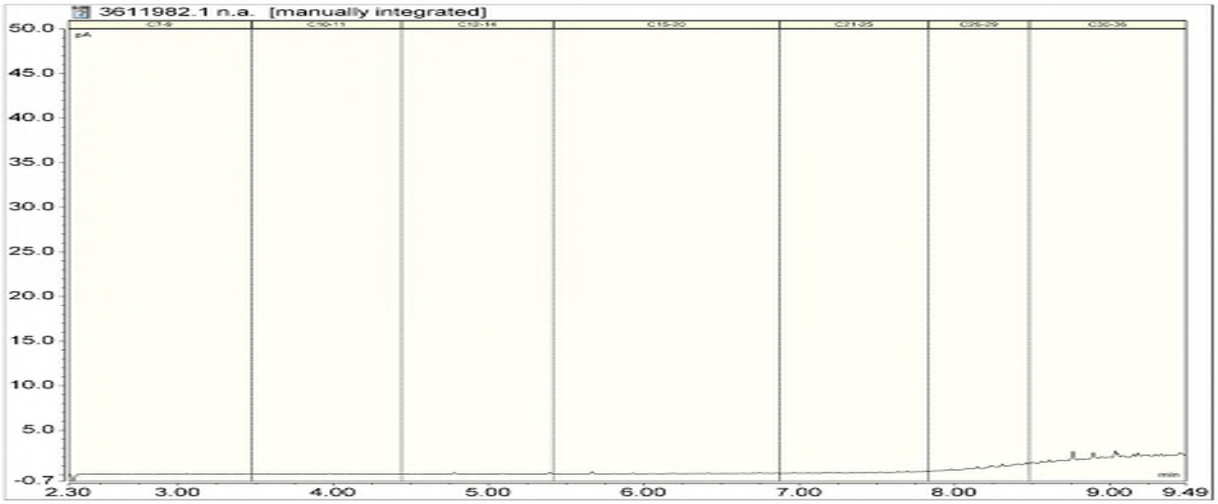
Sample Type: Soil				
Sample Name:		PP06_0.3 21-Jun-2024	PP11_0.3 21-Jun-2024	PP11_0.5 21-Jun-2024
Lab Number:		3611982.3	3611982.7	3611982.8
Organonitro&phosphorus Pesticides Screen in Soil by GCMS				
Acetochlor	mg/kg dry wt	-	< 0.05	< 0.05
Alachlor	mg/kg dry wt	-	< 0.05	< 0.05
Atrazine	mg/kg dry wt	-	< 0.05	< 0.05
Atrazine-desethyl	mg/kg dry wt	-	< 0.05	< 0.05
Atrazine-desisopropyl	mg/kg dry wt	-	< 0.10	< 0.10
Azaconazole	mg/kg dry wt	-	< 0.03	< 0.03
Azinphos-methyl	mg/kg dry wt	-	< 0.10	< 0.10
Benalaxyl	mg/kg dry wt	-	< 0.03	< 0.03
Bromacil	mg/kg dry wt	-	< 0.05	< 0.05
Bromopropylate	mg/kg dry wt	-	< 0.05	< 0.05
Butachlor	mg/kg dry wt	-	< 0.05	< 0.05
Captan	mg/kg dry wt	-	< 0.10	< 0.10
Carbaryl	mg/kg dry wt	-	< 0.05	< 0.05
Carbofuran	mg/kg dry wt	-	< 0.05	< 0.05
Chlorfluazuron	mg/kg dry wt	-	< 0.05	< 0.05
Chlorothalonil	mg/kg dry wt	-	< 0.05	< 0.05
Chlorpyrifos	mg/kg dry wt	-	< 0.05	< 0.05
Chlorpyrifos-methyl	mg/kg dry wt	-	< 0.05	< 0.05
Chlortoluron	mg/kg dry wt	-	< 0.10	< 0.10
Cyanazine	mg/kg dry wt	-	< 0.05	< 0.05
Cyfluthrin	mg/kg dry wt	-	< 0.06	< 0.06
Cyhalothrin	mg/kg dry wt	-	< 0.05	< 0.05
Cypermethrin	mg/kg dry wt	-	< 0.12	< 0.12
Deltamethrin (including Tralomethrin)	mg/kg dry wt	-	< 0.05	< 0.05
Diazinon	mg/kg dry wt	-	< 0.03	< 0.03
Dichlofluanid	mg/kg dry wt	-	< 0.05	< 0.05
Dichloran	mg/kg dry wt	-	< 0.2	< 0.2
Dichlorvos	mg/kg dry wt	-	< 0.09	< 0.09
Difenoconazole	mg/kg dry wt	-	< 0.09	< 0.09
Dimethoate	mg/kg dry wt	-	< 0.10	< 0.10
Diphenylamine	mg/kg dry wt	-	< 0.10	< 0.10
Diuron	mg/kg dry wt	-	< 0.05	< 0.05
Fenpropimorph	mg/kg dry wt	-	< 0.05	< 0.05
Fluazifop-butyl	mg/kg dry wt	-	< 0.05	< 0.05
Fluometuron	mg/kg dry wt	-	< 0.05	< 0.05
Flusilazole	mg/kg dry wt	-	< 0.05	< 0.05
Fluvalinate	mg/kg dry wt	-	< 0.05	< 0.05
Furalaxyl	mg/kg dry wt	-	< 0.03	< 0.03
Haloxyfop-methyl	mg/kg dry wt	-	< 0.05	< 0.05
Hexaconazole	mg/kg dry wt	-	< 0.05	< 0.05
Hexazinone	mg/kg dry wt	-	< 0.03	< 0.03
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	mg/kg dry wt	-	< 0.3	< 0.3
Kresoxim-methyl	mg/kg dry wt	-	< 0.03	< 0.03
Linuron	mg/kg dry wt	-	< 0.10	< 0.10
Malathion	mg/kg dry wt	-	< 0.05	< 0.05
Metalaxyl	mg/kg dry wt	-	< 0.05	< 0.05
Methamidophos	mg/kg dry wt	-	< 0.3	< 0.3
Metolachlor	mg/kg dry wt	-	< 0.05	< 0.05
Metribuzin	mg/kg dry wt	-	< 0.05	< 0.05
Molinate	mg/kg dry wt	-	< 0.10	< 0.10
Myclobutanil	mg/kg dry wt	-	< 0.05	< 0.05
Naled	mg/kg dry wt	-	< 0.3	< 0.3
Norflurazon	mg/kg dry wt	-	< 0.10	< 0.10
Oxadiazon	mg/kg dry wt	-	< 0.05	< 0.05

Sample Type: Soil				
Sample Name:		PP06_0.3 21-Jun-2024	PP11_0.3 21-Jun-2024	PP11_0.5 21-Jun-2024
Lab Number:		3611982.3	3611982.7	3611982.8
Organonitro&phosphorus Pesticides Screen in Soil by GCMS				
Oxyfluorfen	mg/kg dry wt	-	< 0.03	< 0.03
Parathion-ethyl	mg/kg dry wt	-	< 0.05	< 0.05
Parathion-methyl	mg/kg dry wt	-	< 0.05	< 0.05
Pendimethalin	mg/kg dry wt	-	< 0.05	< 0.05
Permethrin	mg/kg dry wt	-	< 0.03	< 0.03
Pirimicarb	mg/kg dry wt	-	< 0.05	< 0.05
Pirimiphos-methyl	mg/kg dry wt	-	< 0.05	< 0.05
Prochloraz	mg/kg dry wt	-	< 0.3	< 0.3
Procymidone	mg/kg dry wt	-	< 0.05	< 0.05
Prometryn	mg/kg dry wt	-	< 0.03	< 0.03
Propachlor	mg/kg dry wt	-	< 0.05	< 0.05
Propanil	mg/kg dry wt	-	< 0.2	< 0.2
Propazine	mg/kg dry wt	-	< 0.03	< 0.03
Propiconazole	mg/kg dry wt	-	< 0.05	< 0.05
Pyriproxyfen	mg/kg dry wt	-	< 0.05	< 0.05
Quizalofop-ethyl	mg/kg dry wt	-	< 0.05	< 0.05
Simazine	mg/kg dry wt	-	< 0.05	< 0.05
Simetryn	mg/kg dry wt	-	< 0.05	< 0.05
Sulfentrazone	mg/kg dry wt	-	< 0.3	< 0.3
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	mg/kg dry wt	-	< 0.10	< 0.10
Tebuconazole	mg/kg dry wt	-	< 0.05	< 0.05
Terbacil	mg/kg dry wt	-	< 0.05	< 0.05
Terbumeton	mg/kg dry wt	-	< 0.05	< 0.05
Terbuthylazine	mg/kg dry wt	-	< 0.03	< 0.03
Terbuthylazine-desethyl	mg/kg dry wt	-	< 0.05	< 0.05
Terbutryn	mg/kg dry wt	-	< 0.05	< 0.05
Thiabendazole	mg/kg dry wt	-	< 0.3	< 0.3
Thiobencarb	mg/kg dry wt	-	< 0.05	< 0.05
Tolylfluanid	mg/kg dry wt	-	< 0.03	< 0.03
Triazophos	mg/kg dry wt	-	< 0.05	< 0.05
Trifluralin	mg/kg dry wt	-	< 0.05	< 0.05
Vinclozolin	mg/kg dry wt	-	< 0.05	< 0.05
Polycyclic Aromatic Hydrocarbons Screening in Soil*				
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
2-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.016	< 0.011
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Acenaphthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Benzo[a]anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.026	< 0.025	< 0.025
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.025	< 0.025	< 0.025
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Benzo[e]pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Chrysene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Fluorene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06

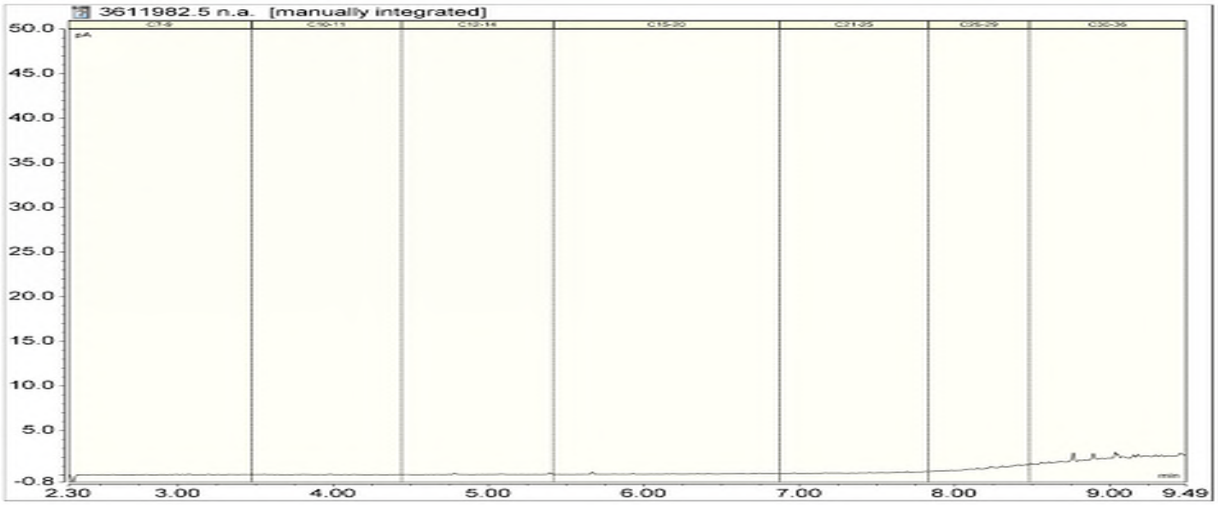
Sample Type: Soil				
Sample Name:		PP06_0.3 21-Jun-2024	PP11_0.3 21-Jun-2024	PP11_0.5 21-Jun-2024
Lab Number:		3611982.3	3611982.7	3611982.8
Polycyclic Aromatic Hydrocarbons Screening in Soil*				
Perylene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Phenanthrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011
Total Petroleum Hydrocarbons in Soil				
C7 - C9	mg/kg dry wt	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80

Sample Type: Roading Material			
Sample Name:		PP06_0.05 21-Jun-2024	PP11_0.05 21-Jun-2024
Lab Number:		3611982.1	3611982.5
Individual Tests			
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*			
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	4	4
Total Recoverable Copper	mg/kg as rcvd	4	3
Total Recoverable Lead	mg/kg as rcvd	3.9	4.9
Total Recoverable Nickel	mg/kg as rcvd	4	3
Total Recoverable Zinc	mg/kg as rcvd	12	16
Polycyclic Aromatic Hydrocarbons Screening in Rock*			
1-Methylnaphthalene*	mg/kg as rcvd	< 0.10	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	< 0.15	< 0.15
Acenaphthylene*	mg/kg as rcvd	< 0.10	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[e]pyrene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[g,h,i]perylene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10	< 0.10
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	< 0.10	< 0.10
Pyrene*	mg/kg as rcvd	< 0.10	< 0.10
Total of Reported PAHs*	mg/kg as rcvd	< 3	< 3
Total Petroleum Hydrocarbons in Rock*			
C7 - C9*	mg/kg as rcvd	< 140	< 140
C10 - C14*	mg/kg as rcvd	< 120	< 120
C15 - C36*	mg/kg as rcvd	1,330	1,310
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	1,350	1,330

3611982.1
PP06_0.05 21-Jun-2024
Client Chromatogram for TPH by FID



3611982.5
PP11_0.05 21-Jun-2024
Client Chromatogram for TPH by FID



Analyst's Comments

It has been noted that the method performance for Paclobutrazol and Bitertanol for ONOP analysis is not acceptable therefore we are unable to report these compounds at this present time.

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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	3, 7-8
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	3, 7-8
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	3, 7-8

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	3, 7-8
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	3, 7-8
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	3, 7-8
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	3, 7-8
Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS	Sonication extraction, GC-ECD and GC-MS analysis. In-house based on US EPA 8081 and US EPA 8270.	0.010 - 0.2 mg/kg dry wt	7-8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 7-8
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 7-8
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	3, 7-8
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	3, 7-8

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 5
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 5
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 5
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 5
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 5
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 5
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 5
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 5
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 5
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 5
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 5
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 5
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 5
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 5
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 5

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 5

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

Testing was completed between 22-Jun-2024 and 01-Jul-2024. 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.

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3615826 SPv1
Contact:	Stuart Caird	**Date Received:**	27-Jun-2024
	C/- Beca Limited	**Date Reported:**	04-Jul-2024
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	338703/800
		Submitted By:	Stuart Caird

Sample Type: Soil

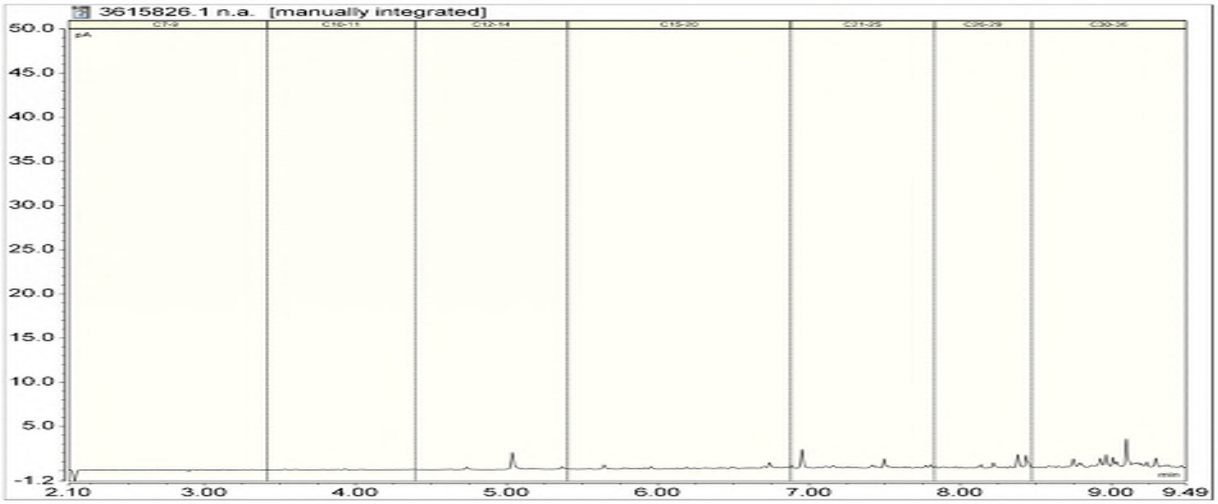
Sample Name:		TP15_0.1 27-Jun-2024	TP15_0.5 27-Jun-2024	Dup_D 27-Jun-2024	TP33_0.1 27-Jun-2024	TP33_0.5 27-Jun-2024
Lab Number:		3615826.1	3615826.3	3615826.8	3615826.9	3615826.11
Individual Tests						
Dry Matter	g/100g as rcvd	83	94	82	88	89
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	3	3	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	12	11	12	11
Total Recoverable Copper	mg/kg dry wt	5	4	5	5	3
Total Recoverable Lead	mg/kg dry wt	15.2	12.4	15.1	15.5	10.9
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	8	11	7	8	9
Total Recoverable Zinc	mg/kg dry wt	54	39	53	59	40
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	0.029	< 0.011	0.030	< 0.011	< 0.011
2-Methylnaphthalene	mg/kg dry wt	0.027	< 0.011	0.028	< 0.011	< 0.011
Acenaphthylene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.011	< 0.011
Acenaphthene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.011	< 0.011
Anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.011	< 0.011
Benzo[a]anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.011	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.015	< 0.011	0.017	< 0.011	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.029	< 0.025	< 0.029	< 0.027	< 0.027
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.029	< 0.025	< 0.029	< 0.027	< 0.027
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.018	< 0.011	0.020	< 0.011	< 0.011
Benzo[e]pyrene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.011	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.012	< 0.011	0.013	< 0.011	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.011	< 0.011
Chrysene	mg/kg dry wt	0.013	< 0.011	< 0.012	< 0.011	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.011	< 0.011
Fluoranthene	mg/kg dry wt	0.031	< 0.011	0.031	0.017	< 0.011
Fluorene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.011	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.011	< 0.011
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.012	< 0.011	< 0.012	< 0.011	< 0.011
Phenanthrene	mg/kg dry wt	0.032	< 0.011	0.031	< 0.011	< 0.011
Pyrene	mg/kg dry wt	0.028	< 0.011	0.031	0.016	< 0.011

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

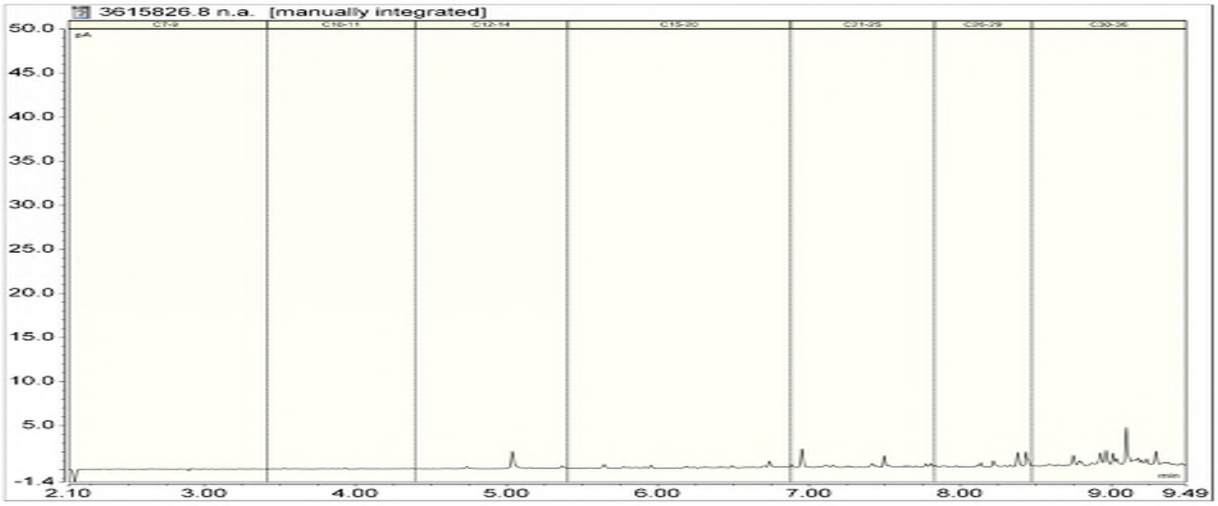
Sample Type: Soil						
Sample Name:		TP15_0.1 27-Jun-2024	TP15_0.5 27-Jun-2024	Dup_D 27-Jun-2024	TP33_0.1 27-Jun-2024	TP33_0.5 27-Jun-2024
Lab Number:		3615826.1	3615826.3	3615826.8	3615826.9	3615826.11
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	72	< 40	85	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	92	< 80	< 80

Sample Name:		TP35_0.1 27-Jun-2024	TP35_0.5 27-Jun-2024
Lab Number:		3615826.14	3615826.16
Individual Tests			
Dry Matter	g/100g as rcvd	81	89
Heavy Metals with Mercury, Screen Level			
Total Recoverable Arsenic	mg/kg dry wt	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	13
Total Recoverable Copper	mg/kg dry wt	4	4
Total Recoverable Lead	mg/kg dry wt	13.5	12.9
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	8	11
Total Recoverable Zinc	mg/kg dry wt	47	40
Polycyclic Aromatic Hydrocarbons Screening in Soil*			
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	0.013	< 0.011
2-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011
Acenaphthylene	mg/kg dry wt	< 0.012	< 0.011
Acenaphthene	mg/kg dry wt	< 0.012	< 0.011
Anthracene	mg/kg dry wt	< 0.012	< 0.011
Benzo[a]anthracene	mg/kg dry wt	< 0.012	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.012	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.029	< 0.027
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.029	< 0.027
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.012	< 0.011
Benzo[e]pyrene	mg/kg dry wt	< 0.012	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.012	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	< 0.012	< 0.011
Chrysene	mg/kg dry wt	< 0.012	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.011
Fluoranthene	mg/kg dry wt	0.021	< 0.011
Fluorene	mg/kg dry wt	< 0.012	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.012	< 0.011
Naphthalene	mg/kg dry wt	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.012	< 0.011
Phenanthrene	mg/kg dry wt	0.018	< 0.011
Pyrene	mg/kg dry wt	0.019	< 0.011
Total Petroleum Hydrocarbons in Soil			
C7 - C9	mg/kg dry wt	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80

3615826.1
TP15_0.1 27-Jun-2024
Client Chromatogram for TPH by FID



3615826.8
Dup_D 27-Jun-2024
Client Chromatogram for TPH by FID



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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 8-9, 11, 14, 16
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	1, 3, 8-9, 11, 14, 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	1, 3, 8-9, 11, 14, 16

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	1, 3, 8-9, 11, 14, 16
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 8
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 8-9, 11, 14, 16
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 8-9, 11, 14, 16

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

Testing was completed between 29-Jun-2024 and 04-Jul-2024. 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.

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Client Services Manager - Environmental

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www.hill-labs.co.nz

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3613940 SPv1
Contact:	Stuart Caird	**Date Received:**	25-Jun-2024
	C/- Beca Limited	**Date Reported:**	03-Jul-2024
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	3338703/800
		Add. Client Ref:	Rolleston 338703
		Submitted By:	Stuart Caird

Sample Type: Soil

Sample Name:		IP07_0.1 25-Jun-2024	IP07_0.5 25-Jun-2024	IP08_0.1 25-Jun-2024	IP08_0.5 25-Jun-2024	IP09_0.1 25-Jun-2024
Lab Number:		3613940.1	3613940.3	3613940.7	3613940.9	3613940.13
Individual Tests						
Dry Matter	g/100g as rcvd	78	95	86	97	81
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	4	3	5	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	0.15
Total Recoverable Chromium	mg/kg dry wt	12	14	11	15	11
Total Recoverable Copper	mg/kg dry wt	6	4	6	4	5
Total Recoverable Lead	mg/kg dry wt	15.7	14.4	32	13.7	28
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	8	11	6	10	7
Total Recoverable Zinc	mg/kg dry wt	63	45	70	45	60
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	0.6	< 0.3	0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.011	0.035	< 0.011	0.037
2-Methylnaphthalene	mg/kg dry wt	< 0.013	< 0.011	0.033	< 0.011	0.035
Acenaphthylene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.013
Acenaphthene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.013
Anthracene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.013
Benzo[a]anthracene	mg/kg dry wt	< 0.013	< 0.011	0.032	< 0.011	0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.013	< 0.011	0.041	< 0.011	0.015
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.030	< 0.025	0.061	< 0.025	< 0.030
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.030	< 0.025	0.061	< 0.025	< 0.030
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.013	< 0.011	0.054	< 0.011	0.018
Benzo[e]pyrene	mg/kg dry wt	< 0.013	< 0.011	0.027	< 0.011	< 0.013
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.013	< 0.011	0.029	< 0.011	< 0.013
Benzo[k]fluoranthene	mg/kg dry wt	< 0.013	< 0.011	0.021	< 0.011	< 0.013
Chrysene	mg/kg dry wt	< 0.013	< 0.011	0.042	< 0.011	0.016
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.013
Fluoranthene	mg/kg dry wt	< 0.013	< 0.011	0.075	< 0.011	0.026
Fluorene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.013	< 0.011	0.027	< 0.011	< 0.013
Naphthalene	mg/kg dry wt	< 0.07	< 0.06	< 0.06	< 0.06	< 0.07
Perylene	mg/kg dry wt	< 0.013	< 0.011	0.012	< 0.011	< 0.013
Phenanthrene	mg/kg dry wt	< 0.013	< 0.011	0.047	< 0.011	0.035
Pyrene	mg/kg dry wt	0.013	< 0.011	0.076	< 0.011	0.031

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

Sample Type: Soil		
Sample Name:		IP09_0.5 25-Jun-2024
Lab Number:		3613940.15
Individual Tests		
Dry Matter	g/100g as rcvd	89
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10
Total Recoverable Chromium	mg/kg dry wt	14
Total Recoverable Copper	mg/kg dry wt	4
Total Recoverable Lead	mg/kg dry wt	14.0
Total Recoverable Mercury	mg/kg dry wt	< 0.10
Total Recoverable Nickel	mg/kg dry wt	11
Total Recoverable Zinc	mg/kg dry wt	42
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.012
2-Methylnaphthalene	mg/kg dry wt	< 0.012
Acenaphthylene	mg/kg dry wt	< 0.012
Acenaphthene	mg/kg dry wt	< 0.012
Anthracene	mg/kg dry wt	< 0.012
Benzo[a]anthracene	mg/kg dry wt	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.027
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.027
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.012
Benzo[e]pyrene	mg/kg dry wt	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt	< 0.012
Chrysene	mg/kg dry wt	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012
Fluoranthene	mg/kg dry wt	< 0.012
Fluorene	mg/kg dry wt	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.012
Naphthalene	mg/kg dry wt	< 0.06
Perylene	mg/kg dry wt	< 0.012
Phenanthrene	mg/kg dry wt	< 0.012
Pyrene	mg/kg dry wt	< 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%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 7, 9, 13, 15
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	1, 3, 7, 9, 13, 15
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 7, 9, 13, 15
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	1, 3, 7, 9, 13, 15

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	1, 3, 7, 9, 13, 15
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	1, 3, 7, 9, 13, 15
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	1, 3, 7, 9, 13, 15

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

Testing was completed between 26-Jun-2024 and 03-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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



Martin Cowell - BSc
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3615000 SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	26-Jun-2024 08-Jul-2024 129425 3338703/800 Stuart Caird

Sample Type: Soil

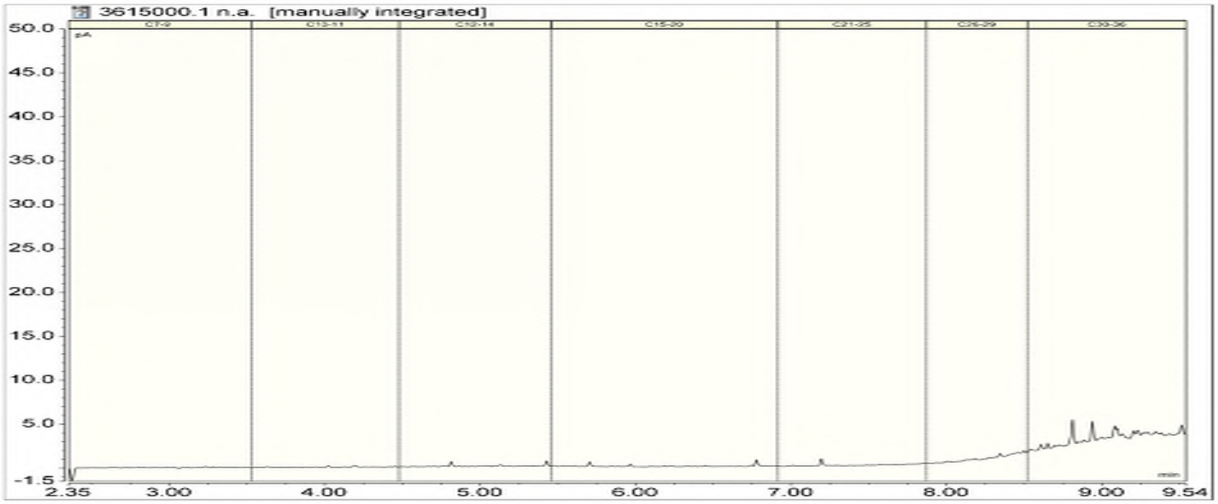
		Sample Name:	PP03_0.3 26-Jun-2024	PP02_0.3 26-Jun-2024
		Lab Number:	3615000.3	3615000.8
Individual Tests				
Dry Matter	g/100g as rcvd		95	85
Heavy Metals with Mercury, Screen Level				
Total Recoverable Arsenic	mg/kg dry wt		4	4
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		13	12
Total Recoverable Copper	mg/kg dry wt		5	4
Total Recoverable Lead	mg/kg dry wt		38	25
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		11	8
Total Recoverable Zinc	mg/kg dry wt		39	46
Polycyclic Aromatic Hydrocarbons Screening in Soil*				
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt		< 0.011	< 0.012
2-Methylnaphthalene	mg/kg dry wt		< 0.016	< 0.018
Acenaphthylene	mg/kg dry wt		< 0.011	< 0.012
Acenaphthene	mg/kg dry wt		< 0.011	< 0.012
Anthracene	mg/kg dry wt		< 0.011	< 0.012
Benzo[a]anthracene	mg/kg dry wt		< 0.011	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt		< 0.011	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.025	< 0.028
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.025	< 0.028
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		< 0.011	< 0.012
Benzo[e]pyrene	mg/kg dry wt		< 0.011	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt		< 0.011	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt		< 0.011	< 0.012
Chrysene	mg/kg dry wt		< 0.011	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.011	< 0.012
Fluoranthene	mg/kg dry wt		< 0.011	< 0.012
Fluorene	mg/kg dry wt		< 0.011	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		< 0.011	< 0.012
Naphthalene	mg/kg dry wt		< 0.06	< 0.06
Perylene	mg/kg dry wt		< 0.011	< 0.012
Phenanthrene	mg/kg dry wt		< 0.011	< 0.012
Pyrene	mg/kg dry wt		< 0.011	< 0.012

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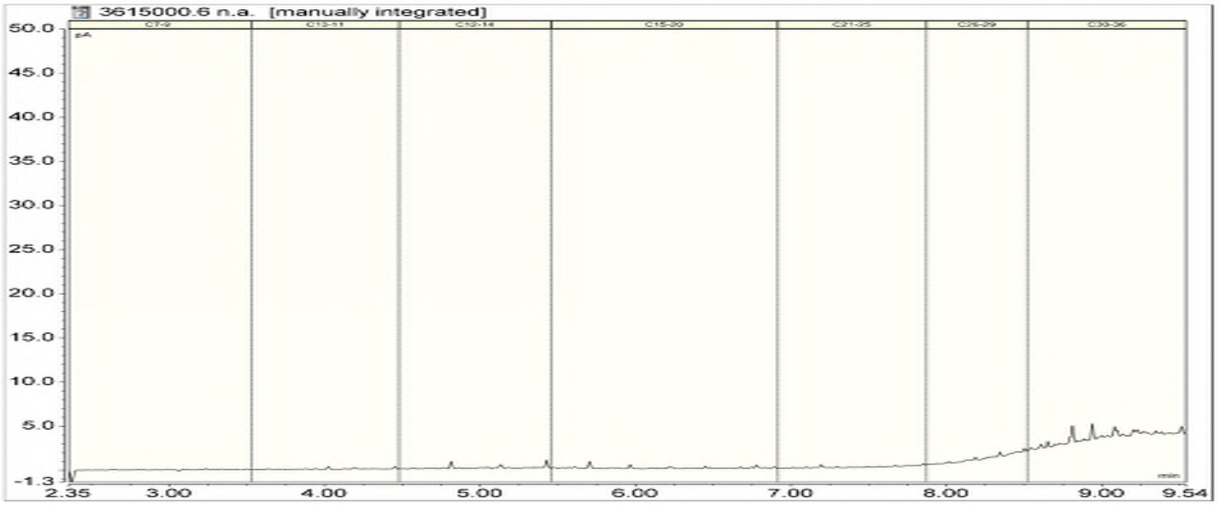
Sample Type: Soil				
	Sample Name:		PP03_0.3 26-Jun-2024	PP02_0.3 26-Jun-2024
	Lab Number:		3615000.3	3615000.8
Total Petroleum Hydrocarbons in Soil				
C7 - C9		mg/kg dry wt	< 20	< 20
C10 - C14		mg/kg dry wt	< 20	< 20
C15 - C36		mg/kg dry wt	< 40	< 40
Total hydrocarbons (C7 - C36)		mg/kg dry wt	< 80	< 80

Sample Type: Roading Material				
	Sample Name:		PP03_0.05 26-Jun-2024	PP02_0.05 26-Jun-2024
	Lab Number:		3615000.1	3615000.6
Individual Tests				
Total Recoverable Mercury*		mg/kg dry wt	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*				
Total Recoverable Arsenic		mg/kg as rcvd	< 2	< 2
Total Recoverable Cadmium*		mg/kg as rcvd	< 0.10	< 0.10
Total Recoverable Chromium		mg/kg as rcvd	5	3
Total Recoverable Copper		mg/kg as rcvd	4	9
Total Recoverable Lead		mg/kg as rcvd	4.7	4.3
Total Recoverable Nickel		mg/kg as rcvd	5	6
Total Recoverable Zinc		mg/kg as rcvd	20	17
Polycyclic Aromatic Hydrocarbons Screening in Rock*				
1-Methylnaphthalene*		mg/kg as rcvd	0.56	0.35
2-Methylnaphthalene*		mg/kg as rcvd	0.56	0.34
Acenaphthylene*		mg/kg as rcvd	< 0.10	< 0.10
Acenaphthene*		mg/kg as rcvd	< 0.10	< 0.10
Anthracene*		mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]anthracene*		mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene (BAP)*		mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*		mg/kg as rcvd	< 0.24	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*		mg/kg as rcvd	< 0.3	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*		mg/kg as rcvd	< 0.10	< 0.10
Benzo[e]pyrene*		mg/kg as rcvd	0.13	0.10
Benzo[g,h,i]perylene*		mg/kg as rcvd	0.12	0.14
Benzo[k]fluoranthene*		mg/kg as rcvd	< 0.10	< 0.10
Chrysene*		mg/kg as rcvd	< 0.10	< 0.10
Dibenzo[a,h]anthracene*		mg/kg as rcvd	< 0.10	< 0.10
Fluoranthene*		mg/kg as rcvd	< 0.10	< 0.10
Fluorene*		mg/kg as rcvd	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*		mg/kg as rcvd	< 0.10	< 0.10
Naphthalene*		mg/kg as rcvd	< 0.5	< 0.5
Perylene*		mg/kg as rcvd	< 0.10	< 0.10
Phenanthrene*		mg/kg as rcvd	< 0.10	< 0.10
Pyrene*		mg/kg as rcvd	< 0.10	< 0.10
Total of Reported PAHs*		mg/kg as rcvd	< 3	< 3
Total Petroleum Hydrocarbons in Rock*				
C7 - C9*		mg/kg as rcvd	< 140	< 140
C10 - C14*		mg/kg as rcvd	< 120	161
C15 - C36*		mg/kg as rcvd	2,300	2,600
Total hydrocarbons (C7 - C36)*		mg/kg as rcvd	2,400	2,800

3615000.1
PP03_0.05 26-Jun-2024
Client Chromatogram for TPH by FID



3615000.6
PP02_0.05 26-Jun-2024
Client Chromatogram for TPH by FID



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**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	3, 8
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	3, 8
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	3, 8

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	3, 8
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	3, 8
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	3, 8
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	3, 8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	3, 8
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	3, 8
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	3, 8

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 6
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 6
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6

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

Testing was completed between 27-Jun-2024 and 08-Jul-2024. 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.

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Ara Heron BSc (Tech)
Client Services Manager - Environmental

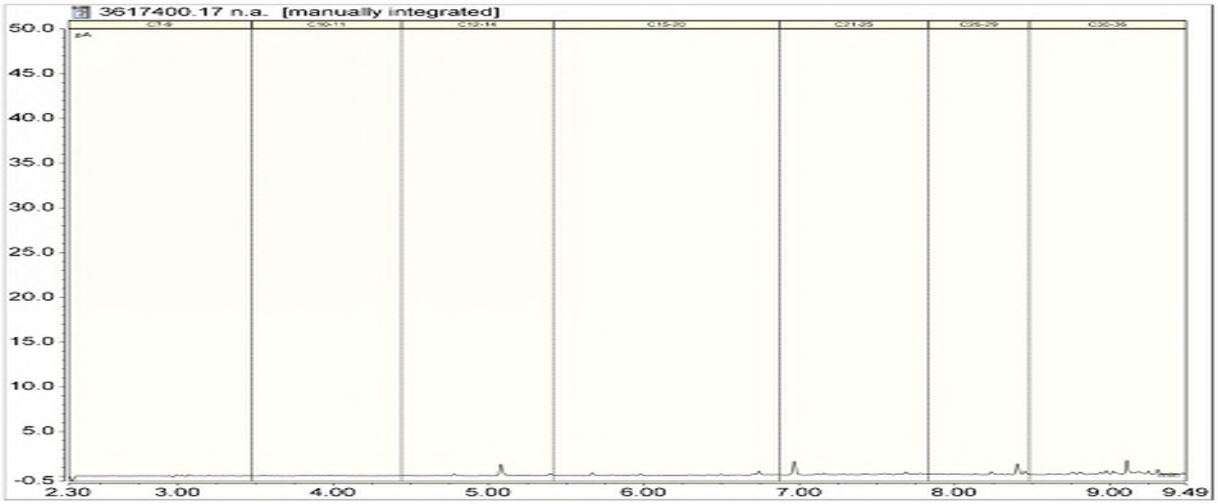
Sample Type: Soil						
Sample Name:		TP06_0.1 01-Jul-2024	TP06_0.5 01-Jul-2024	TP08_0.1 01-Jul-2024	TP08_0.5 01-Jul-2024	TP03_0.1 01-Jul-2024
Lab Number:		3617400.1	3617400.3	3617400.10	3617400.12	3617400.17
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	44
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80	< 80

Sample Name:		TP03_0.5 01-Jul-2024	DUP_E 01-Jul-2024	BH02_0.1-0.2 01-Jul-2024	BH02_0.5-0.7 01-Jul-2024	IP02_0.1 01-Jul-2024
Lab Number:		3617400.19	3617400.24	3617400.25	3617400.27	3617400.30
Individual Tests						
Dry Matter	g/100g as rcvd	93	92	90	92	82
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	5	3	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	15	16	14	13	10
Total Recoverable Copper	mg/kg dry wt	4	5	4	5	4
Total Recoverable Lead	mg/kg dry wt	15.3	16.2	15.6	14.1	14.9
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	9	11	8	10	7
Total Recoverable Zinc	mg/kg dry wt	40	47	41	44	39
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Acenaphthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[a]anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.026	< 0.026	< 0.027	< 0.026	< 0.030
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.026	< 0.026	< 0.026	< 0.026	< 0.030
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[e]pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Chrysene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	0.013
Fluorene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06	< 0.07
Perylene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Phenanthrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	< 0.013
Pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.011	< 0.011	0.013
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	62	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80	< 80

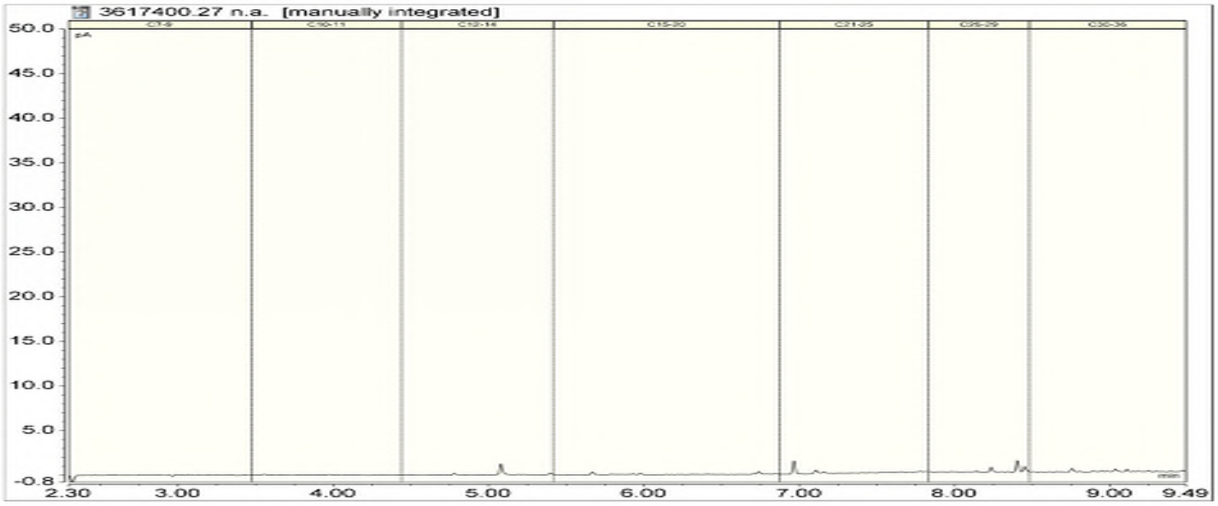
Sample Name:		IP02_0.5 01-Jul-2024
Lab Number:		3617400.32
Individual Tests		
Dry Matter	g/100g as rcvd	88

Sample Type: Soil		
Sample Name:		IP02_0.5 01-Jul-2024
Lab Number:		3617400.32
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10
Total Recoverable Chromium	mg/kg dry wt	17
Total Recoverable Copper	mg/kg dry wt	5
Total Recoverable Lead	mg/kg dry wt	19.1
Total Recoverable Mercury	mg/kg dry wt	< 0.10
Total Recoverable Nickel	mg/kg dry wt	12
Total Recoverable Zinc	mg/kg dry wt	58
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.011
2-Methylnaphthalene	mg/kg dry wt	< 0.011
Acenaphthylene	mg/kg dry wt	< 0.011
Acenaphthene	mg/kg dry wt	< 0.011
Anthracene	mg/kg dry wt	< 0.011
Benzo[a]anthracene	mg/kg dry wt	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.027
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.027
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011
Benzo[e]pyrene	mg/kg dry wt	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011
Chrysene	mg/kg dry wt	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011
Fluoranthene	mg/kg dry wt	< 0.011
Fluorene	mg/kg dry wt	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011
Naphthalene	mg/kg dry wt	< 0.06
Perylene	mg/kg dry wt	< 0.011
Phenanthrene	mg/kg dry wt	< 0.011
Pyrene	mg/kg dry wt	< 0.011
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80

3617400.17
TP03_0.1 01-Jul-2024
Client Chromatogram for TPH by FID



3617400.27
BH02_0.5-0.7 01-Jul-2024
Client Chromatogram for TPH by FID



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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
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	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	17, 27
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 10, 12, 17, 19, 24-25, 27, 30, 32

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

Testing was completed between 02-Jul-2024 and 04-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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



Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3620180	SPv2
Contact:	Stuart Caird	**Date Received:**	04-Jul-2024	
	C/- Beca Limited	**Date Reported:**	18-Jul-2024	**(Amended)**
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Maisie Hopkins	

Sample Type: Soil

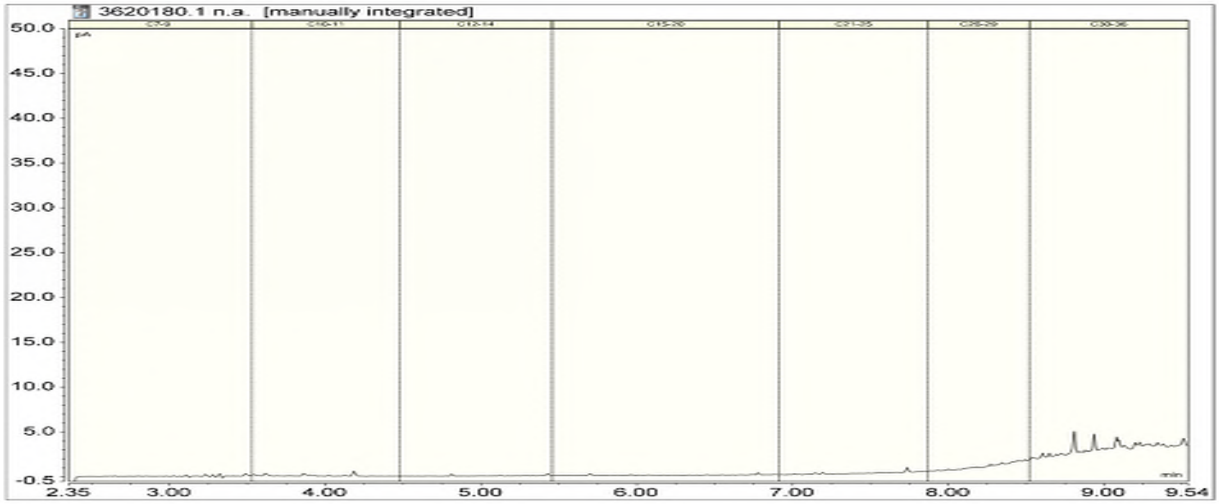
Sample Name:		PP23_0.15 04-Jul-2024	PP23_0.45 04-Jul-2024	PP22_0.15 04-Jul-2024	PP22_0.3 04-Jul-2024
Lab Number:		3620180.2	3620180.5	3620180.8	3620180.10
Individual Tests					
Dry Matter	g/100g as rcvd	95	88	95	91
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	4	-	4	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	< 0.10	-
Total Recoverable Chromium	mg/kg dry wt	12	-	12	-
Total Recoverable Copper	mg/kg dry wt	6	-	8	-
Total Recoverable Lead	mg/kg dry wt	15.7	-	16.3	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	-	< 0.10	-
Total Recoverable Nickel	mg/kg dry wt	10	-	11	-
Total Recoverable Zinc	mg/kg dry wt	39	-	41	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	1.7	2.4	3.4
1-Methylnaphthalene	mg/kg dry wt	< 0.011	0.028	0.026	0.050
2-Methylnaphthalene	mg/kg dry wt	< 0.011	0.026	0.030	0.060
Acenaphthylene	mg/kg dry wt	< 0.011	0.024	0.018	0.026
Acenaphthene	mg/kg dry wt	< 0.011	0.017	0.031	0.039
Anthracene	mg/kg dry wt	< 0.011	0.093	0.122	0.143
Benzo[a]anthracene	mg/kg dry wt	< 0.011	0.114	0.149	0.22
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	0.100	0.141	0.23
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.025	0.144	0.21	0.33
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.025	0.142	0.20	0.33
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011	0.091	0.142	0.23
Benzo[e]pyrene	mg/kg dry wt	< 0.011	0.043	0.069	0.116
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	0.041	0.072	0.114
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	0.041	0.060	0.093
Chrysene	mg/kg dry wt	< 0.011	0.101	0.118	0.185
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	0.012	0.019	0.028
Fluoranthene	mg/kg dry wt	0.011	0.24	0.40	0.47
Fluorene	mg/kg dry wt	< 0.011	0.075	0.089	0.126
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	0.046	0.074	0.115
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	0.08
Perylene	mg/kg dry wt	< 0.011	0.018	0.028	0.046
Phenanthrene	mg/kg dry wt	0.016	0.35	0.45	0.56
Pyrene	mg/kg dry wt	0.011	0.25	0.34	0.45

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

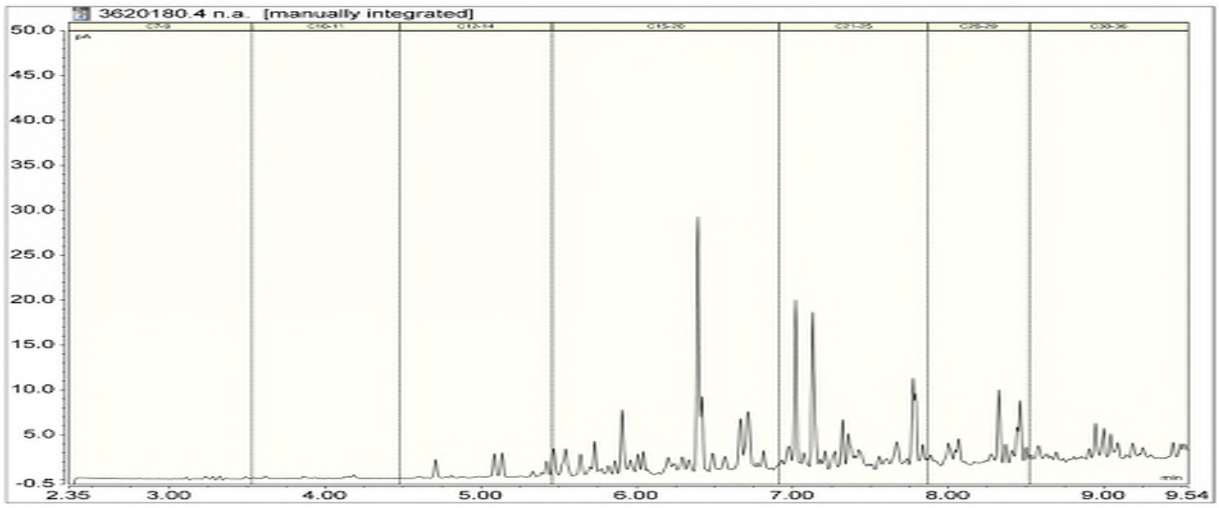
Sample Type: Soil					
Sample Name:		PP23_0.15 04-Jul-2024	PP23_0.45 04-Jul-2024	PP22_0.15 04-Jul-2024	PP22_0.3 04-Jul-2024
Lab Number:		3620180.2	3620180.5	3620180.8	3620180.10
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80

Sample Type: Roading Material					
Sample Name:		PP23_0.05 04-Jul-2024	PP23_0.35 04-Jul-2024	PP22_0.05 04-Jul-2024	PP22_0.25 04-Jul-2024
Lab Number:		3620180.1	3620180.4	3620180.7	3620180.9
Individual Tests					
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*					
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	3	4	3	3
Total Recoverable Copper	mg/kg as rcvd	9	5	9	6
Total Recoverable Lead	mg/kg as rcvd	66	69	63	58
Total Recoverable Nickel	mg/kg as rcvd	2	3	3	3
Total Recoverable Zinc	mg/kg as rcvd	29	21	24	19
Polycyclic Aromatic Hydrocarbons Screening in Rock*					
1-Methylnaphthalene*	mg/kg as rcvd	< 0.10	30	< 0.10	109
2-Methylnaphthalene*	mg/kg as rcvd	< 0.10	29	< 0.10	143
Acenaphthylene*	mg/kg as rcvd	< 0.10	23	0.15	18.8
Acenaphthene*	mg/kg as rcvd	< 0.10	19.9	< 0.10	98
Anthracene*	mg/kg as rcvd	< 0.10	84	< 0.10	240
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	92	< 0.10	240
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10	80	< 0.10	230
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24	118	< 0.24	330
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	116	< 0.3	320
Benzo[b]fluoranthene + Benzo[j]fluoranthene*	mg/kg as rcvd	< 0.10	73	0.10	210
Benzo[e]pyrene*	mg/kg as rcvd	0.17	35	0.23	98
Benzo[g,h,i]perylene*	mg/kg as rcvd	0.11	33	0.18	94
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	33	< 0.10	91
Chrysene*	mg/kg as rcvd	< 0.10	78	< 0.10	220
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	11.2	< 0.10	30
Fluoranthene*	mg/kg as rcvd	< 0.10	230	0.11	710
Fluorene*	mg/kg as rcvd	< 0.10	76	< 0.10	280
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	38	0.11	110
Naphthalene*	mg/kg as rcvd	< 0.5	24	< 0.5	220
Perylene*	mg/kg as rcvd	< 0.10	16.3	< 0.10	48
Phenanthrene*	mg/kg as rcvd	0.11	400	0.18	1,220
Pyrene*	mg/kg as rcvd	0.10	210	0.16	590
Total of Reported PAHs*	mg/kg as rcvd	< 3	1,620	< 3	5,000
Total Petroleum Hydrocarbons in Rock*					
C7 - C9*	mg/kg as rcvd	< 140	< 140	< 140	< 140
C10 - C14*	mg/kg as rcvd	< 120	260	< 120	820
C15 - C36*	mg/kg as rcvd	2,100	5,800	2,400	11,900
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	2,300	6,100	2,600	12,800

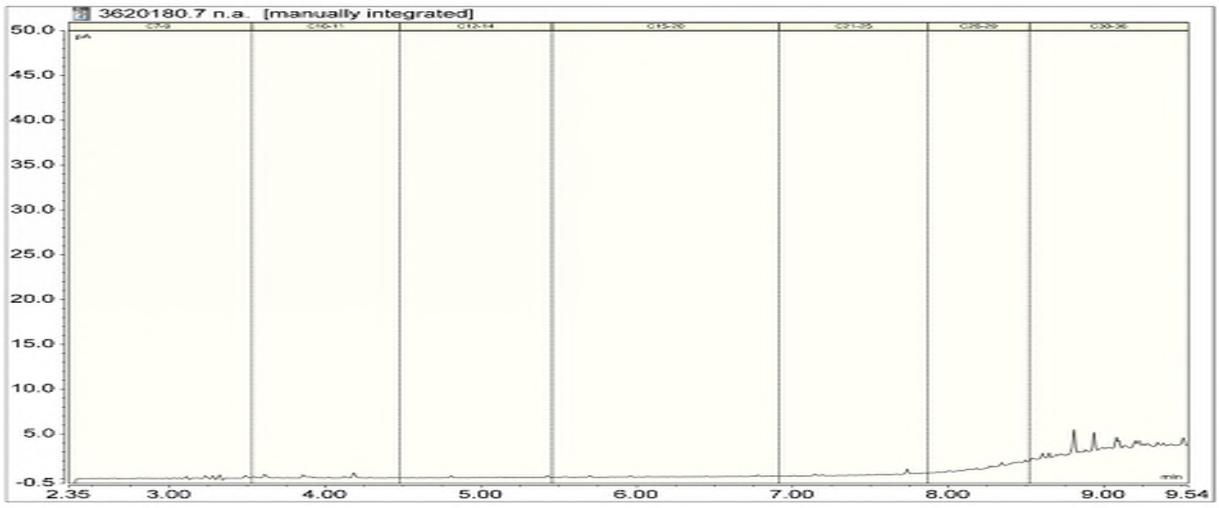
3620180.1
PP23_0.05 04-Jul-2024
Client Chromatogram for TPH by FID



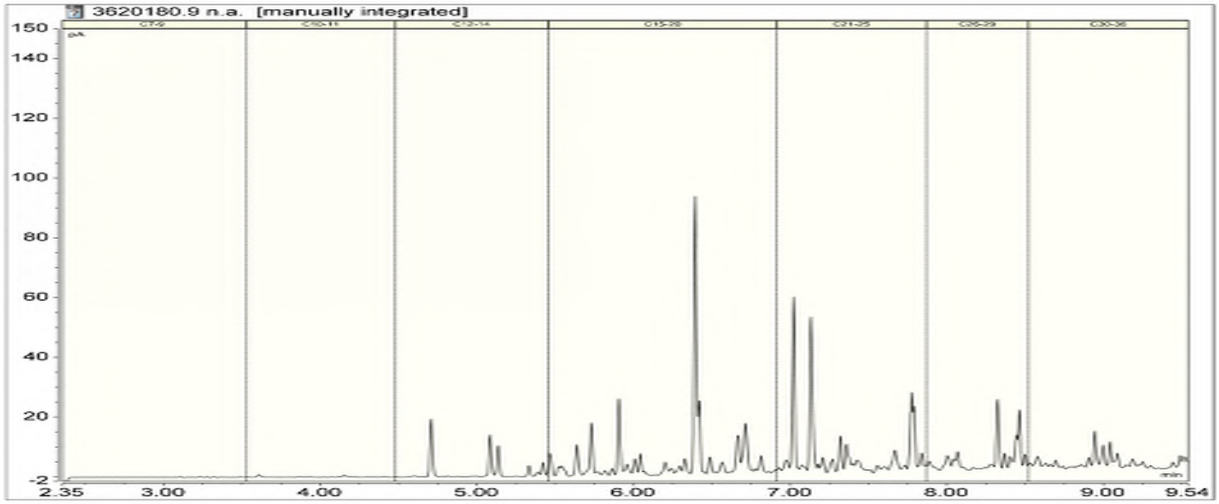
3620180.4
PP23_0.35 04-Jul-2024
Client Chromatogram for TPH by FID



3620180.7
PP22_0.05 04-Jul-2024
Client Chromatogram for TPH by FID



3620180.9
PP22_0.25 04-Jul-2024
Client Chromatogram for TPH by FID



Analyst's Comments

Amended Report: This certificate of analysis replaces report '3620180-SPv1' issued on 15-Jul-2024 at 3:18 pm.
Reason for amendment: Testing has been added to samples 5 and 10 as per clients request.

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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 8
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	2, 5, 8, 10
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	2, 5, 8, 10
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	2, 5, 8, 10
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	2, 5, 8, 10
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 5, 8, 10
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 5, 8, 10
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 5, 8, 10

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 5, 8, 10
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 5, 8, 10

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 4, 7, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 4, 7, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 4, 7, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 4, 7, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 4, 7, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 4, 7, 9
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 7, 9
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 7, 9
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 4, 7, 9
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 4, 7, 9

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

Testing was completed between 05-Jul-2024 and 18-Jul-2024. 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.

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Martin Cowell - BSc
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3615825	A2Pv1
Contact:	Stuart Caird	**Date Received:**	27-Jun-2024	
	C/- Beca Limited	**Date Reported:**	02-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP15_0.1 27-Jun-2024	TP15_0.5 27-Jun-2024	TP33_0.1 27-Jun-2024	TP33_0.5 27-Jun-2024	TP35_0.1 27-Jun-2024
Lab Number:		3615825.1	3615825.3	3615825.6	3615825.8	3615825.11
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	747.2	970.4	664.5	824.7	725.2
Dry Weight	g	635.6	928.5	579.9	735.8	593.8
Moisture*	%	15	4	13	11	18
Sample Fraction >10mm	g dry wt	81.2	198.1	19.3	< 0.1	< 0.1
Sample Fraction <10mm to >2mm	g dry wt	86.0	146.4	47.6	15.0	46.5
Sample Fraction <2mm	g dry wt	466.5	583.0	510.8	719.2	546.4
<2mm Subsample Weight	g dry wt	52.4	55.7	54.4	53.1	57.5
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		TP35_0.5 27-Jun-2024
Lab Number:		3615825.13
Asbestos Presence / Absence		Asbestos NOT detected.
Description of Asbestos Form		-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001
As Received Weight	g	866.0
Dry Weight	g	767.9
Moisture*	%	11
Sample Fraction >10mm	g dry wt	69.7

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

Sample Type: Soil		
Sample Name:		TP35_0.5 27-Jun-2024
Lab Number:		3615825.13
Sample Fraction <10mm to >2mm	g dry wt	126.2
Sample Fraction <2mm	g dry wt	570.8
<2mm Subsample Weight	g dry wt	51.2
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001

Glossary of Terms
• Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
• Trace - Trace levels of asbestos, as defined by AS4964-2004.
For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

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**
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8, 11, 13
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8, 11, 13
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 6, 8, 11, 13
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 6, 8, 11, 13
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 6, 8, 11, 13
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13

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

Testing was completed on 02-Jul-2024. 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.

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Team Leader - Asbestos

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3621255	SPv1
Contact:	Stuart Caird	**Date Received:**	05-Jul-2024	
	C/- Beca Limited	**Date Reported:**	15-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

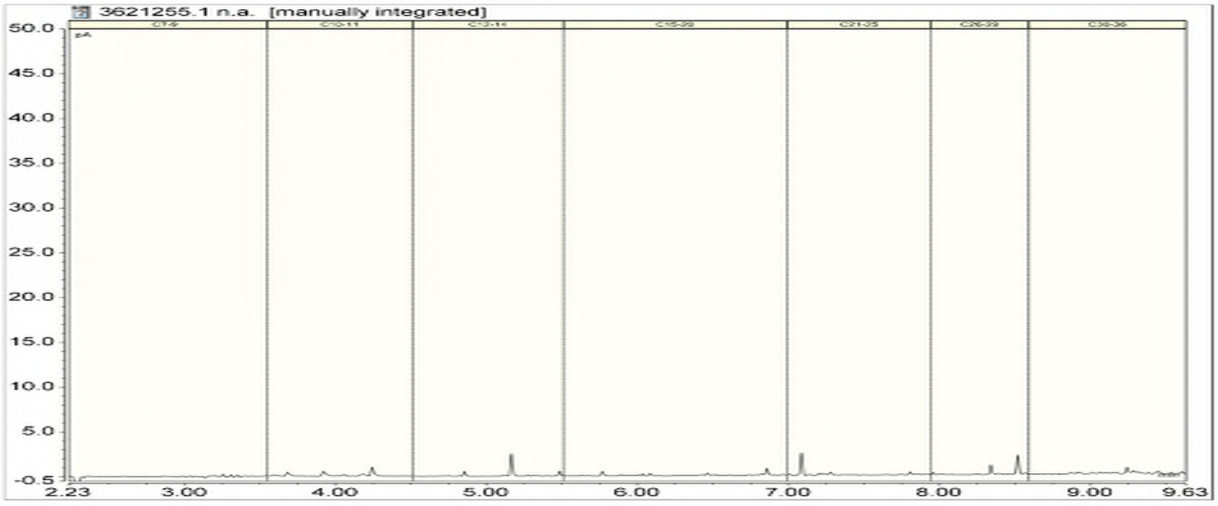
		Sample Name:	IP11_0.1 05-Jul-2024	IP11_0.5 05-Jul-2024	PP19_0.15 05-Jul-2024	DUP_F 05-Jul-2024
		Lab Number:	3621255.1	3621255.3	3621255.9	3621255.14
Individual Tests						
Dry Matter	g/100g as rcvd		65	96	97	97
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt		5	5	4	4
Total Recoverable Cadmium	mg/kg dry wt		0.28	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		17	18	13	13
Total Recoverable Copper	mg/kg dry wt		39	7	10	9
Total Recoverable Lead	mg/kg dry wt		250	18.3	13.7	14.0
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		10	14	12	12
Total Recoverable Zinc	mg/kg dry wt		175	45	41	44
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt		2.0	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt		0.027	< 0.011	< 0.010	< 0.011
2-Methylnaphthalene	mg/kg dry wt		0.020	< 0.016	< 0.015	< 0.016
Acenaphthylene	mg/kg dry wt		0.038	< 0.011	< 0.010	< 0.011
Acenaphthene	mg/kg dry wt		< 0.015	< 0.011	< 0.010	< 0.011
Anthracene	mg/kg dry wt		0.042	< 0.011	< 0.010	< 0.011
Benzo[a]anthracene	mg/kg dry wt		0.116	< 0.011	< 0.010	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt		0.123	< 0.011	< 0.010	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		0.184	< 0.025	< 0.025	< 0.025
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		0.180	< 0.025	< 0.025	< 0.025
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		0.139	< 0.011	< 0.010	< 0.011
Benzo[e]pyrene	mg/kg dry wt		0.070	< 0.011	< 0.010	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt		0.071	< 0.011	< 0.010	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt		0.057	< 0.011	< 0.010	< 0.011
Chrysene	mg/kg dry wt		0.116	< 0.011	< 0.010	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt		0.018	< 0.011	< 0.010	< 0.011
Fluoranthene	mg/kg dry wt		0.35	< 0.011	< 0.010	< 0.011
Fluorene	mg/kg dry wt		0.033	< 0.011	< 0.010	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		0.068	< 0.011	< 0.010	< 0.011
Naphthalene	mg/kg dry wt		< 0.08	< 0.06	< 0.05	< 0.06
Perylene	mg/kg dry wt		0.021	< 0.011	< 0.010	< 0.011
Phenanthrene	mg/kg dry wt		0.32	< 0.011	< 0.010	< 0.011
Pyrene	mg/kg dry wt		0.31	< 0.011	< 0.010	< 0.011

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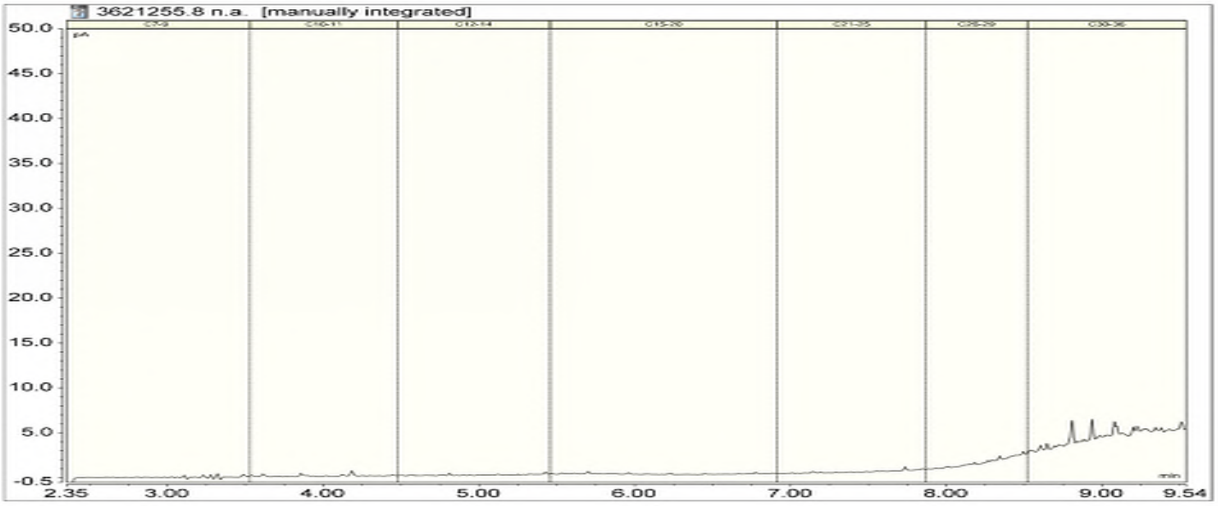
Sample Type: Soil					
Sample Name:		IP11_0.1 05-Jul-2024	IP11_0.5 05-Jul-2024	PP19_0.15 05-Jul-2024	DUP_F 05-Jul-2024
Lab Number:		3621255.1	3621255.3	3621255.9	3621255.14
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 30	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	75	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	105	< 80	< 80	< 80

Sample Type: Roading Material			
Sample Name:		PP19_0.05 05-Jul-2024	PP19_0.25 05-Jul-2024
Lab Number:		3621255.8	3621255.10
Individual Tests			
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*			
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	3	6
Total Recoverable Copper	mg/kg as rcvd	8	8
Total Recoverable Lead	mg/kg as rcvd	11.6 #1	108
Total Recoverable Nickel	mg/kg as rcvd	3	5
Total Recoverable Zinc	mg/kg as rcvd	25	26
Polycyclic Aromatic Hydrocarbons Screening in Rock*			
1-Methylnaphthalene*	mg/kg as rcvd	0.11	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	< 0.10	< 0.10
Acenaphthylene*	mg/kg as rcvd	< 0.10	0.11
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	0.11	< 0.10
Benzo[e]pyrene*	mg/kg as rcvd	0.19	0.10
Benzo[g,h,i]perylene*	mg/kg as rcvd	0.16	0.14
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10	< 0.10
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	0.11	0.10
Pyrene*	mg/kg as rcvd	0.38	0.11
Total of Reported PAHs*	mg/kg as rcvd	< 3	< 3
Total Petroleum Hydrocarbons in Rock*			
C7 - C9*	mg/kg as rcvd	< 140	< 140
C10 - C14*	mg/kg as rcvd	230	< 120
C15 - C36*	mg/kg as rcvd	3,500	1,420
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	3,800	1,600

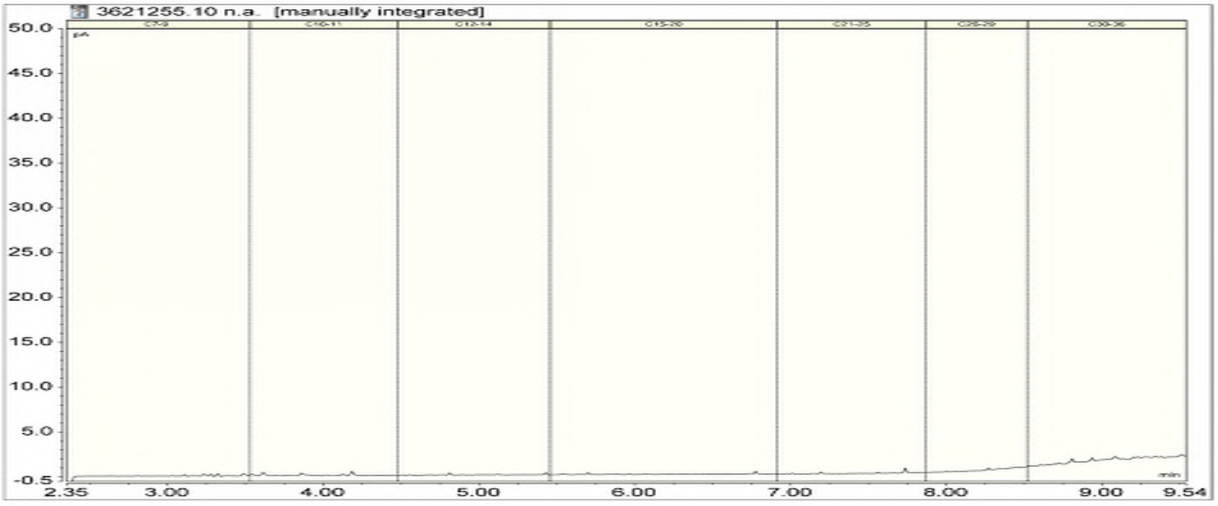
3621255.1
IP11_0.1 05-Jul-2024
Client Chromatogram for TPH by FID



3621255.8
PP19_0.05 05-Jul-2024
Client Chromatogram for TPH by FID



3621255.10
PP19_0.25 05-Jul-2024
Client Chromatogram for TPH by FID



Analyst's Comments

#1 It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample. Replicate 1 = 11.6mg/kg, replicate 2 = 67mg/kg.

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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 9, 14
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	1, 3, 9, 14
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	1, 3, 9, 14
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	1, 3, 9, 14
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	1, 3, 9, 14
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 9, 14
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 9, 14
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 8, 10
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 9, 14
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 9, 14
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 9, 14
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 9, 14

Sample Type: Roading Material

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	8, 10
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	8, 10
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	8, 10
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	8, 10
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	8, 10

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	8, 10
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	8, 10
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	8, 10
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	8, 10
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	8, 10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	8, 10
Total Petroleum Hydrocarbons in Rock			
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	8, 10
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	8, 10
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	8, 10
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	8, 10

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

Testing was completed between 06-Jul-2024 and 15-Jul-2024. 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.

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Kim Harrison MSc
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3625445	A2Pv1
Contact:	Stuart Caird	**Date Received:**	11-Jul-2024	
	C/- Beca Limited	**Date Reported:**	17-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	Rolleston 338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP25_0.1 11-Jul-2024	TP25_0.5 11-Jul-2024	TP29_0.1 11-Jul-2024	TP29_0.5 11-Jul-2024
Lab Number:		3625445.1	3625445.3	3625445.6	3625445.8
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	722.1	915.0	692.4	915.5
Dry Weight	g	594.5	846.1	567.2	833.0
Moisture*	%	18	8	18	9
Sample Fraction >10mm	g dry wt	41.0	122.7	3.5	174.6
Sample Fraction <10mm to >2mm	g dry wt	55.4	268.2	38.2	219.8
Sample Fraction <2mm	g dry wt	496.2	453.7	524.0	437.1
<2mm Subsample Weight	g dry wt	56.6	54.7	51.6	50.9
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Glossary of Terms

- Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
- Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
- ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
- ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
- Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
- Trace - Trace levels of asbestos, as defined by AS4964-2004.

For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil. https://www.branz.co.nz/asbestos

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

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

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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 6, 8
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 6, 8
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 6, 8
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8

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

Testing was completed between 15-Jul-2024 and 17-Jul-2024. 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.

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Team Leader - Asbestos

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3626395 SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	12-Jul-2024 23-Jul-2024 129425 3338703/800 Rolleston 338703 Stuart Caird

Sample Type: Soil

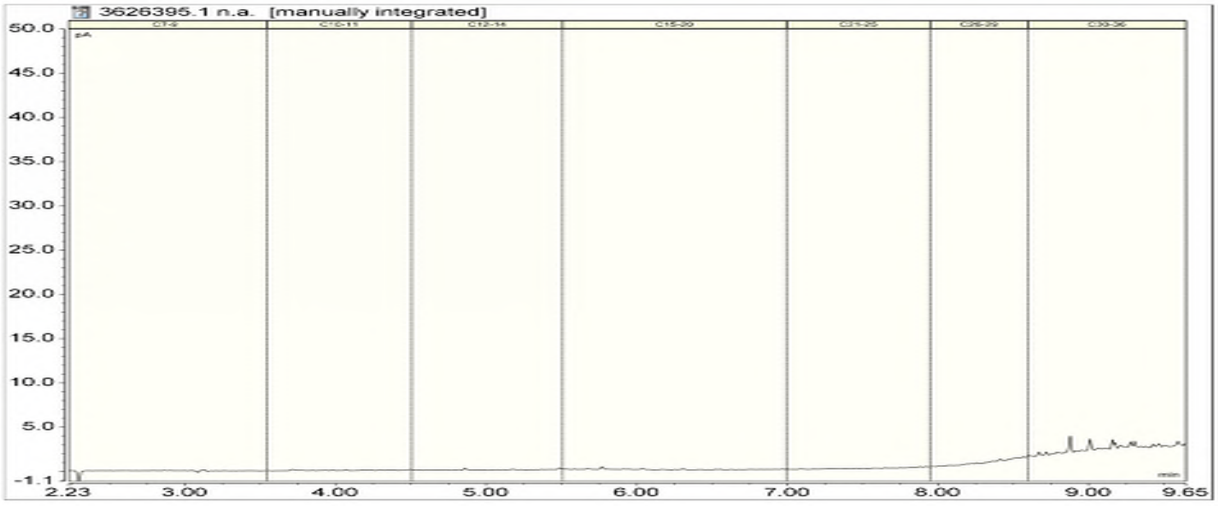
		Sample Name:	PP18_0.15 12-Jul-2024	PP04_0.1 12-Jul-2024
		Lab Number:	3626395.2	3626395.8
Individual Tests				
Dry Matter	g/100g as rcvd		97	97
Heavy Metals with Mercury, Screen Level				
Total Recoverable Arsenic	mg/kg dry wt		4	4
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		12	12
Total Recoverable Copper	mg/kg dry wt		7	9
Total Recoverable Lead	mg/kg dry wt		12.8	26
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		10	11
Total Recoverable Zinc	mg/kg dry wt		41	45
Polycyclic Aromatic Hydrocarbons Screening in Soil*				
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt		< 0.010	< 0.010
2-Methylnaphthalene	mg/kg dry wt		< 0.010	< 0.018
Acenaphthylene	mg/kg dry wt		< 0.010	< 0.010
Acenaphthene	mg/kg dry wt		< 0.010	< 0.010
Anthracene	mg/kg dry wt		< 0.010	< 0.010
Benzo[a]anthracene	mg/kg dry wt		< 0.010	< 0.010
Benzo[a]pyrene (BAP)	mg/kg dry wt		< 0.010	< 0.010
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.025	< 0.025
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.025	< 0.025
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		< 0.010	< 0.010
Benzo[e]pyrene	mg/kg dry wt		< 0.010	< 0.010
Benzo[g,h,i]perylene	mg/kg dry wt		< 0.010	< 0.010
Benzo[k]fluoranthene	mg/kg dry wt		< 0.010	< 0.010
Chrysene	mg/kg dry wt		< 0.010	< 0.010
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.010	< 0.010
Fluoranthene	mg/kg dry wt		< 0.010	< 0.010
Fluorene	mg/kg dry wt		< 0.010	< 0.010
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		< 0.010	< 0.010
Naphthalene	mg/kg dry wt		< 0.05	< 0.05
Perylene	mg/kg dry wt		< 0.010	< 0.010
Phenanthrene	mg/kg dry wt		< 0.010	< 0.010
Pyrene	mg/kg dry wt		< 0.010	< 0.010

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The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

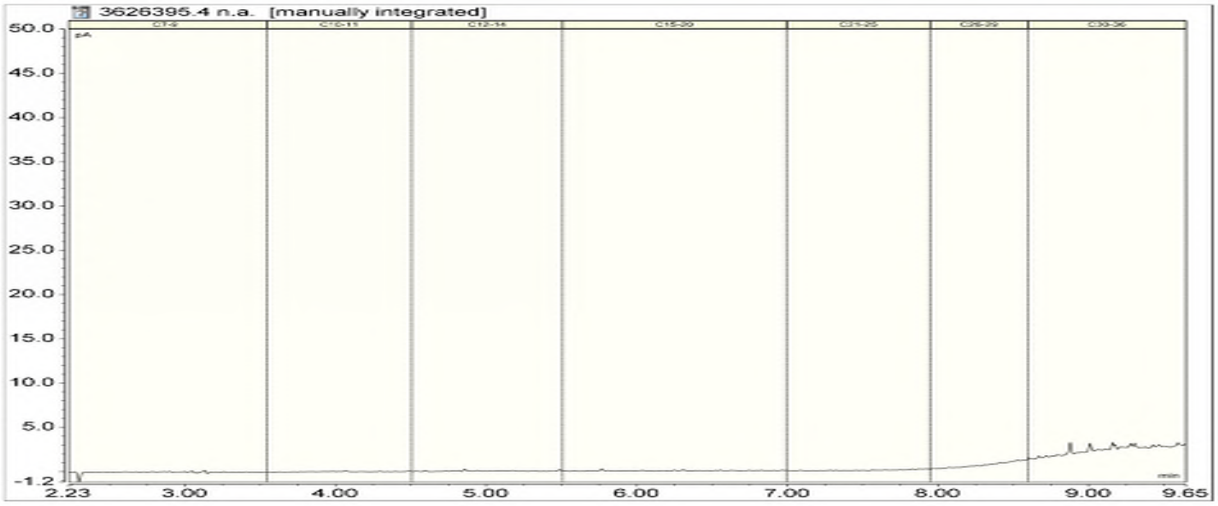
Sample Type: Soil			
Sample Name:		PP18_0.15 12-Jul-2024	PP04_0.1 12-Jul-2024
Lab Number:		3626395.2	3626395.8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	mg/kg dry wt	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80

Sample Type: Roading Material					
Sample Name:		PP18_0.05 12-Jul-2024	PP18_0.35 12-Jul-2024	PP04_0.05 12-Jul-2024	PP04_0.15 12-Jul-2024
Lab Number:		3626395.1	3626395.4	3626395.7	3626395.9
Individual Tests					
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*					
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	4	6	3	4
Total Recoverable Copper	mg/kg as rcvd	19	4	7	4
Total Recoverable Lead	mg/kg as rcvd	15.2	46	8.0	70
Total Recoverable Nickel	mg/kg as rcvd	9	4	4	3
Total Recoverable Zinc	mg/kg as rcvd	35	18	29	17
Polycyclic Aromatic Hydrocarbons Screening in Rock*					
1-Methylnaphthalene*	mg/kg as rcvd	0.15	< 0.10	0.18	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	0.12	< 0.10	0.13	< 0.10
Acenaphthylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24	< 0.24	< 0.24	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	< 0.3	< 0.3	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[e]pyrene*	mg/kg as rcvd	0.12	< 0.10	0.15	< 0.10
Benzo[g,h,i]perylene*	mg/kg as rcvd	0.10	< 0.10	0.12	< 0.10
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	< 0.10	0.11	< 0.10	< 0.10
Pyrene*	mg/kg as rcvd	0.17	< 0.10	0.25	< 0.10
Total of Reported PAHs*	mg/kg as rcvd	< 3	< 3	< 3	< 3
Total Petroleum Hydrocarbons in Rock*					
C7 - C9*	mg/kg as rcvd	< 140	< 140	< 140	< 140
C10 - C14*	mg/kg as rcvd	< 120	< 120	< 120	< 120
C15 - C36*	mg/kg as rcvd	1,780	1,670	2,800	840
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	1,830	1,730	2,800	850

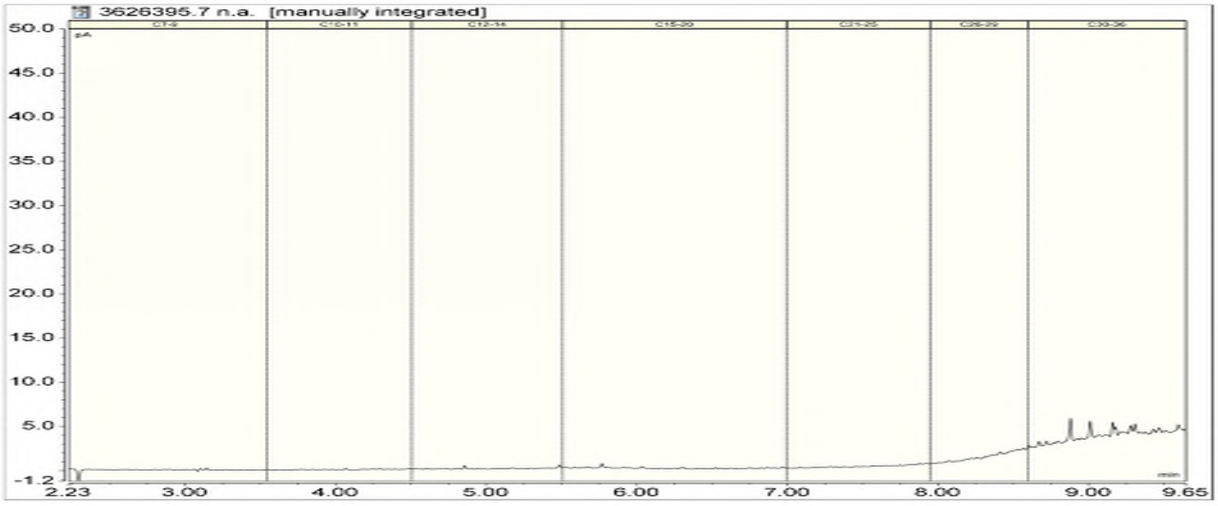
3626395.1
PP18_0.05 12-Jul-2024
Client Chromatogram for TPH by FID



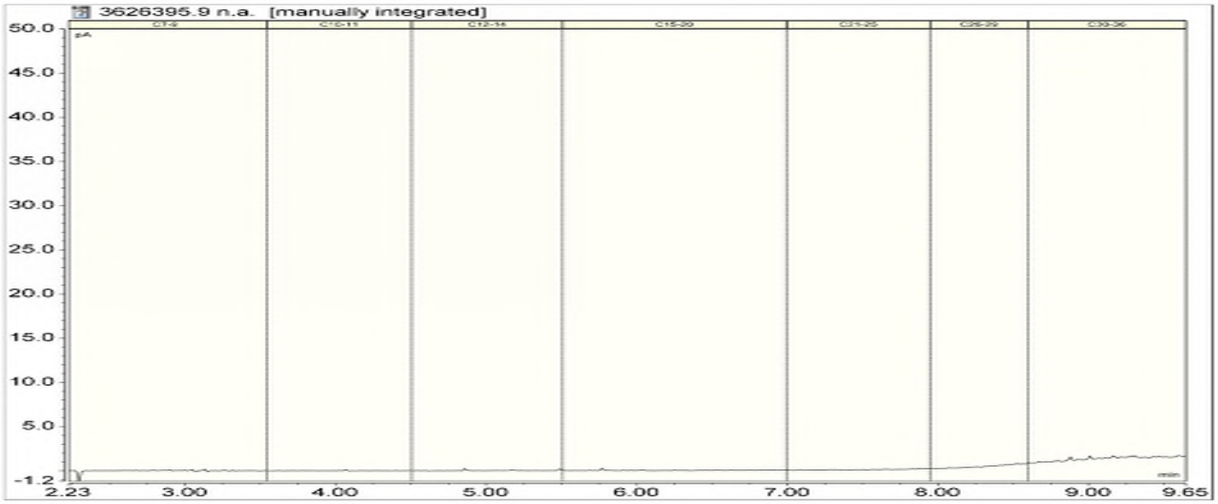
3626395.4
PP18_0.35 12-Jul-2024
Client Chromatogram for TPH by FID



3626395.7
PP04_0.05 12-Jul-2024
Client Chromatogram for TPH by FID



3626395.9
PP04_0.15 12-Jul-2024
Client Chromatogram for TPH by FID



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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 8
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	2, 8
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	2, 8
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	2, 8
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	2, 8
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 8
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 8
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 8
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 8
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 8
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 8

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 4, 7, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 4, 7, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 4, 7, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 4, 7, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 4, 7, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 4, 7, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 4, 7, 9
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 7, 9
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 4, 7, 9
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 4, 7, 9
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 4, 7, 9

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

Testing was completed between 13-Jul-2024 and 23-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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



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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3622315	SPv1
Contact:	Stuart Caird	**Date Received:**	08-Jul-2024	
	C/- Beca Limited	**Date Reported:**	18-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

		Sample Name:	PP05_0.15 08-Jul-2024	PP21_0.15 08-Jul-2024	UT12A_0.1 08-Jul-2024	UT12A_0.5 08-Jul-2024
		Lab Number:	3622315.2	3622315.7	3622315.10	3622315.11
Individual Tests						
Dry Matter	g/100g as rcvd		96	97	95	83
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt		4	3	4	4
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		12	11	13	15
Total Recoverable Copper	mg/kg dry wt		8	7	9	4
Total Recoverable Lead	mg/kg dry wt		22	12.9	28	15.0
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		10	10	10	10
Total Recoverable Zinc	mg/kg dry wt		40	38	52	56
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt		-	-	< 0.05	< 0.05
Toluene	mg/kg dry wt		-	-	< 0.05	< 0.05
Ethylbenzene	mg/kg dry wt		-	-	< 0.05	< 0.05
m&p-Xylene	mg/kg dry wt		-	-	< 0.10	< 0.10
o-Xylene	mg/kg dry wt		-	-	< 0.05	< 0.05
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.3	< 0.3	-	-
1-Methylnaphthalene	mg/kg dry wt		< 0.011	< 0.011	-	-
2-Methylnaphthalene	mg/kg dry wt		< 0.016	< 0.016	-	-
Acenaphthylene	mg/kg dry wt		< 0.011	< 0.011	-	-
Acenaphthene	mg/kg dry wt		< 0.011	< 0.011	-	-
Anthracene	mg/kg dry wt		< 0.011	< 0.011	-	-
Benzo[a]anthracene	mg/kg dry wt		0.013	< 0.011	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt		0.016	< 0.011	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.025	< 0.025	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.025	< 0.025	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		0.016	< 0.011	-	-
Benzo[e]pyrene	mg/kg dry wt		0.011	< 0.011	-	-
Benzo[g,h,i]perylene	mg/kg dry wt		0.014	< 0.011	-	-
Benzo[k]fluoranthene	mg/kg dry wt		< 0.011	< 0.011	-	-
Chrysene	mg/kg dry wt		0.012	< 0.011	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.011	< 0.011	-	-
Fluoranthene	mg/kg dry wt		0.024	< 0.011	-	-
Fluorene	mg/kg dry wt		< 0.011	< 0.011	-	-

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

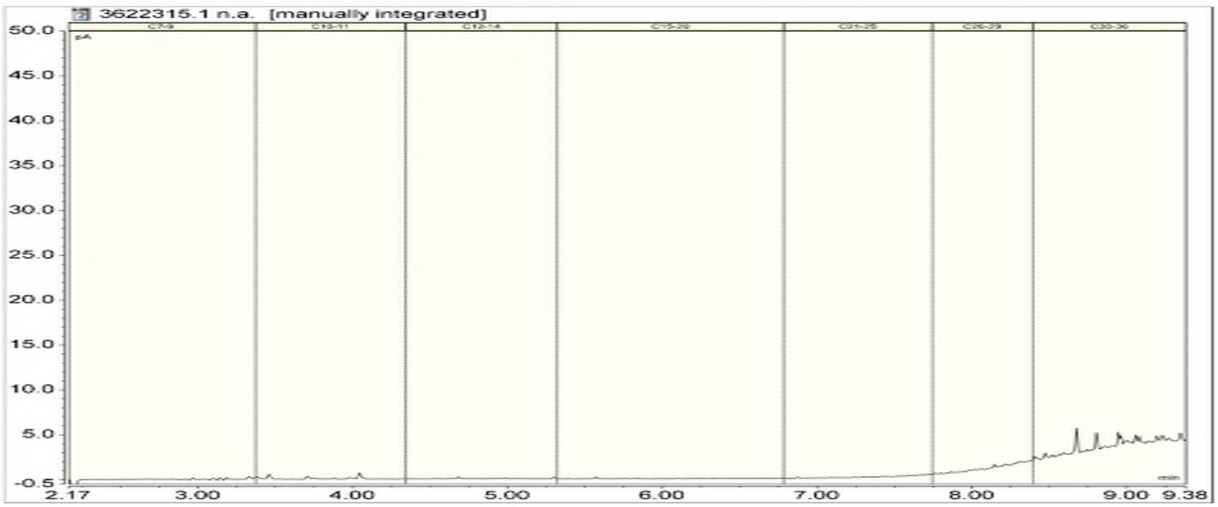
Sample Type: Soil					
Sample Name:		PP05_0.15 08-Jul-2024	PP21_0.15 08-Jul-2024	UT12A_0.1 08-Jul-2024	UT12A_0.5 08-Jul-2024
Lab Number:		3622315.2	3622315.7	3622315.10	3622315.11
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.012	< 0.011	-	-
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	-	-
Perylene	mg/kg dry wt	< 0.011	< 0.011	-	-
Phenanthrene	mg/kg dry wt	0.011	< 0.011	-	-
Pyrene	mg/kg dry wt	0.027	0.010	-	-
Haloethers Trace in SVOC Soil Samples by GC-MS					
Bis(2-chloroethoxy) methane	mg/kg dry wt	-	-	< 0.10	< 0.10
Bis(2-chloroethyl)ether	mg/kg dry wt	-	-	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	-	-	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	-	-	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	-	-	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS					
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	-	-	< 0.12	< 0.13
2,4-Dinitrotoluene	mg/kg dry wt	-	-	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt	-	-	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	-	-	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	-	-	< 0.12	< 0.13
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS					
Aldrin	mg/kg dry wt	-	-	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	-	-	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	-	-	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	-	-	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	-	-	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	-	-	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	-	-	< 0.2	< 0.2
Dieldrin	mg/kg dry wt	-	-	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	-	-	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	-	-	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	-	-	< 0.2	< 0.2
Endrin	mg/kg dry wt	-	-	< 0.12	< 0.13
Endrin ketone	mg/kg dry wt	-	-	< 0.2	< 0.2
Heptachlor	mg/kg dry wt	-	-	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*					
Acenaphthene	mg/kg dry wt	-	-	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	-	-	< 0.10	< 0.10
Anthracene	mg/kg dry wt	-	-	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	-	-	< 0.10	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	< 0.10	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	< 0.10	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	< 0.10	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	-	-	< 0.10	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	-	-	< 0.10	< 0.10
Chrysene	mg/kg dry wt	-	-	< 0.10	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	-	-	< 0.10	< 0.10
Fluorene	mg/kg dry wt	-	-	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	< 0.10	< 0.10
2-Methylnaphthalene	mg/kg dry wt	-	-	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	-	-	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	-	-	< 0.10	< 0.10

Sample Type: Soil					
Sample Name:		PP05_0.15 08-Jul-2024	PP21_0.15 08-Jul-2024	UT12A_0.1 08-Jul-2024	UT12A_0.5 08-Jul-2024
Lab Number:		3622315.2	3622315.7	3622315.10	3622315.11
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*					
Pyrene	mg/kg dry wt	-	-	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	< 0.25	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	< 0.25	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS					
4-Chloro-3-methylphenol	mg/kg dry wt	-	-	< 0.5	< 0.5
2-Chlorophenol	mg/kg dry wt	-	-	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	-	-	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	-	-	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	-	-	< 0.4	< 0.4
2-Methylphenol (o-cresol)	mg/kg dry wt	-	-	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	-	-	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	-	-	< 6	< 6
Phenol	mg/kg dry wt	-	-	< 0.2	< 0.2
2,4,5-Trichlorophenol	mg/kg dry wt	-	-	< 0.2	< 0.2
2,4,6-Trichlorophenol	mg/kg dry wt	-	-	< 0.2	< 0.2
Plasticisers Trace in SVOC Soil Samples by GC-MS					
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	-	-	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	-	-	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	-	-	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	-	-	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	-	-	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	-	-	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	-	-	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	-	-	< 0.12	< 0.13
1,3-Dichlorobenzene	mg/kg dry wt	-	-	< 0.12	< 0.13
1,4-Dichlorobenzene	mg/kg dry wt	-	-	< 0.12	< 0.13
Hexachlorobutadiene	mg/kg dry wt	-	-	< 0.12	< 0.13
Hexachloroethane	mg/kg dry wt	-	-	< 0.12	< 0.13
1,2,4-Trichlorobenzene	mg/kg dry wt	-	-	< 0.10	< 0.10
Other SVOC Trace in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	-	-	< 1.0	< 1.0
Carbazole	mg/kg dry wt	-	-	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	-	-	< 0.10	< 0.10
Isophorone	mg/kg dry wt	-	-	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	96	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	109	< 80	< 80

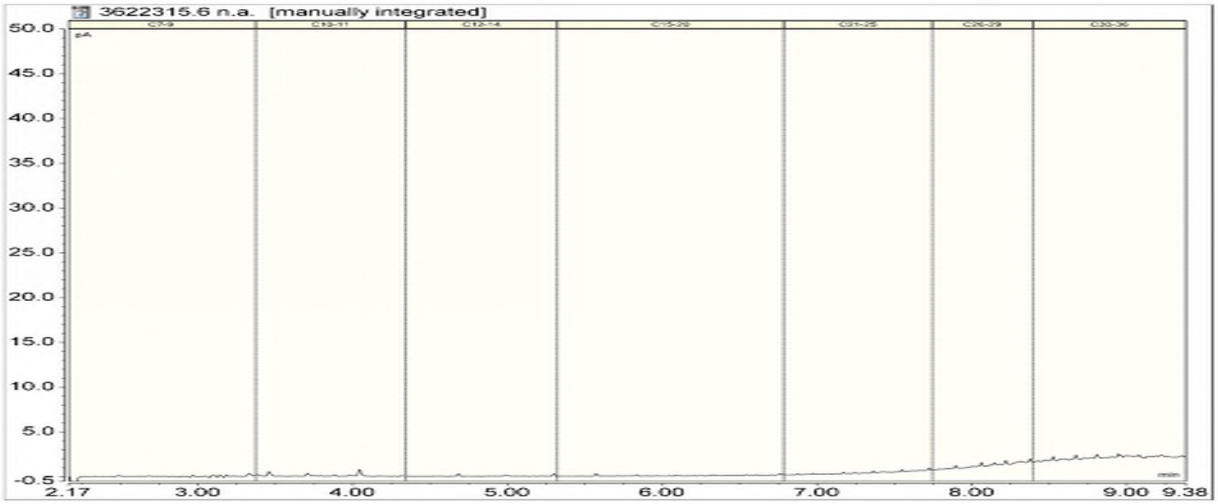
Sample Type: Roading Material			
Sample Name:		PP05_0.05 08-Jul-2024	PP21_0.05 08-Jul-2024
Lab Number:		3622315.1	3622315.6
Individual Tests			
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*			
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	4	2
Total Recoverable Copper	mg/kg as rcvd	6	3
Total Recoverable Lead	mg/kg as rcvd	8.3	2.7

Sample Type: Roading Material			
Sample Name:		PP05_0.05 08-Jul-2024	PP21_0.05 08-Jul-2024
Lab Number:		3622315.1	3622315.6
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*			
Total Recoverable Nickel	mg/kg as rcvd	3	3
Total Recoverable Zinc	mg/kg as rcvd	30	11
Polycyclic Aromatic Hydrocarbons Screening in Rock*			
1-Methylnaphthalene*	mg/kg as rcvd	< 0.10	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	< 0.15	< 0.15
Acenaphthylene*	mg/kg as rcvd	< 0.10	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10	0.14
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.25	0.36
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	0.4
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	< 0.10	0.17
Benzo[e]pyrene*	mg/kg as rcvd	0.15	< 0.10
Benzo[g,h,i]perylene*	mg/kg as rcvd	0.11	0.18
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	0.12
Chrysene*	mg/kg as rcvd	< 0.10	0.17
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	0.17
Fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	0.15
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	< 0.10	0.17
Pyrene*	mg/kg as rcvd	< 0.10	0.11
Total of Reported PAHs*	mg/kg as rcvd	< 3	< 3
Total Petroleum Hydrocarbons in Rock*			
C7 - C9*	mg/kg as rcvd	< 140	< 140
C10 - C14*	mg/kg as rcvd	< 120	< 120
C15 - C36*	mg/kg as rcvd	2,200	1,490
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	2,400	1,660

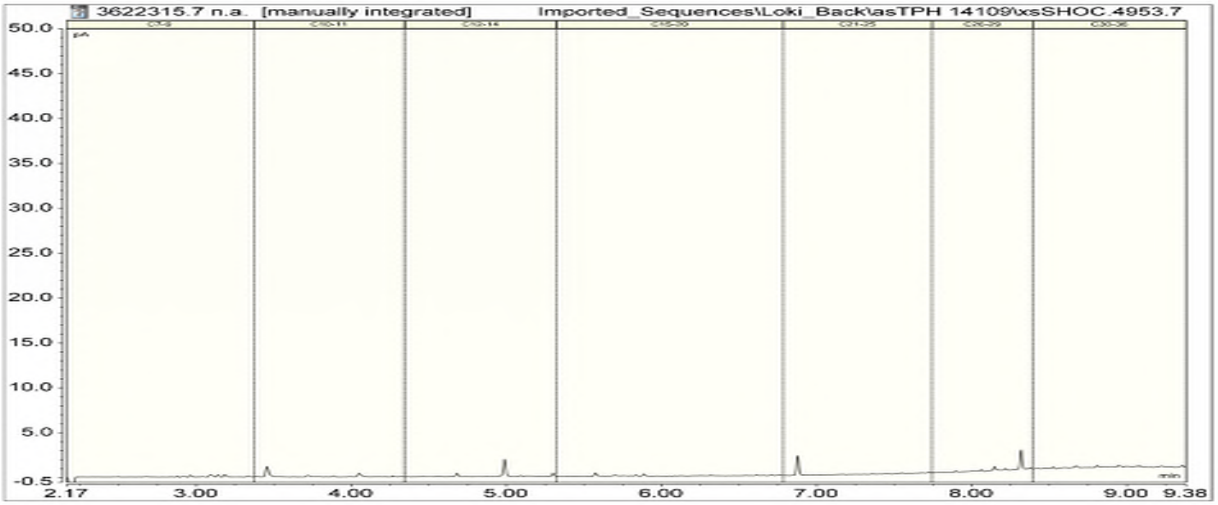
3622315.1
PP05_0.05 08-Jul-2024
Client Chromatogram for TPH by FID



3622315.6
PP21_0.05 08-Jul-2024
Client Chromatogram for TPH by FID



3622315.7
PP21_0.15 08-Jul-2024
Client Chromatogram for TPH by FID



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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 7, 10-11
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	2, 7
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	2, 7, 10-11

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	2, 7
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	2, 7
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 7
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 7, 10-11
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	10-11
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	10-11
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7, 10-11
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7, 10-11
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 7, 10-11
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 7, 10-11

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 6
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 6-7
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6

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

Testing was completed between 09-Jul-2024 and 18-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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



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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3629427	SPv1
Contact:	Stuart Caird	**Date Received:**	17-Jul-2024	
	C/- Beca Limited	**Date Reported:**	22-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP24_0.1 17-Jul-2024	TP24_0.5 17-Jul-2024	TP26_0.1 17-Jul-2024	TP26_0.5 17-Jul-2024	DUP_I 17-Jul-2024
Lab Number:		3629427.1	3629427.3	3629427.6	3629427.8	3629427.11
Individual Tests						
Dry Matter	g/100g as rcvd	75	81	71	86	85
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	12	5	8	4	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.21	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	12	19	14	16	15
Total Recoverable Copper	mg/kg dry wt	8	5	17	4	4
Total Recoverable Lead	mg/kg dry wt	30	21	166	17.0	15.3
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	7	15	9	10	11
Total Recoverable Zinc	mg/kg dry wt	65	60	181	57	52
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	0.4	< 0.3	0.6	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	0.044	< 0.013	0.073	< 0.012	< 0.012
2-Methylnaphthalene	mg/kg dry wt	0.042	< 0.013	0.064	< 0.012	< 0.012
Acenaphthylene	mg/kg dry wt	< 0.014	< 0.013	< 0.014	< 0.012	< 0.012
Acenaphthene	mg/kg dry wt	< 0.014	< 0.013	< 0.014	< 0.012	< 0.012
Anthracene	mg/kg dry wt	< 0.014	< 0.013	< 0.014	< 0.012	< 0.012
Benzo[a]anthracene	mg/kg dry wt	0.018	< 0.013	0.026	< 0.012	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.019	< 0.013	0.029	< 0.012	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.032	< 0.030	0.043	< 0.028	< 0.028
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.032	< 0.030	0.042	< 0.027	< 0.028
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.026	< 0.013	0.039	< 0.012	< 0.012
Benzo[e]pyrene	mg/kg dry wt	< 0.014	< 0.013	0.020	< 0.012	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.014	< 0.013	0.020	< 0.012	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt	< 0.014	< 0.013	< 0.014	< 0.012	< 0.012
Chrysene	mg/kg dry wt	0.018	< 0.013	0.027	< 0.012	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.014	< 0.013	< 0.014	< 0.012	< 0.012
Fluoranthene	mg/kg dry wt	0.040	< 0.013	0.057	< 0.012	< 0.012
Fluorene	mg/kg dry wt	< 0.014	< 0.013	< 0.014	< 0.012	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.014	< 0.013	0.021	< 0.012	< 0.012
Naphthalene	mg/kg dry wt	< 0.07	< 0.07	< 0.07	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.014	< 0.013	0.016	< 0.012	< 0.012
Phenanthrene	mg/kg dry wt	0.047	< 0.013	0.080	< 0.012	< 0.012
Pyrene	mg/kg dry wt	0.043	< 0.013	0.062	< 0.012	< 0.012

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

Sample Type: Soil						
Sample Name:		TP24_0.1 17-Jul-2024	TP24_0.5 17-Jul-2024	TP26_0.1 17-Jul-2024	TP26_0.5 17-Jul-2024	DUP_I 17-Jul-2024
Lab Number:		3629427.1	3629427.3	3629427.6	3629427.8	3629427.11
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	102	< 40	109	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	110	< 80	111	< 80	< 80

Sample Name:		TP28_0.1 17-Jul-2024	TP28_0.5 17-Jul-2024	TP32_0.1 17-Jul-2024	TP32_0.5 17-Jul-2024	TP31_0.1 17-Jul-2024
Lab Number:		3629427.12	3629427.14	3629427.17	3629427.19	3629427.22
Individual Tests						
Dry Matter	g/100g as rcvd	72	92	84	90	89
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	10	5	3	3	4
Total Recoverable Cadmium	mg/kg dry wt	0.81	< 0.10	< 0.10	< 0.10	0.10
Total Recoverable Chromium	mg/kg dry wt	21	15	12	13	13
Total Recoverable Copper	mg/kg dry wt	47	6	8	4	8
Total Recoverable Lead	mg/kg dry wt	790	28	17.6	17.9	41
Total Recoverable Mercury	mg/kg dry wt	0.12	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	12	10	8	8	9
Total Recoverable Zinc	mg/kg dry wt	490	57	86	49	65
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	1.7	< 0.3	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	0.094	< 0.011	0.032	< 0.011	< 0.012
2-Methylnaphthalene	mg/kg dry wt	0.082	< 0.011	0.031	< 0.011	< 0.012
Acenaphthylene	mg/kg dry wt	< 0.014	< 0.011	< 0.012	< 0.011	< 0.012
Acenaphthene	mg/kg dry wt	< 0.014	< 0.011	< 0.012	< 0.011	< 0.012
Anthracene	mg/kg dry wt	0.036	< 0.011	< 0.012	< 0.011	< 0.012
Benzo[a]anthracene	mg/kg dry wt	0.098	< 0.011	< 0.012	< 0.011	0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.121	< 0.011	< 0.012	< 0.011	0.014
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.174	< 0.026	< 0.028	< 0.027	< 0.027
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.172	< 0.026	< 0.028	< 0.027	< 0.027
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.145	< 0.011	0.013	0.013	0.015
Benzo[e]pyrene	mg/kg dry wt	0.075	< 0.011	< 0.012	< 0.011	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt	0.081	< 0.011	< 0.012	< 0.011	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt	0.052	< 0.011	< 0.012	< 0.011	< 0.012
Chrysene	mg/kg dry wt	0.098	< 0.011	< 0.012	< 0.011	0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.014	< 0.011	< 0.012	< 0.011	< 0.012
Fluoranthene	mg/kg dry wt	0.24	< 0.011	0.025	0.018	0.025
Fluorene	mg/kg dry wt	< 0.014	< 0.011	< 0.012	< 0.011	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.078	< 0.011	< 0.012	< 0.011	< 0.012
Naphthalene	mg/kg dry wt	< 0.07	< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	0.035	< 0.011	< 0.012	< 0.011	< 0.012
Phenanthrene	mg/kg dry wt	0.169	< 0.011	0.031	0.012	0.017
Pyrene	mg/kg dry wt	0.22	< 0.011	0.025	0.018	0.024
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	120	< 40	58	89	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	131	< 80	< 80	93	< 80

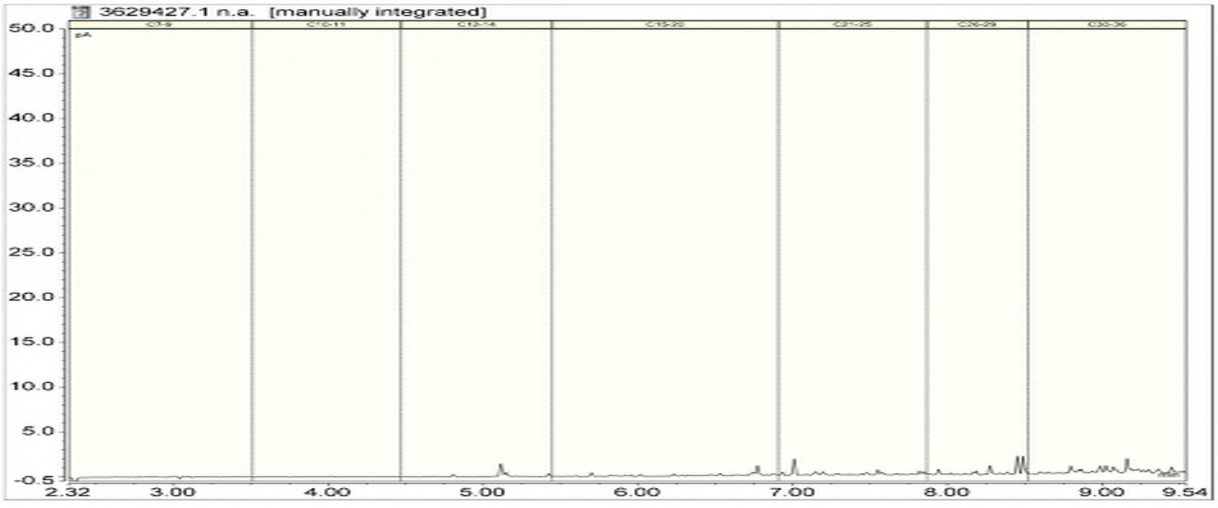
Sample Name:		TP31_0.5 17-Jul-2024	TP30_0.1 17-Jul-2024	TP30_0.5 17-Jul-2024	TP27_0.1 17-Jul-2024	TP27_0.5 17-Jul-2024
Lab Number:		3629427.24	3629427.28	3629427.30	3629427.33	3629427.35

Sample Type: Soil						
Sample Name:		TP31_0.5 17-Jul-2024	TP30_0.1 17-Jul-2024	TP30_0.5 17-Jul-2024	TP27_0.1 17-Jul-2024	TP27_0.5 17-Jul-2024
Lab Number:		3629427.24	3629427.28	3629427.30	3629427.33	3629427.35
Individual Tests						
Dry Matter	g/100g as rcvd	93	79	95	85	83
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	4	4	5	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.12	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	13	13	12	14	15
Total Recoverable Copper	mg/kg dry wt	6	8	6	7	4
Total Recoverable Lead	mg/kg dry wt	26	21	17.4	28	37
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	9	9	10	9	10
Total Recoverable Zinc	mg/kg dry wt	64	70	44	65	54
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.011	0.034	< 0.011	0.024	< 0.012
2-Methylnaphthalene	mg/kg dry wt	< 0.011	0.032	< 0.011	0.024	< 0.012
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.013	< 0.011	< 0.012	< 0.012
Acenaphthene	mg/kg dry wt	< 0.011	< 0.013	< 0.011	< 0.012	< 0.012
Anthracene	mg/kg dry wt	< 0.011	< 0.013	< 0.011	< 0.012	< 0.012
Benzo[a]anthracene	mg/kg dry wt	< 0.011	0.013	< 0.011	< 0.012	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.011	< 0.013	< 0.011	< 0.012	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.025	< 0.030	< 0.025	< 0.029	< 0.029
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.025	< 0.030	< 0.025	< 0.029	< 0.028
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.013	0.017	< 0.011	< 0.012	< 0.012
Benzo[e]pyrene	mg/kg dry wt	< 0.011	< 0.013	< 0.011	< 0.012	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	< 0.013	< 0.011	< 0.012	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	< 0.013	< 0.011	< 0.012	< 0.012
Chrysene	mg/kg dry wt	< 0.011	< 0.013	< 0.011	< 0.012	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.013	< 0.011	< 0.012	< 0.012
Fluoranthene	mg/kg dry wt	0.024	0.025	< 0.011	0.014	< 0.012
Fluorene	mg/kg dry wt	< 0.011	< 0.013	< 0.011	< 0.012	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	< 0.013	< 0.011	< 0.012	< 0.012
Naphthalene	mg/kg dry wt	< 0.06	< 0.07	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.011	< 0.013	< 0.011	< 0.012	< 0.012
Phenanthrene	mg/kg dry wt	0.020	0.032	< 0.011	0.021	< 0.012
Pyrene	mg/kg dry wt	0.022	0.028	< 0.011	0.016	< 0.012
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	57	< 40	47	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80	< 80

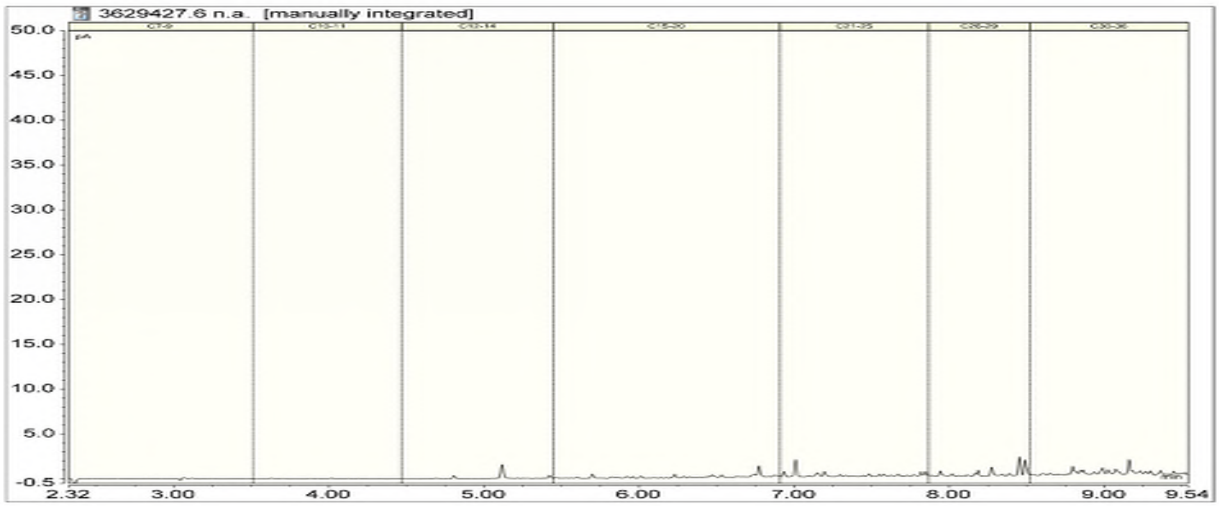
Sample Name:		TP23_0.1 17-Jul-2024	TP23_0.5 17-Jul-2024
Lab Number:		3629427.38	3629427.40
Individual Tests			
Dry Matter	g/100g as rcvd	78	93
Heavy Metals with Mercury, Screen Level			
Total Recoverable Arsenic	mg/kg dry wt	4	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	15
Total Recoverable Copper	mg/kg dry wt	6	5
Total Recoverable Lead	mg/kg dry wt	26	16.1
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	8	12
Total Recoverable Zinc	mg/kg dry wt	60	45

Sample Type: Soil			
Sample Name:		TP23_0.1 17-Jul-2024	TP23_0.5 17-Jul-2024
Lab Number:		3629427.38	3629427.40
Polycyclic Aromatic Hydrocarbons Screening in Soil*			
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	0.027	< 0.011
2-Methylnaphthalene	mg/kg dry wt	0.027	< 0.011
Acenaphthylene	mg/kg dry wt	< 0.013	< 0.011
Acenaphthene	mg/kg dry wt	< 0.013	< 0.011
Anthracene	mg/kg dry wt	< 0.013	< 0.011
Benzo[a]anthracene	mg/kg dry wt	< 0.013	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.013	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.030	< 0.025
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.030	< 0.025
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.016	< 0.011
Benzo[e]pyrene	mg/kg dry wt	< 0.013	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.013	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	< 0.013	< 0.011
Chrysene	mg/kg dry wt	0.012	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013	< 0.011
Fluoranthene	mg/kg dry wt	0.028	< 0.011
Fluorene	mg/kg dry wt	< 0.013	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.013	< 0.011
Naphthalene	mg/kg dry wt	< 0.07	< 0.06
Perylene	mg/kg dry wt	< 0.013	< 0.011
Phenanthrene	mg/kg dry wt	0.027	< 0.011
Pyrene	mg/kg dry wt	0.025	< 0.011
Total Petroleum Hydrocarbons in Soil			
C7 - C9	mg/kg dry wt	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20
C15 - C36	mg/kg dry wt	59	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80

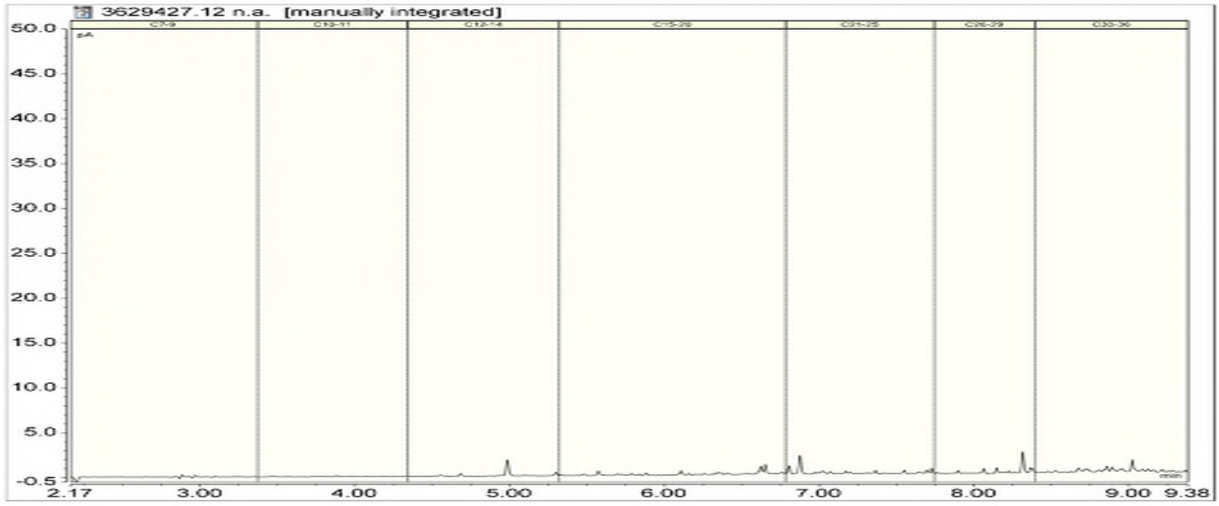
3629427.1
TP24_0.1 17-Jul-2024
Client Chromatogram for TPH by FID



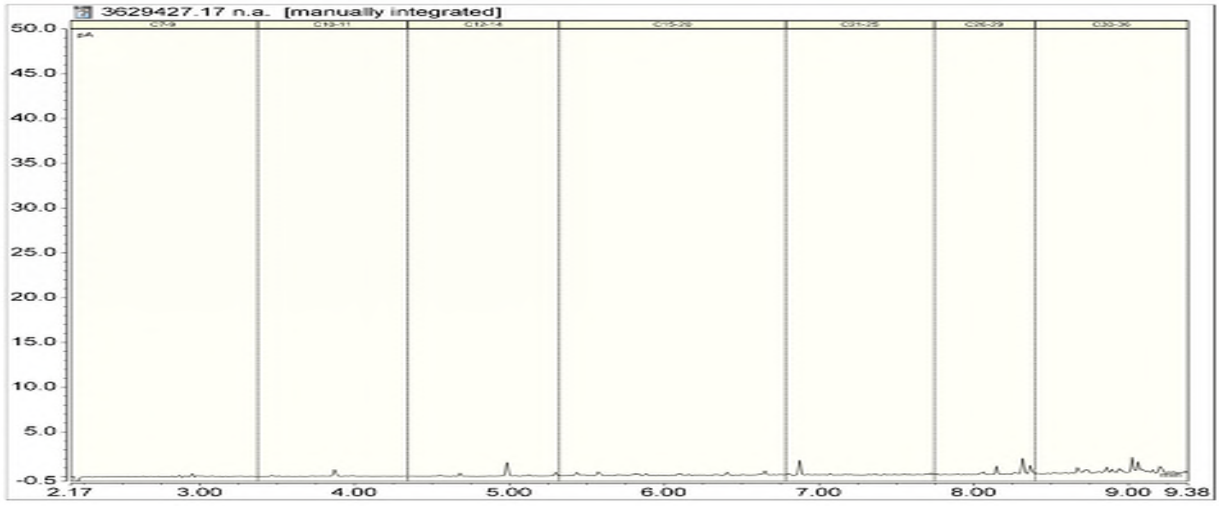
3629427.6
TP26_0.1 17-Jul-2024
Client Chromatogram for TPH by FID



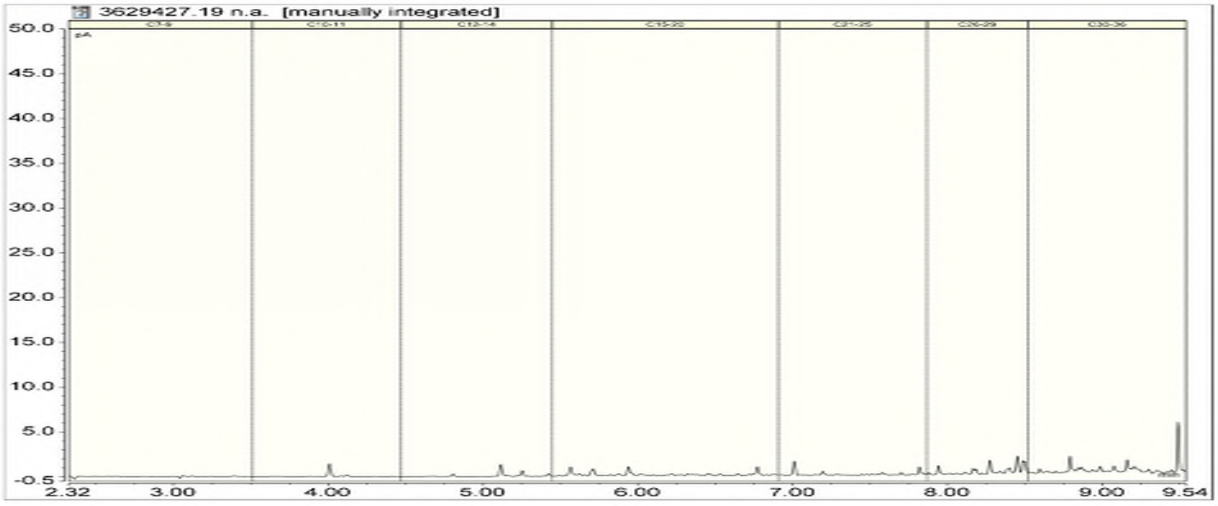
3629427.12
TP28_0.1 17-Jul-2024
Client Chromatogram for TPH by FID



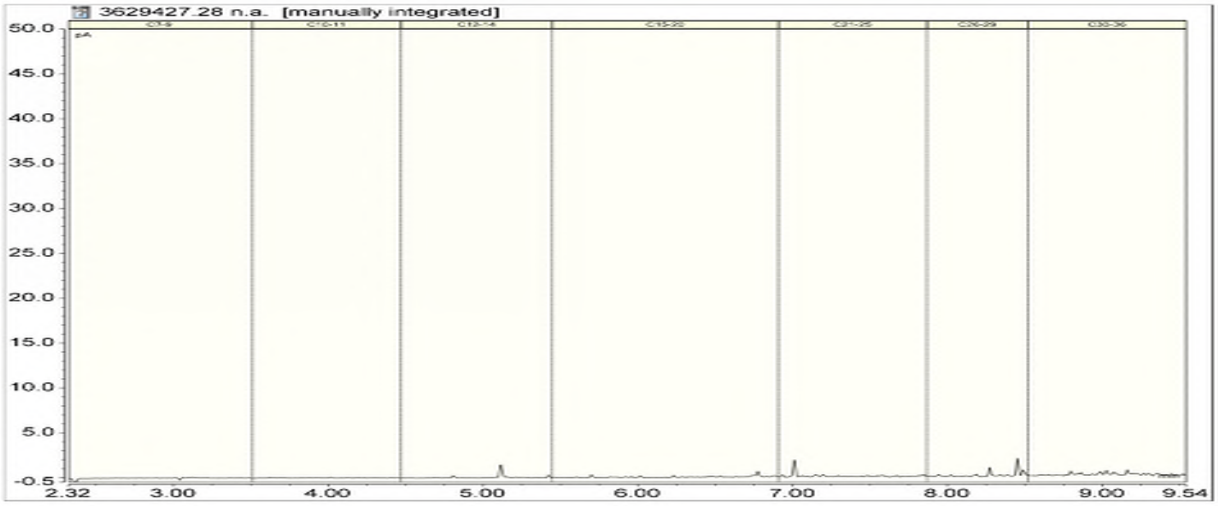
3629427.17
TP32_0.1 17-Jul-2024
Client Chromatogram for TPH by FID



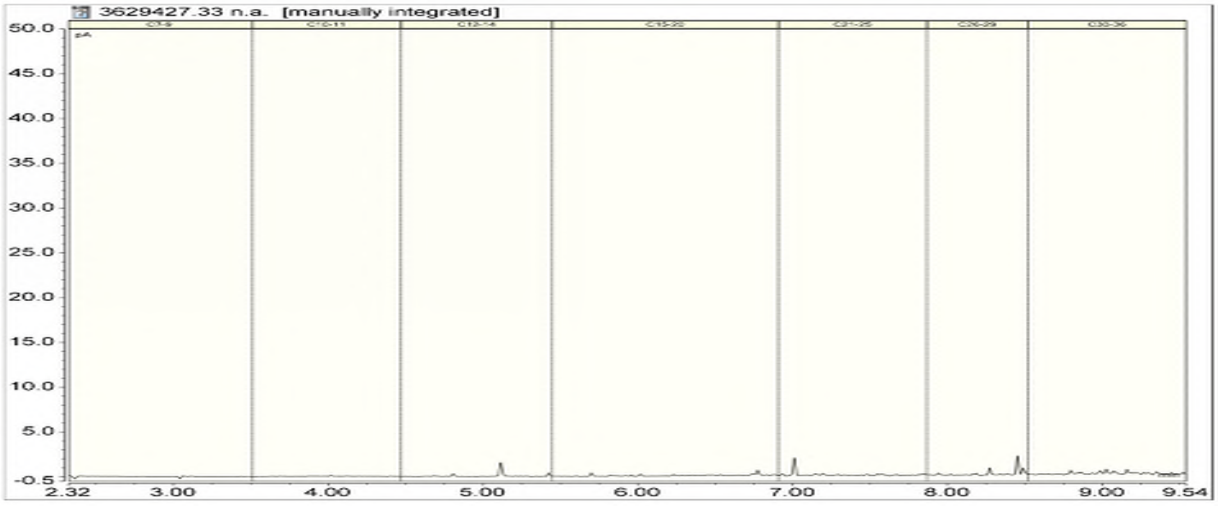
3629427.19
TP32_0.5 17-Jul-2024
Client Chromatogram for TPH by FID



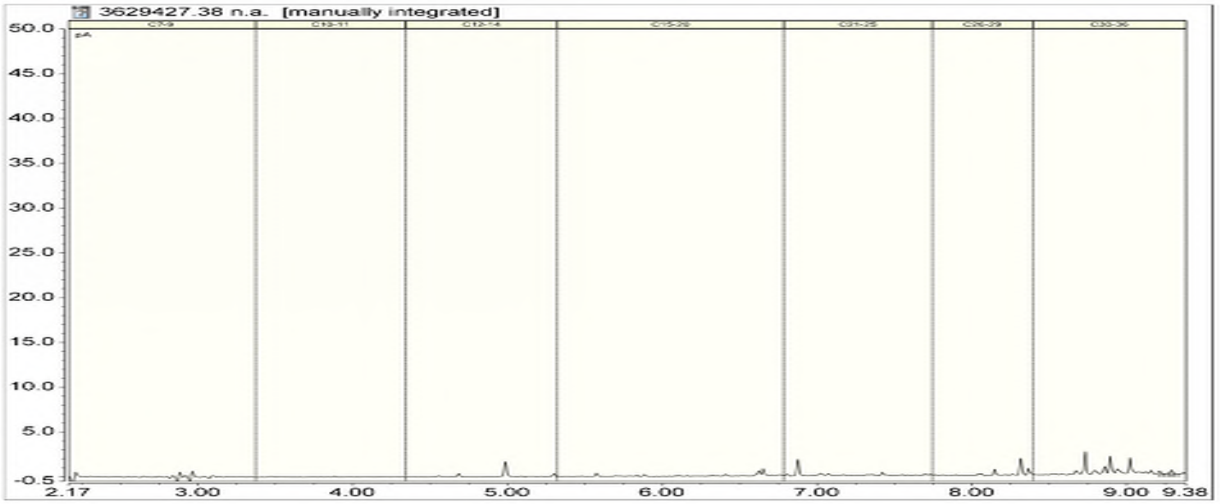
3629427.28
TP30_0.1 17-Jul-2024
Client Chromatogram for TPH by FID



3629427.33
TP27_0.1 17-Jul-2024
Client Chromatogram for TPH by FID



3629427.38
TP23_0.1 17-Jul-2024
Client Chromatogram for TPH by FID



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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
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	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
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	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
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	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
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	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 6, 12, 17, 19, 28, 33, 38
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 6, 8, 11-12, 14, 17, 19, 22, 24, 28, 30, 33, 35, 38, 40

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

Testing was completed between 18-Jul-2024 and 22-Jul-2024. 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.

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Client Services Manager - Environmental

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www.hill-labs.co.nz

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3623104	SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:**	09-Jul-2024	
		Date Reported:	12-Jul-2024	
		Quote No:	129425	
		Order No:		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

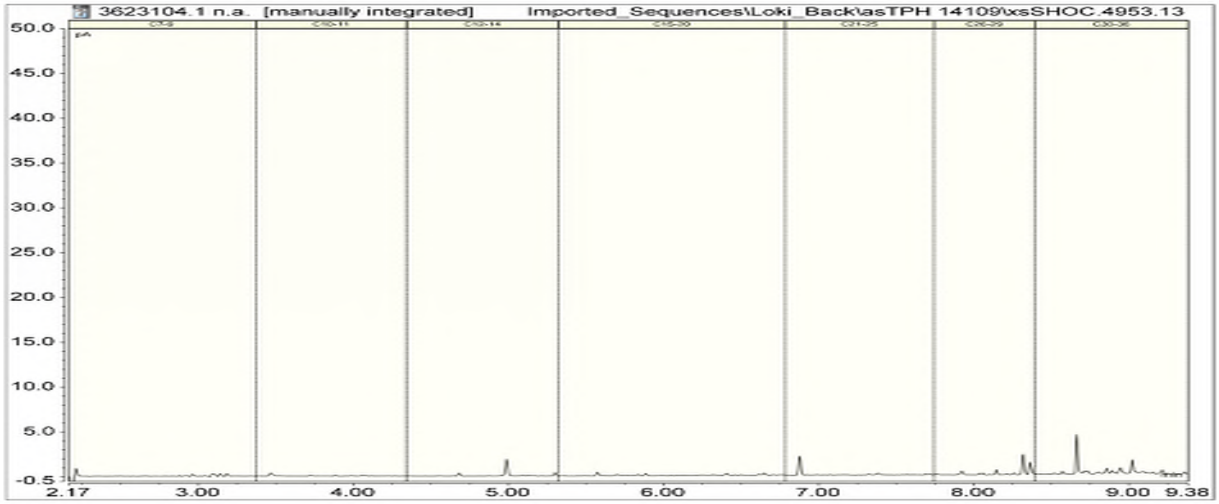
Sample Type: Soil

Sample Name:		TP14_0.1 09-Jul-2024	TP14_0.6 09-Jul-2024	TP34_0.1 09-Jul-2024	TP34_0.5 09-Jul-2024	DUP_G 09-Jul-2024
Lab Number:		3623104.1	3623104.3	3623104.4	3623104.6	3623104.9
Individual Tests						
Dry Matter	g/100g as rcvd	85	84	84	91	92
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	4	4	4	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	14	13	12	12	13
Total Recoverable Copper	mg/kg dry wt	7	5	5	5	5
Total Recoverable Lead	mg/kg dry wt	15.9	15.3	18.3	13.8	13.8
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	10	9	8	11	11
Total Recoverable Zinc	mg/kg dry wt	58	52	52	40	41
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.011	< 0.011
2-Methylnaphthalene	mg/kg dry wt	< 0.018	< 0.018	< 0.018	< 0.016	< 0.016
Acenaphthylene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.011	< 0.011
Acenaphthene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.011	< 0.011
Anthracene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.011	< 0.011
Benzo[a]anthracene	mg/kg dry wt	< 0.012	< 0.012	0.013	< 0.011	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.012	< 0.012	0.014	< 0.011	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.028	< 0.029	< 0.029	< 0.026	< 0.026
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.028	< 0.029	< 0.029	< 0.026	< 0.026
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.012	< 0.012	0.016	< 0.011	< 0.011
Benzo[e]pyrene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.011	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.011	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.011	< 0.011
Chrysene	mg/kg dry wt	< 0.012	< 0.012	0.012	< 0.011	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.011	< 0.011
Fluoranthene	mg/kg dry wt	< 0.012	< 0.012	0.027	< 0.011	< 0.011
Fluorene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.011	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.011	< 0.011
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.011	< 0.011
Phenanthrene	mg/kg dry wt	< 0.012	< 0.012	0.026	< 0.011	< 0.011
Pyrene	mg/kg dry wt	0.013	< 0.012	0.028	< 0.011	< 0.011

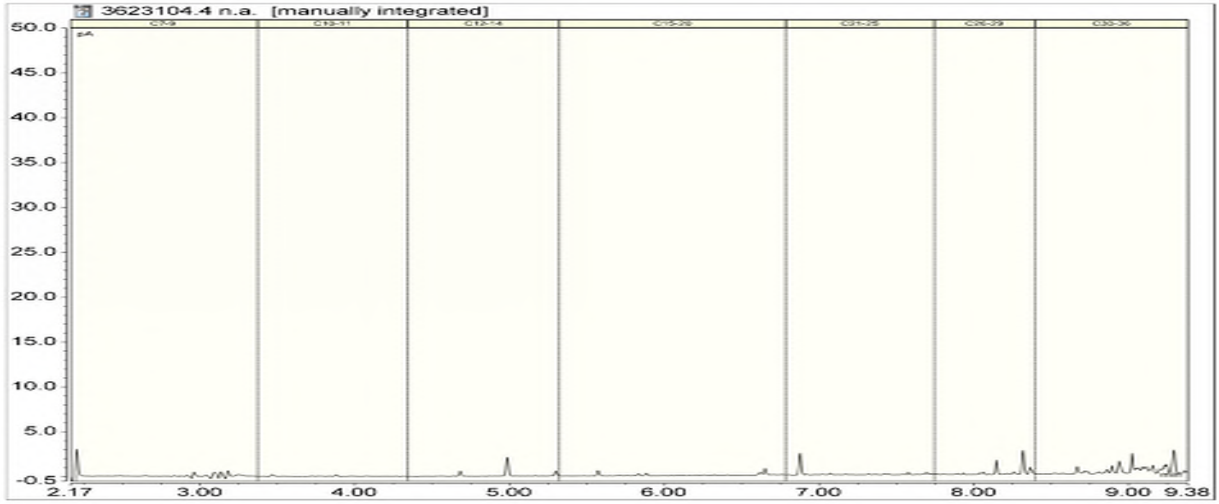
This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported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

Sample Type: Soil						
Sample Name:		TP14_0.1 09-Jul-2024	TP14_0.6 09-Jul-2024	TP34_0.1 09-Jul-2024	TP34_0.5 09-Jul-2024	DUP_G 09-Jul-2024
Lab Number:		3623104.1	3623104.3	3623104.4	3623104.6	3623104.9
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	43	< 40	54	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80	< 80

3623104.1
TP14_0.1 09-Jul-2024
Client Chromatogram for TPH by FID



3623104.4
TP34_0.1 09-Jul-2024
Client Chromatogram for TPH by FID



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**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3-4, 6, 9

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	1, 3-4, 6, 9
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	1, 3-4, 6, 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	1, 3-4, 6, 9
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	1, 3-4, 6, 9
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3-4, 6, 9
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3-4, 6, 9
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 4
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3-4, 6, 9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3-4, 6, 9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3-4, 6, 9
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3-4, 6, 9

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

Testing was completed between 10-Jul-2024 and 12-Jul-2024. 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.

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Martin Cowell - BSc
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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3624497	SPv1
Contact:	Stuart Caird	**Date Received:**	10-Jul-2024	
	C/- Beca Limited	**Date Reported:**	16-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		IP13_0.1 10-Jul-2024	IP13_0.5 10-Jul-2024	DUP_H 10-Jul-2024	TP13_0.1 10-Jul-2024	TP13_0.5 10-Jul-2024
Lab Number:		3624497.1	3624497.3	3624497.6	3624497.7	3624497.9
Individual Tests						
Dry Matter	g/100g as rcvd	87	87	88	80	85
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	4	4	4	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.14	< 0.10
Total Recoverable Chromium	mg/kg dry wt	13	14	14	13	14
Total Recoverable Copper	mg/kg dry wt	7	8	8	7	5
Total Recoverable Lead	mg/kg dry wt	23	25	24	17.5	12.2
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	10	11	11	9	12
Total Recoverable Zinc	mg/kg dry wt	56	61	57	58	43
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.012	0.015	< 0.012	< 0.012	< 0.012
2-Methylnaphthalene	mg/kg dry wt	< 0.014	0.017	< 0.014	< 0.015	< 0.015
Acenaphthylene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Acenaphthene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Anthracene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Benzo[a]anthracene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.012	0.011	0.011	< 0.012	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.028	< 0.027	< 0.027	< 0.029	< 0.028
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.027	< 0.027	< 0.027	< 0.029	< 0.028
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.012	0.013	0.013	< 0.012	< 0.012
Benzo[e]pyrene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Chrysene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Fluoranthene	mg/kg dry wt	0.016	0.021	0.024	< 0.012	< 0.012
Fluorene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Phenanthrene	mg/kg dry wt	0.011	0.015	0.017	< 0.012	< 0.012
Pyrene	mg/kg dry wt	0.015	0.021	0.022	< 0.012	< 0.012

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

Sample Type: Soil						
Sample Name:		IP13_0.1 10-Jul-2024	IP13_0.5 10-Jul-2024	DUP_H 10-Jul-2024	TP13_0.1 10-Jul-2024	TP13_0.5 10-Jul-2024
Lab Number:		3624497.1	3624497.3	3624497.6	3624497.7	3624497.9
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80	< 80

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**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 6-7, 9
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	1, 3, 6-7, 9
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	1, 3, 6-7, 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	1, 3, 6-7, 9
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	1, 3, 6-7, 9
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 6-7, 9
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 6-7, 9
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6-7, 9
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6-7, 9
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 6-7, 9
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 6-7, 9

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

Testing was completed between 11-Jul-2024 and 16-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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



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Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3625446	SPv1
Contact:	Stuart Caird	**Date Received:**	11-Jul-2024	
	C/- Beca Limited	**Date Reported:**	23-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP25_0.1 11-Jul-2024	TP25_0.5 11-Jul-2024	TP29_0.1 11-Jul-2024	TP29_0.5 11-Jul-2024	TP12_0.1 11-Jul-2024
Lab Number:		3625446.1	3625446.3	3625446.6	3625446.8	3625446.11
Individual Tests						
Dry Matter	g/100g as rcvd	79	89	81	89	89
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	3	4	4	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	14	13	13	13	12
Total Recoverable Copper	mg/kg dry wt	9	4	7	4	9
Total Recoverable Lead	mg/kg dry wt	18.9	14.1	30	15.8	20
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	10	10	9	10	9
Total Recoverable Zinc	mg/kg dry wt	87	45	66	45	89
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	-	-	-	< 0.011
alpha-BHC	mg/kg dry wt	-	-	-	-	< 0.011
beta-BHC	mg/kg dry wt	-	-	-	-	< 0.011
delta-BHC	mg/kg dry wt	-	-	-	-	< 0.011
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	-	< 0.011
cis-Chlordane	mg/kg dry wt	-	-	-	-	< 0.011
trans-Chlordane	mg/kg dry wt	-	-	-	-	< 0.011
2,4'-DDD	mg/kg dry wt	-	-	-	-	< 0.011
4,4'-DDD	mg/kg dry wt	-	-	-	-	< 0.011
2,4'-DDE	mg/kg dry wt	-	-	-	-	< 0.011
4,4'-DDE	mg/kg dry wt	-	-	-	-	0.019
2,4'-DDT	mg/kg dry wt	-	-	-	-	< 0.011
4,4'-DDT	mg/kg dry wt	-	-	-	-	< 0.011
Total DDT Isomers	mg/kg dry wt	-	-	-	-	< 0.07
Dieldrin	mg/kg dry wt	-	-	-	-	< 0.011
Endosulfan I	mg/kg dry wt	-	-	-	-	< 0.011
Endosulfan II	mg/kg dry wt	-	-	-	-	< 0.011
Endosulfan sulphate	mg/kg dry wt	-	-	-	-	< 0.011
Endrin	mg/kg dry wt	-	-	-	-	< 0.011
Endrin aldehyde	mg/kg dry wt	-	-	-	-	< 0.011
Endrin ketone	mg/kg dry wt	-	-	-	-	< 0.011
Heptachlor	mg/kg dry wt	-	-	-	-	< 0.011
Heptachlor epoxide	mg/kg dry wt	-	-	-	-	< 0.011
Hexachlorobenzene	mg/kg dry wt	-	-	-	-	< 0.011
Methoxychlor	mg/kg dry wt	-	-	-	-	< 0.011

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

Sample Type: Soil						
Sample Name:		TP25_0.1 11-Jul-2024	TP25_0.5 11-Jul-2024	TP29_0.1 11-Jul-2024	TP29_0.5 11-Jul-2024	TP12_0.1 11-Jul-2024
Lab Number:		3625446.1	3625446.3	3625446.6	3625446.8	3625446.11
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Acetochlor	mg/kg dry wt	-	-	-	-	< 0.06
Alachlor	mg/kg dry wt	-	-	-	-	< 0.05
Atrazine	mg/kg dry wt	-	-	-	-	< 0.06
Atrazine-desethyl	mg/kg dry wt	-	-	-	-	< 0.06
Atrazine-desisopropyl	mg/kg dry wt	-	-	-	-	< 0.11
Azaconazole	mg/kg dry wt	-	-	-	-	< 0.03
Azinphos-methyl	mg/kg dry wt	-	-	-	-	< 0.11
Benalaxyl	mg/kg dry wt	-	-	-	-	< 0.03
Bitertanol	mg/kg dry wt	-	-	-	-	< 0.11
Bromacil	mg/kg dry wt	-	-	-	-	< 0.06
Bromopropylate	mg/kg dry wt	-	-	-	-	< 0.06
Butachlor	mg/kg dry wt	-	-	-	-	< 0.06
Captan	mg/kg dry wt	-	-	-	-	< 0.11
Carbaryl	mg/kg dry wt	-	-	-	-	< 0.06
Carbofuran	mg/kg dry wt	-	-	-	-	< 0.06
Chlorfluazuron	mg/kg dry wt	-	-	-	-	< 0.06
Chlorothalonil	mg/kg dry wt	-	-	-	-	< 0.06
Chlorpyrifos	mg/kg dry wt	-	-	-	-	< 0.06
Chlorpyrifos-methyl	mg/kg dry wt	-	-	-	-	< 0.06
Chlortoluron	mg/kg dry wt	-	-	-	-	< 0.11
Cyanazine	mg/kg dry wt	-	-	-	-	< 0.06
Cyfluthrin	mg/kg dry wt	-	-	-	-	< 0.07
Cyhalothrin	mg/kg dry wt	-	-	-	-	< 0.06
Cypermethrin	mg/kg dry wt	-	-	-	-	< 0.13
Deltamethrin (including Tralomethrin)	mg/kg dry wt	-	-	-	-	< 0.06
Diazinon	mg/kg dry wt	-	-	-	-	< 0.03
Dichlofluanid	mg/kg dry wt	-	-	-	-	< 0.06
Dichloran	mg/kg dry wt	-	-	-	-	< 0.2
Dichlorvos	mg/kg dry wt	-	-	-	-	< 0.09
Difenoconazole	mg/kg dry wt	-	-	-	-	< 0.09
Dimethoate	mg/kg dry wt	-	-	-	-	< 0.11
Diphenylamine	mg/kg dry wt	-	-	-	-	< 0.11
Diuron	mg/kg dry wt	-	-	-	-	< 0.06
Fenpropimorph	mg/kg dry wt	-	-	-	-	< 0.06
Fluazifop-butyl	mg/kg dry wt	-	-	-	-	< 0.06
Fluometuron	mg/kg dry wt	-	-	-	-	< 0.06
Flusilazole	mg/kg dry wt	-	-	-	-	< 0.06
Fluvalinate	mg/kg dry wt	-	-	-	-	< 0.05
Furalaxyl	mg/kg dry wt	-	-	-	-	< 0.03
Haloxyfop-methyl	mg/kg dry wt	-	-	-	-	< 0.06
Hexaconazole	mg/kg dry wt	-	-	-	-	< 0.06
Hexazinone	mg/kg dry wt	-	-	-	-	< 0.03
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	mg/kg dry wt	-	-	-	-	< 0.3
Kresoxim-methyl	mg/kg dry wt	-	-	-	-	< 0.03
Linuron	mg/kg dry wt	-	-	-	-	< 0.06
Malathion	mg/kg dry wt	-	-	-	-	< 0.06
Metalaxyl	mg/kg dry wt	-	-	-	-	< 0.06
Methamidophos	mg/kg dry wt	-	-	-	-	< 0.3
Metolachlor	mg/kg dry wt	-	-	-	-	< 0.05
Metribuzin	mg/kg dry wt	-	-	-	-	< 0.06
Molinate	mg/kg dry wt	-	-	-	-	< 0.11
Myclobutanil	mg/kg dry wt	-	-	-	-	< 0.06
Naled	mg/kg dry wt	-	-	-	-	< 0.3

Sample Type: Soil						
Sample Name:		TP25_0.1 11-Jul-2024	TP25_0.5 11-Jul-2024	TP29_0.1 11-Jul-2024	TP29_0.5 11-Jul-2024	TP12_0.1 11-Jul-2024
Lab Number:		3625446.1	3625446.3	3625446.6	3625446.8	3625446.11
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Norflurazon	mg/kg dry wt	-	-	-	-	< 0.11
Oxadiazon	mg/kg dry wt	-	-	-	-	< 0.06
Oxyfluorfen	mg/kg dry wt	-	-	-	-	< 0.03
Paclobutrazol	mg/kg dry wt	-	-	-	-	< 0.06
Parathion-ethyl	mg/kg dry wt	-	-	-	-	< 0.06
Parathion-methyl	mg/kg dry wt	-	-	-	-	< 0.06
Pendimethalin	mg/kg dry wt	-	-	-	-	< 0.06
Permethrin	mg/kg dry wt	-	-	-	-	< 0.03
Pirimicarb	mg/kg dry wt	-	-	-	-	< 0.06
Pirimiphos-methyl	mg/kg dry wt	-	-	-	-	< 0.06
Prochloraz	mg/kg dry wt	-	-	-	-	< 0.3
Procymidone	mg/kg dry wt	-	-	-	-	< 0.06
Prometryn	mg/kg dry wt	-	-	-	-	< 0.03
Propachlor	mg/kg dry wt	-	-	-	-	< 0.06
Propanil	mg/kg dry wt	-	-	-	-	< 0.2
Propazine	mg/kg dry wt	-	-	-	-	< 0.03
Propiconazole	mg/kg dry wt	-	-	-	-	< 0.05
Pyriproxyfen	mg/kg dry wt	-	-	-	-	< 0.06
Quizalofop-ethyl	mg/kg dry wt	-	-	-	-	< 0.06
Simazine	mg/kg dry wt	-	-	-	-	< 0.06
Simetryn	mg/kg dry wt	-	-	-	-	< 0.06
Sulfentrazone	mg/kg dry wt	-	-	-	-	< 0.3
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	mg/kg dry wt	-	-	-	-	< 0.11
Tebuconazole	mg/kg dry wt	-	-	-	-	< 0.06
Terbacil	mg/kg dry wt	-	-	-	-	< 0.06
Terbumeton	mg/kg dry wt	-	-	-	-	< 0.06
Terbuthylazine	mg/kg dry wt	-	-	-	-	< 0.03
Terbuthylazine-desethyl	mg/kg dry wt	-	-	-	-	< 0.06
Terbutryn	mg/kg dry wt	-	-	-	-	< 0.06
Thiabendazole	mg/kg dry wt	-	-	-	-	< 0.3
Thiobencarb	mg/kg dry wt	-	-	-	-	< 0.06
Tolylfluanid	mg/kg dry wt	-	-	-	-	< 0.03
Triazophos	mg/kg dry wt	-	-	-	-	< 0.06
Trifluralin	mg/kg dry wt	-	-	-	-	< 0.06
Vinclozolin	mg/kg dry wt	-	-	-	-	< 0.06
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	0.4	< 0.3	< 0.3	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	0.040	< 0.011	0.028	< 0.011	0.016
2-Methylnaphthalene	mg/kg dry wt	0.038	< 0.014	0.028	< 0.014	0.015
Acenaphthylene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.011
Acenaphthene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.011
Anthracene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.011
Benzo[a]anthracene	mg/kg dry wt	0.012	< 0.011	< 0.012	< 0.011	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.015	< 0.011	< 0.012	< 0.011	0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.030	< 0.027	< 0.029	< 0.026	< 0.027
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.030	< 0.027	< 0.029	< 0.026	< 0.027
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.017	< 0.011	0.015	< 0.011	0.013
Benzo[e]pyrene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	0.020	< 0.011	< 0.012	< 0.011	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.011
Chrysene	mg/kg dry wt	0.016	< 0.011	< 0.012	< 0.011	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.011

Sample Type: Soil						
Sample Name:		TP25_0.1 11-Jul-2024	TP25_0.5 11-Jul-2024	TP29_0.1 11-Jul-2024	TP29_0.5 11-Jul-2024	TP12_0.1 11-Jul-2024
Lab Number:		3625446.1	3625446.3	3625446.6	3625446.8	3625446.11
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Fluoranthene	mg/kg dry wt	0.035	< 0.011	0.018	< 0.011	0.023
Fluorene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.014	< 0.011	< 0.012	< 0.011	< 0.011
Naphthalene	mg/kg dry wt	< 0.07	< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.013	< 0.011	< 0.012	< 0.011	< 0.011
Phenanthrene	mg/kg dry wt	0.043	< 0.011	0.022	< 0.011	0.021
Pyrene	mg/kg dry wt	0.034	< 0.011	0.022	< 0.011	0.025
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	65	< 40	50	44	71
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80	< 80

Sample Name:		TP12_0.5 11-Jul-2024	PP20_0.15 11-Jul-2024	BH05_0.1 11-Jul-2024	BH05_0.4-0.5 11-Jul-2024	BH05_0.6 11-Jul-2024
Lab Number:		3625446.13	3625446.19	3625446.24	3625446.26	3625446.27
Individual Tests						
Dry Matter	g/100g as rcvd	82	96	91	84	84
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	4	3	9	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.13	< 0.10
Total Recoverable Chromium	mg/kg dry wt	12	12	16	15	12
Total Recoverable Copper	mg/kg dry wt	4	6	6	18	4
Total Recoverable Lead	mg/kg dry wt	24	14.3	15.5	63	16.2
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	0.11	0.11	< 0.10
Total Recoverable Nickel	mg/kg dry wt	8	10	10	13	8
Total Recoverable Zinc	mg/kg dry wt	44	42	40	56	44
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	-	-	< 0.05	< 0.05	< 0.05
Toluene	mg/kg dry wt	-	-	< 0.05	< 0.05	< 0.05
Ethylbenzene	mg/kg dry wt	-	-	< 0.05	< 0.05	< 0.05
m&p-Xylene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
o-Xylene	mg/kg dry wt	-	-	< 0.05	< 0.05	< 0.05
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	-	-	-	-

Sample Type: Soil						
Sample Name:		TP12_0.5 11-Jul-2024	PP20_0.15 11-Jul-2024	BH05_0.1 11-Jul-2024	BH05_0.4-0.5 11-Jul-2024	BH05_0.6 11-Jul-2024
Lab Number:		3625446.13	3625446.19	3625446.24	3625446.26	3625446.27
Organochlorine Pesticides Screening in Soil						
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	-	-	-	-
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Acetochlor	mg/kg dry wt	< 0.06	-	-	-	-
Alachlor	mg/kg dry wt	< 0.05	-	-	-	-
Atrazine	mg/kg dry wt	< 0.06	-	-	-	-
Atrazine-desethyl	mg/kg dry wt	< 0.06	-	-	-	-
Atrazine-desisopropyl	mg/kg dry wt	< 0.12	-	-	-	-
Azaconazole	mg/kg dry wt	< 0.03	-	-	-	-
Azinphos-methyl	mg/kg dry wt	< 0.12	-	-	-	-
Benalaxyl	mg/kg dry wt	< 0.03	-	-	-	-
Bitertanol	mg/kg dry wt	< 0.12	-	-	-	-
Bromacil	mg/kg dry wt	< 0.06	-	-	-	-
Bromopropylate	mg/kg dry wt	< 0.06	-	-	-	-
Butachlor	mg/kg dry wt	< 0.06	-	-	-	-
Captan	mg/kg dry wt	< 0.12	-	-	-	-
Carbaryl	mg/kg dry wt	< 0.06	-	-	-	-
Carbofuran	mg/kg dry wt	< 0.06	-	-	-	-
Chlorfluazuron	mg/kg dry wt	< 0.06	-	-	-	-
Chlorothalonil	mg/kg dry wt	< 0.06	-	-	-	-
Chlorpyrifos	mg/kg dry wt	< 0.06	-	-	-	-
Chlorpyrifos-methyl	mg/kg dry wt	< 0.06	-	-	-	-
Chlortoluron	mg/kg dry wt	< 0.12	-	-	-	-
Cyanazine	mg/kg dry wt	< 0.06	-	-	-	-
Cyfluthrin	mg/kg dry wt	< 0.07	-	-	-	-
Cyhalothrin	mg/kg dry wt	< 0.06	-	-	-	-
Cypermethrin	mg/kg dry wt	< 0.14	-	-	-	-
Deltamethrin (including Tralomethrin)	mg/kg dry wt	< 0.06	-	-	-	-
Diazinon	mg/kg dry wt	< 0.03	-	-	-	-
Dichlofluanid	mg/kg dry wt	< 0.06	-	-	-	-
Dichloran	mg/kg dry wt	< 0.2	-	-	-	-
Dichlorvos	mg/kg dry wt	< 0.09	-	-	-	-
Difenoconazole	mg/kg dry wt	< 0.09	-	-	-	-
Dimethoate	mg/kg dry wt	< 0.12	-	-	-	-
Diphenylamine	mg/kg dry wt	< 0.12	-	-	-	-
Diuron	mg/kg dry wt	< 0.06	-	-	-	-
Fenpropimorph	mg/kg dry wt	< 0.06	-	-	-	-
Fluazifop-butyl	mg/kg dry wt	< 0.06	-	-	-	-
Fluometuron	mg/kg dry wt	< 0.06	-	-	-	-
Flusilazole	mg/kg dry wt	< 0.06	-	-	-	-
Fluvalinate	mg/kg dry wt	< 0.05	-	-	-	-
Furalaxyl	mg/kg dry wt	< 0.03	-	-	-	-
Haloxyfop-methyl	mg/kg dry wt	< 0.06	-	-	-	-
Hexaconazole	mg/kg dry wt	< 0.06	-	-	-	-
Hexazinone	mg/kg dry wt	< 0.03	-	-	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	mg/kg dry wt	< 0.3	-	-	-	-
Kresoxim-methyl	mg/kg dry wt	< 0.03	-	-	-	-
Linuron	mg/kg dry wt	< 0.06	-	-	-	-
Malathion	mg/kg dry wt	< 0.06	-	-	-	-
Metalaxyl	mg/kg dry wt	< 0.06	-	-	-	-
Methamidophos	mg/kg dry wt	< 0.3	-	-	-	-

Sample Type: Soil						
Sample Name:		TP12_0.5 11-Jul-2024	PP20_0.15 11-Jul-2024	BH05_0.1 11-Jul-2024	BH05_0.4-0.5 11-Jul-2024	BH05_0.6 11-Jul-2024
Lab Number:		3625446.13	3625446.19	3625446.24	3625446.26	3625446.27
Organonitro&phosphorus Pesticides Screen in Soil by GCMS						
Metolachlor	mg/kg dry wt	< 0.05	-	-	-	-
Metribuzin	mg/kg dry wt	< 0.06	-	-	-	-
Molinate	mg/kg dry wt	< 0.12	-	-	-	-
Myclobutanil	mg/kg dry wt	< 0.06	-	-	-	-
Naled	mg/kg dry wt	< 0.3	-	-	-	-
Norflurazon	mg/kg dry wt	< 0.12	-	-	-	-
Oxadiazon	mg/kg dry wt	< 0.06	-	-	-	-
Oxyfluorfen	mg/kg dry wt	< 0.03	-	-	-	-
Paclobutrazol	mg/kg dry wt	< 0.06	-	-	-	-
Parathion-ethyl	mg/kg dry wt	< 0.06	-	-	-	-
Parathion-methyl	mg/kg dry wt	< 0.06	-	-	-	-
Pendimethalin	mg/kg dry wt	< 0.06	-	-	-	-
Permethrin	mg/kg dry wt	< 0.03	-	-	-	-
Pirimicarb	mg/kg dry wt	< 0.06	-	-	-	-
Pirimiphos-methyl	mg/kg dry wt	< 0.06	-	-	-	-
Prochloraz	mg/kg dry wt	< 0.3	-	-	-	-
Procymidone	mg/kg dry wt	< 0.06	-	-	-	-
Prometryn	mg/kg dry wt	< 0.03	-	-	-	-
Propachlor	mg/kg dry wt	< 0.06	-	-	-	-
Propanil	mg/kg dry wt	< 0.2	-	-	-	-
Propazine	mg/kg dry wt	< 0.03	-	-	-	-
Propiconazole	mg/kg dry wt	< 0.05	-	-	-	-
Pyriproxyfen	mg/kg dry wt	< 0.06	-	-	-	-
Quizalofop-ethyl	mg/kg dry wt	< 0.06	-	-	-	-
Simazine	mg/kg dry wt	< 0.06	-	-	-	-
Simetryn	mg/kg dry wt	< 0.06	-	-	-	-
Sulfentrazone	mg/kg dry wt	< 0.3	-	-	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	mg/kg dry wt	< 0.12	-	-	-	-
Tebuconazole	mg/kg dry wt	< 0.06	-	-	-	-
Terbacil	mg/kg dry wt	< 0.06	-	-	-	-
Terbumeton	mg/kg dry wt	< 0.06	-	-	-	-
Terbuthylazine	mg/kg dry wt	< 0.03	-	-	-	-
Terbuthylazine-desethyl	mg/kg dry wt	< 0.06	-	-	-	-
Terbutryn	mg/kg dry wt	< 0.06	-	-	-	-
Thiabendazole	mg/kg dry wt	< 0.3	-	-	-	-
Thiobencarb	mg/kg dry wt	< 0.06	-	-	-	-
Tolylfluanid	mg/kg dry wt	< 0.03	-	-	-	-
Triazophos	mg/kg dry wt	< 0.06	-	-	-	-
Trifluralin	mg/kg dry wt	< 0.06	-	-	-	-
Vinclozolin	mg/kg dry wt	< 0.06	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	0.3	< 0.3	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.012	< 0.011	-	-	-
Acenaphthene	mg/kg dry wt	< 0.012	< 0.011	-	-	-
Anthracene	mg/kg dry wt	< 0.012	< 0.011	-	-	-
Benzo[a]anthracene	mg/kg dry wt	0.018	< 0.011	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.026	< 0.011	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.038	< 0.025	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.037	< 0.025	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.033	< 0.011	-	-	-

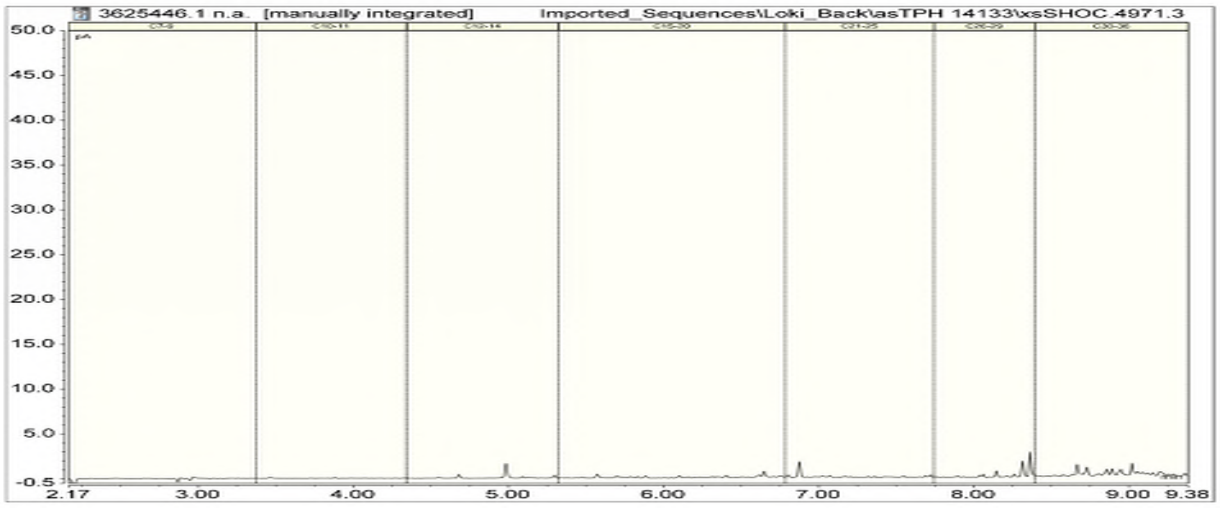
Sample Type: Soil						
Sample Name:		TP12_0.5 11-Jul-2024	PP20_0.15 11-Jul-2024	BH05_0.1 11-Jul-2024	BH05_0.4-0.5 11-Jul-2024	BH05_0.6 11-Jul-2024
Lab Number:		3625446.13	3625446.19	3625446.24	3625446.26	3625446.27
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Benzo[e]pyrene	mg/kg dry wt	0.016	< 0.011	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.016	< 0.011	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	0.013	< 0.011	-	-	-
Chrysene	mg/kg dry wt	0.021	< 0.011	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.011	-	-	-
Fluoranthene	mg/kg dry wt	0.050	< 0.011	-	-	-
Fluorene	mg/kg dry wt	< 0.012	< 0.011	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.018	< 0.011	-	-	-
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	-	-	-
Perylene	mg/kg dry wt	< 0.012	< 0.011	-	-	-
Phenanthrene	mg/kg dry wt	0.034	< 0.011	-	-	-
Pyrene	mg/kg dry wt	0.054	< 0.011	-	-	-
Haloethers Trace in SVOC Soil Samples by GC-MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Bis(2-chloroethyl)ether	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS						
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	-	-	< 0.12	< 0.13	< 0.13
2,4-Dinitrotoluene	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	-	-	< 0.12	< 0.13	< 0.13
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS						
Aldrin	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Dieldrin	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	-	-	< 0.5	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Endrin	mg/kg dry wt	-	-	< 0.12	< 0.13	< 0.13
Endrin ketone	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Heptachlor	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*						
Acenaphthene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	-	-	< 0.10	0.18	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	< 0.10	0.16	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	< 0.10	0.18	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg dry wt	-	-	< 0.10	0.20	< 0.10

Sample Type: Soil						
Sample Name:		TP12_0.5 11-Jul-2024	PP20_0.15 11-Jul-2024	BH05_0.1 11-Jul-2024	BH05_0.4-0.5 11-Jul-2024	BH05_0.6 11-Jul-2024
Lab Number:		3625446.13	3625446.19	3625446.24	3625446.26	3625446.27
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*						
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	-	-	< 0.10	0.33	< 0.10
Fluorene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	< 0.10	0.11	< 0.10
2-Methylnaphthalene	mg/kg dry wt	-	-	< 0.10	0.43	< 0.10
Naphthalene	mg/kg dry wt	-	-	< 0.10	0.25	< 0.10
Phenanthrene	mg/kg dry wt	-	-	< 0.10	0.35	< 0.10
Pyrene	mg/kg dry wt	-	-	< 0.10	0.37	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	< 0.25	< 0.25	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	< 0.25	< 0.25	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	-	-	< 0.5	< 0.5	< 0.5
2-Chlorophenol	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	-	-	< 0.4	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	-	-	< 0.4	< 0.4	< 0.4
2-Methylphenol (o-cresol)	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	-	-	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	-	-	< 6	< 6	< 6
Phenol	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4,5-Trichlorophenol	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Plasticisers Trace in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	-	-	< 0.5	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	-	-	< 0.2	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	-	-	< 0.12	< 0.13	< 0.13
1,3-Dichlorobenzene	mg/kg dry wt	-	-	< 0.12	< 0.13	< 0.13
1,4-Dichlorobenzene	mg/kg dry wt	-	-	< 0.12	< 0.13	< 0.13
Hexachlorobutadiene	mg/kg dry wt	-	-	< 0.12	< 0.13	< 0.13
Hexachloroethane	mg/kg dry wt	-	-	< 0.12	< 0.13	< 0.13
1,2,4-Trichlorobenzene	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Other SVOC Trace in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	-	-	< 1.0	< 1.0	< 1.0
Carbazole	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	-	-	< 0.10	0.18	< 0.10
Isophorone	mg/kg dry wt	-	-	< 0.10	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	46	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	460	< 40	< 40	91	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	510	< 80	< 80	96	< 80

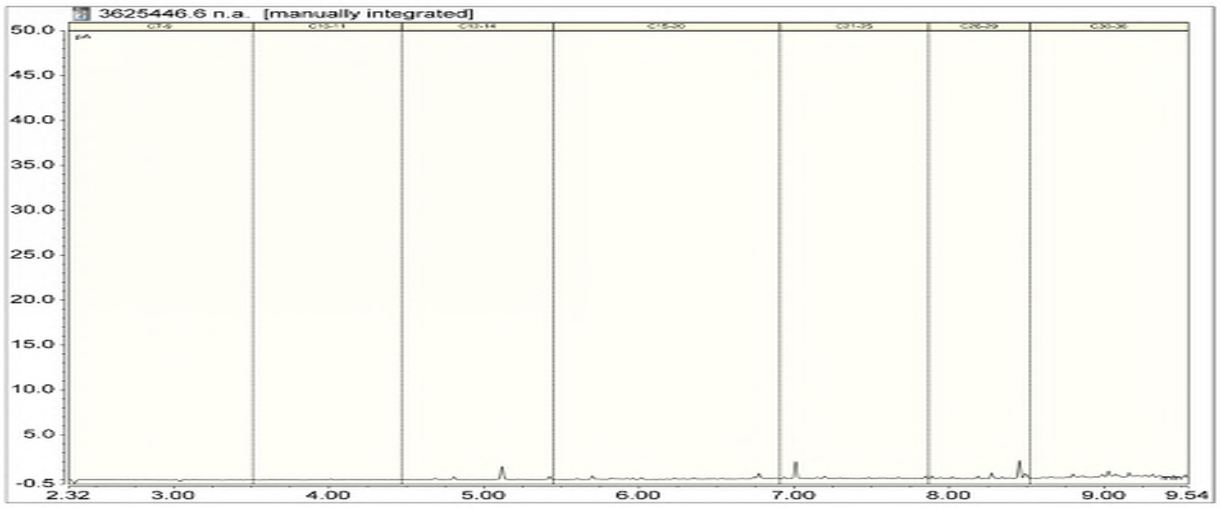
Sample Type: Roading Material			
Sample Name:		PP20_0.05 11-Jul-2024	PP20_0.2 11-Jul-2024
Lab Number:		3625446.18	3625446.20

Sample Type: Roading Material			
Sample Name:		PP20_0.05 11-Jul-2024	PP20_0.2 11-Jul-2024
Lab Number:		3625446.18	3625446.20
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*			
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	2	3
Total Recoverable Copper	mg/kg as rcvd	3	2
Total Recoverable Lead	mg/kg as rcvd	7.8	20
Total Recoverable Nickel	mg/kg as rcvd	< 2	2
Total Recoverable Zinc	mg/kg as rcvd	18	14
Polycyclic Aromatic Hydrocarbons Screening in Rock*			
1-Methylnaphthalene*	mg/kg as rcvd	0.51	0.44
2-Methylnaphthalene*	mg/kg as rcvd	0.48	0.49
Acenaphthylene*	mg/kg as rcvd	< 0.10	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	0.10	0.15
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	< 0.3
Benzo[b]fluoranthene + Benzo[j]fluoranthene*	mg/kg as rcvd	< 0.10	0.18
Benzo[e]pyrene*	mg/kg as rcvd	0.18	0.23
Benzo[g,h,i]perylene*	mg/kg as rcvd	0.15	0.21
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10	0.17
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10	0.29
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	0.22	0.41
Pyrene*	mg/kg as rcvd	0.42	0.34
Total of Reported PAHs*	mg/kg as rcvd	3	3
Total Petroleum Hydrocarbons in Rock*			
C7 - C9*	mg/kg as rcvd	< 140	< 140
C10 - C14*	mg/kg as rcvd	300	290
C15 - C36*	mg/kg as rcvd	3,200	4,100
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	3,500	4,500

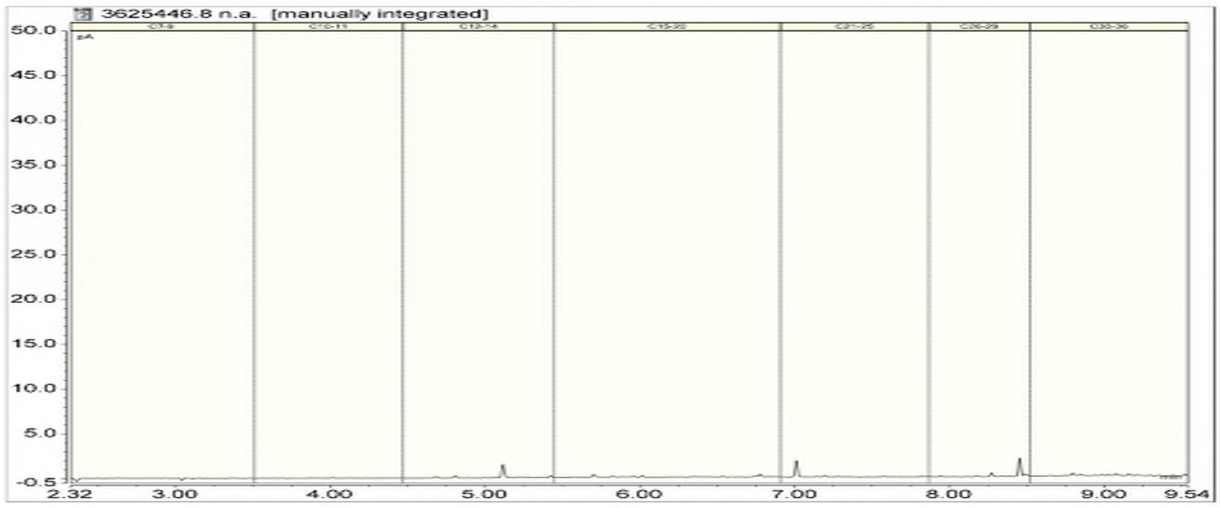
3625446.1
TP25_0.1 11-Jul-2024
Client Chromatogram for TPH by FID



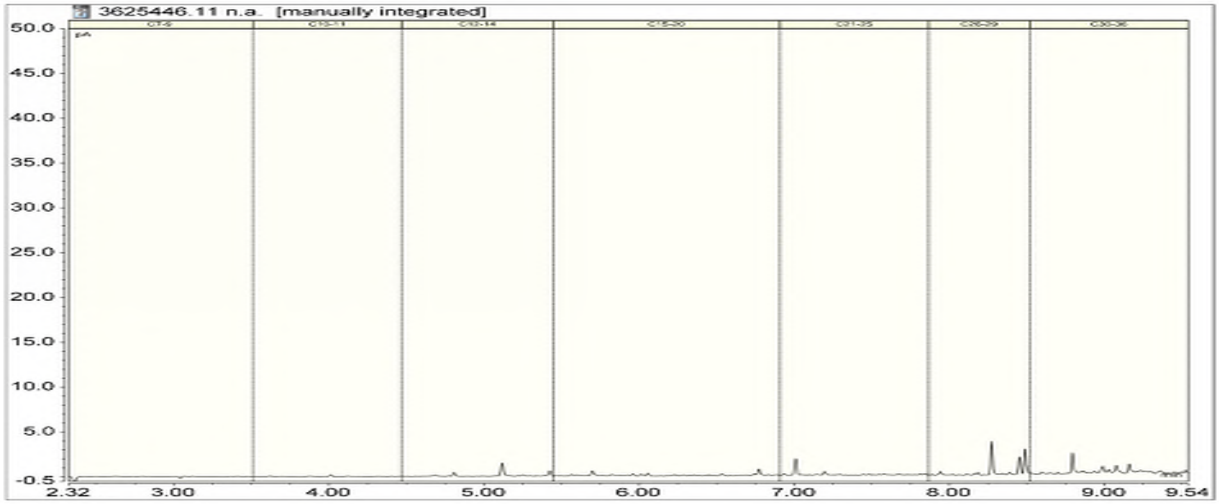
3625446.6
TP29_0.1 11-Jul-2024
Client Chromatogram for TPH by FID



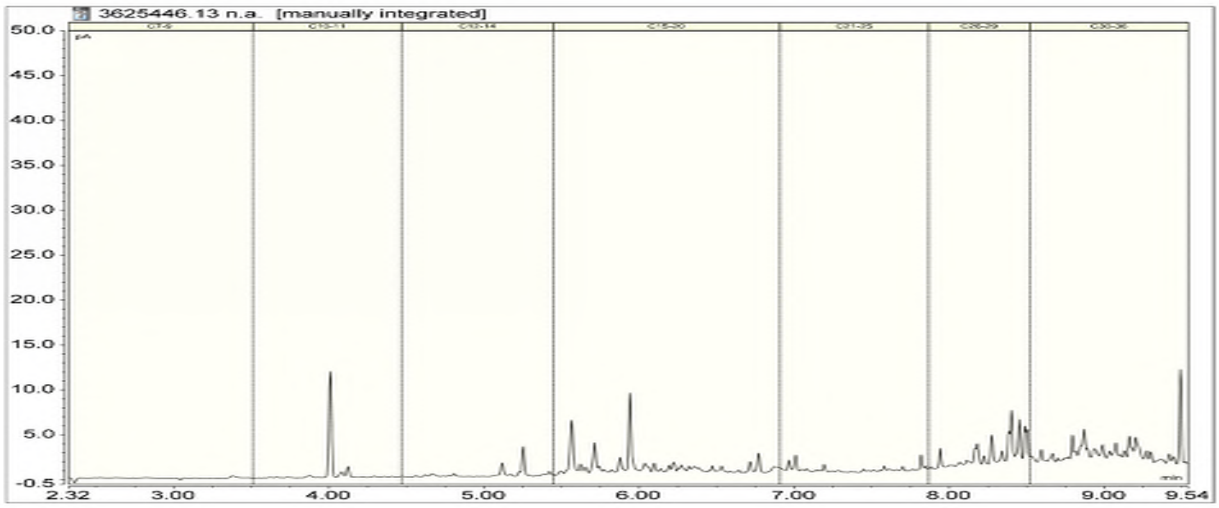
3625446.8
TP29_0.5 11-Jul-2024
Client Chromatogram for TPH by FID



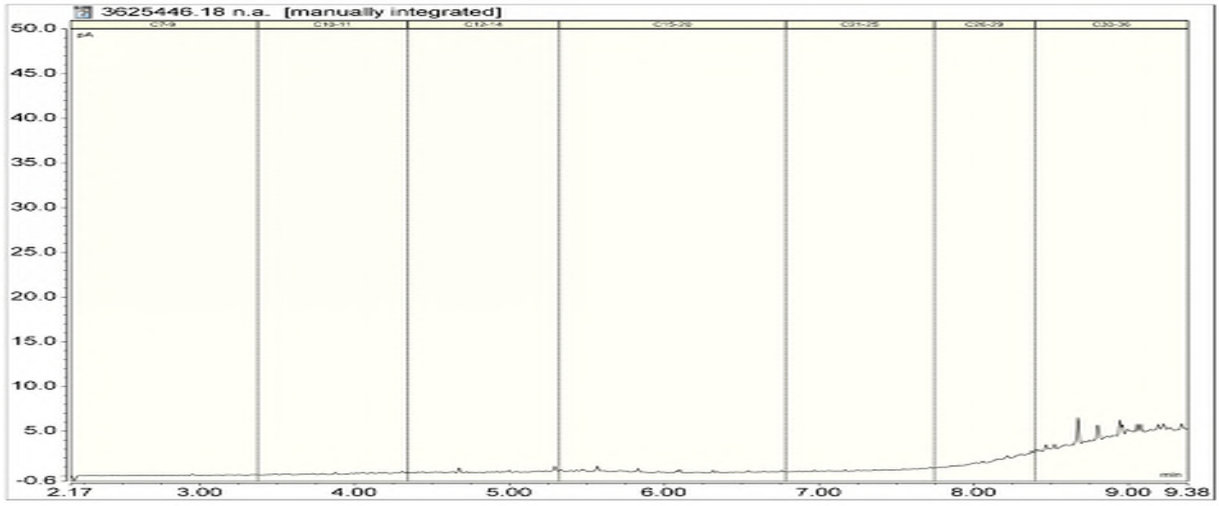
3625446.11
TP12_0.1 11-Jul-2024
Client Chromatogram for TPH by FID



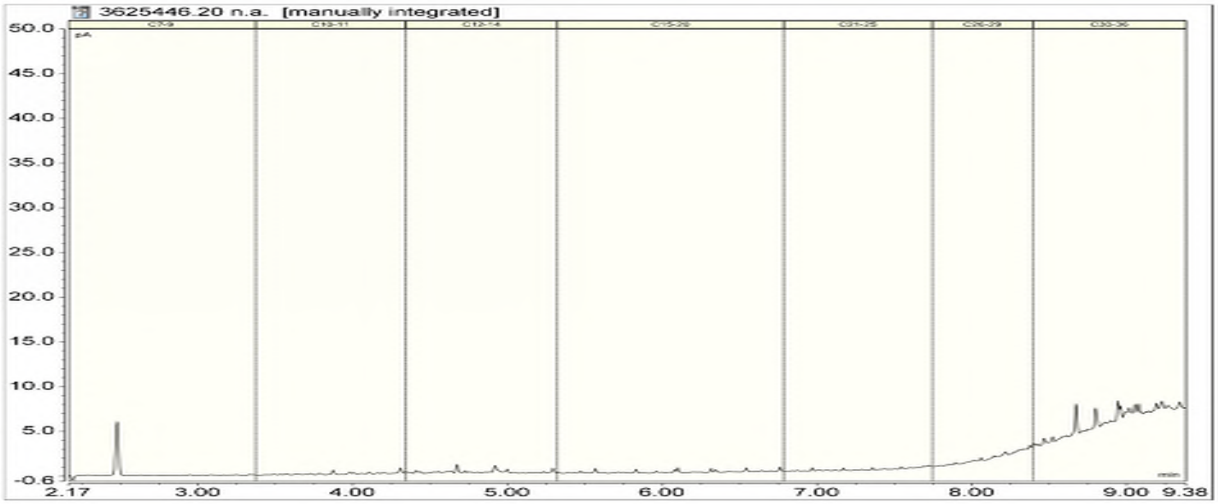
3625446.13
TP12_0.5 11-Jul-2024
Client Chromatogram for TPH by FID



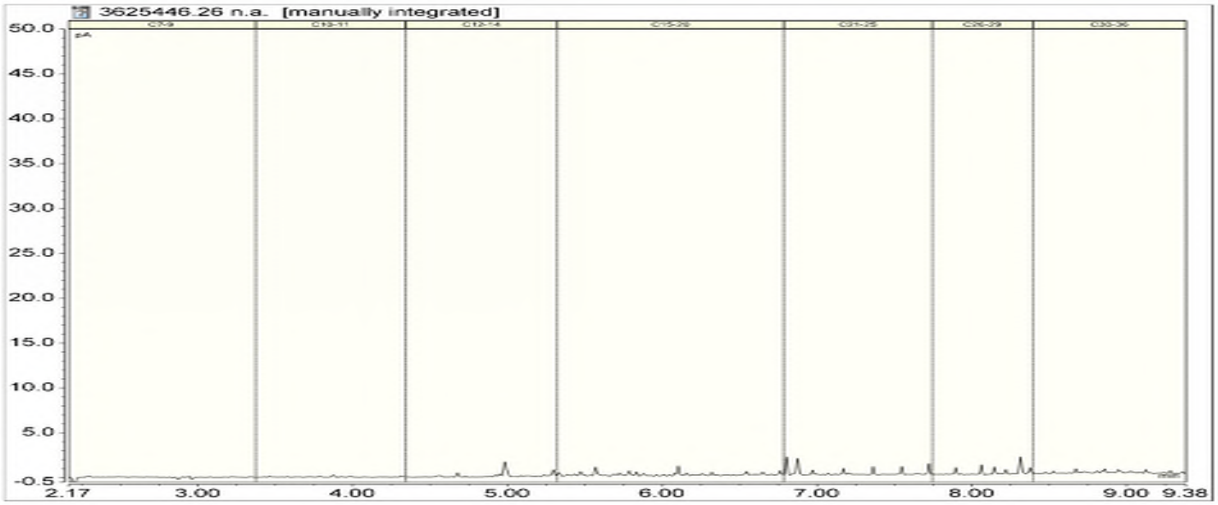
3625446.18
PP20_0.05 11-Jul-2024
Client Chromatogram for TPH by FID



3625446.20
PP20_0.2 11-Jul-2024
Client Chromatogram for TPH by FID



3625446.26
BH05_0.4-0.5 11-Jul-2024
Client Chromatogram for TPH by FID



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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 6, 8, 11, 13, 19, 24, 26-27
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	1, 3, 6, 8, 11, 13, 19
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	1, 3, 6, 8, 11, 13, 19, 24, 26-27

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	1, 3, 6, 8, 11, 13, 19
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	1, 3, 6, 8, 11, 13, 19
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19, 24, 26-27
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	24, 26-27
Organochlorine/nitro&phosphorus Pest.s Screen in Soils, GCMS	Sonication extraction, GC-ECD and GC-MS analysis. In-house based on US EPA 8081 and US EPA 8270.	0.010 - 0.2 mg/kg dry wt	11, 13
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	24, 26-27
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 6, 8, 11, 13, 18, 20, 26
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19, 24, 26-27
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19, 24, 26-27
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19, 24, 26-27
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 6, 8, 11, 13, 19, 24, 26-27

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	18, 20
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	18, 20
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	18, 20
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	18, 20
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	18, 20
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	18, 20
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	18, 20
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	18, 20
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	18, 20
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	18, 20
Total Petroleum Hydrocarbons in Rock			
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	18, 20

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	18, 20
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	18, 20
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	18, 20

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

Testing was completed between 12-Jul-2024 and 23-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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



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

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mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3628493 SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	16-Jul-2024 26-Jul-2024 129425 3338703/800 Maisie Hopkins

Sample Type: Soil

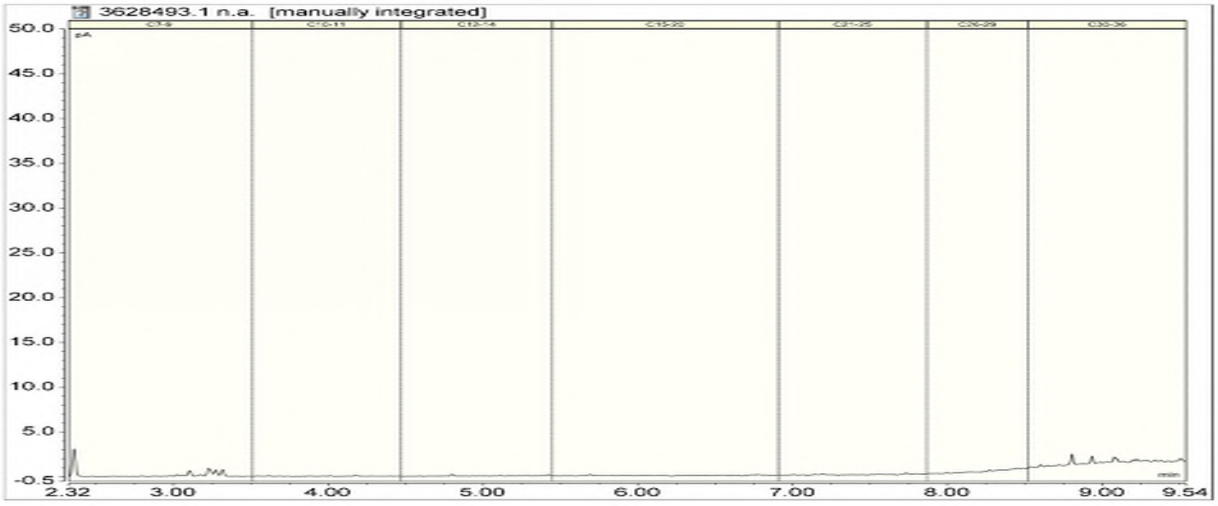
		Sample Name:	PP25_0.2 16-Jul-2024	PP01_0.1 16-Jul-2024	IP12_0.05 15-Jul-2024	IP12_0.5 15-Jul-2024
		Lab Number:	3628493.2	3628493.7	3628493.12	3628493.14
Individual Tests						
Dry Matter	g/100g as rcvd		95	94	85	97
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt		4	3	3	4
Total Recoverable Cadmium	mg/kg dry wt		0.22	0.38	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		12	12	13	14
Total Recoverable Copper	mg/kg dry wt		11	7	11	5
Total Recoverable Lead	mg/kg dry wt		93	47	70	14.0
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		9	9	7	11
Total Recoverable Zinc	mg/kg dry wt		55	41	67	41
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt		0.5	< 0.3	1.0	< 0.3
1-Methylnaphthalene	mg/kg dry wt		< 0.011	< 0.011	0.014	< 0.011
2-Methylnaphthalene	mg/kg dry wt		< 0.011	< 0.011	0.013	< 0.011
Acenaphthylene	mg/kg dry wt		0.012	< 0.011	0.015	< 0.011
Acenaphthene	mg/kg dry wt		< 0.011	< 0.011	< 0.012	< 0.011
Anthracene	mg/kg dry wt		0.011	< 0.011	0.016	< 0.011
Benzo[a]anthracene	mg/kg dry wt		0.033	< 0.011	0.061	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt		0.037	< 0.011	0.075	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		0.056	< 0.025	0.109	< 0.025
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		0.056	< 0.025	0.108	< 0.025
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		0.043	< 0.011	0.083	< 0.011
Benzo[e]pyrene	mg/kg dry wt		0.022	< 0.011	0.044	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt		0.022	< 0.011	0.044	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt		0.017	< 0.011	0.035	< 0.011
Chrysene	mg/kg dry wt		0.034	< 0.011	0.067	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.011	< 0.011	< 0.012	< 0.011
Fluoranthene	mg/kg dry wt		0.072	< 0.011	0.153	< 0.011
Fluorene	mg/kg dry wt		< 0.011	< 0.011	< 0.012	< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		0.023	< 0.011	0.048	< 0.011
Naphthalene	mg/kg dry wt		< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt		< 0.011	< 0.011	0.016	< 0.011
Phenanthrene	mg/kg dry wt		0.052	< 0.011	0.096	< 0.011
Pyrene	mg/kg dry wt		0.072	< 0.011	0.150	< 0.011

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

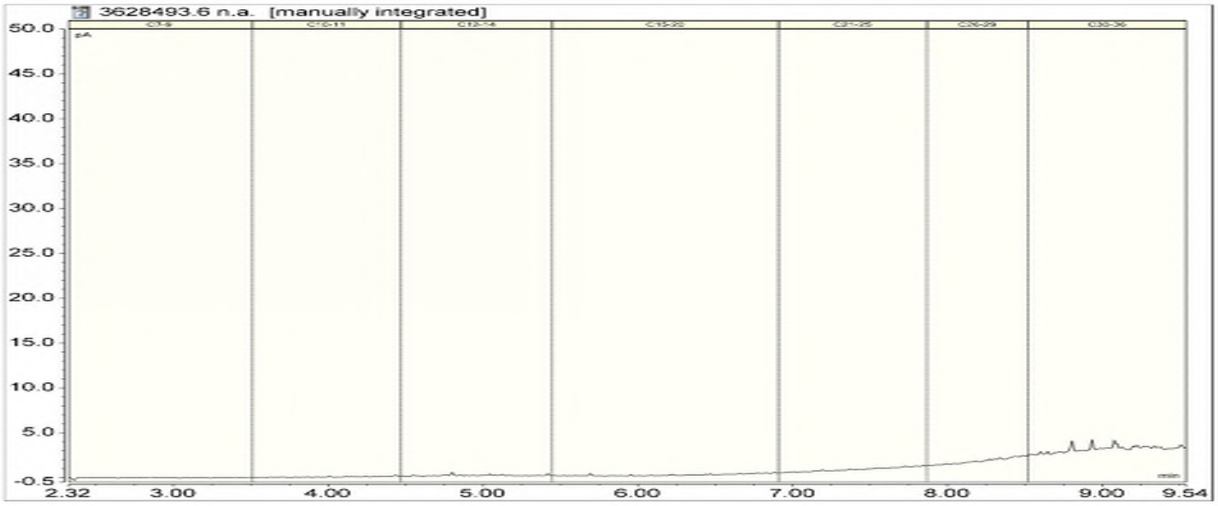
Sample Type: Soil					
Sample Name:		PP25_0.2 16-Jul-2024	PP01_0.1 16-Jul-2024	IP12_0.05 15-Jul-2024	IP12_0.5 15-Jul-2024
Lab Number:		3628493.2	3628493.7	3628493.12	3628493.14
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	78	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	83	< 80

Sample Type: Roading Material				
Sample Name:		PP25_0.1 16-Jul-2024	PP01_0.05 16-Jul-2024	PP01_0.40 16-Jul-2024
Lab Number:		3628493.1	3628493.6	3628493.9
Individual Tests				
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*				
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	5	3	6
Total Recoverable Copper	mg/kg as rcvd	8 #1	4	4
Total Recoverable Lead	mg/kg as rcvd	52 #1	55	29
Total Recoverable Nickel	mg/kg as rcvd	3	3	5
Total Recoverable Zinc	mg/kg as rcvd	29	24	23
Polycyclic Aromatic Hydrocarbons Screening in Rock*				
1-Methylnaphthalene*	mg/kg as rcvd	< 0.10	0.52	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	< 0.15	0.59	< 0.15
Acenaphthylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24	< 0.24	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	< 0.3	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Benzo[e]pyrene*	mg/kg as rcvd	0.12	0.12	< 0.10
Benzo[g,h,i]perylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10	0.11	< 0.10
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	< 0.10	0.28	< 0.10
Pyrene*	mg/kg as rcvd	< 0.10	0.10	< 0.10
Total of Reported PAHs*	mg/kg as rcvd	< 3	3	< 3
Total Petroleum Hydrocarbons in Rock*				
C7 - C9*	mg/kg as rcvd	< 140	< 140	151
C10 - C14*	mg/kg as rcvd	< 120	157	< 120
C15 - C36*	mg/kg as rcvd	1,110	3,000	340
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	1,230	3,200	500

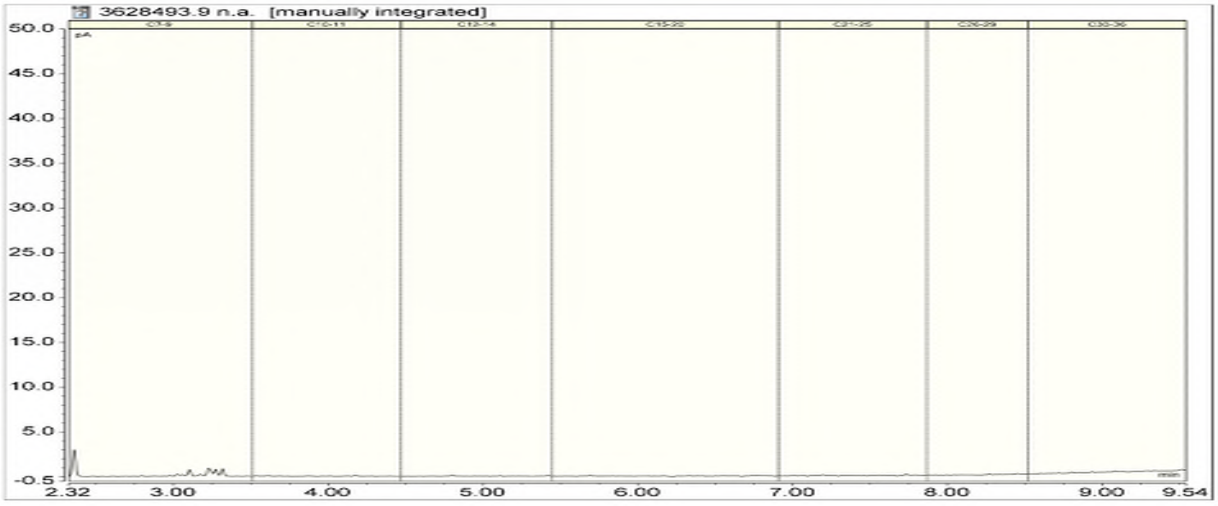
3628493.1
PP25_0.1 16-Jul-2024
Client Chromatogram for TPH by FID



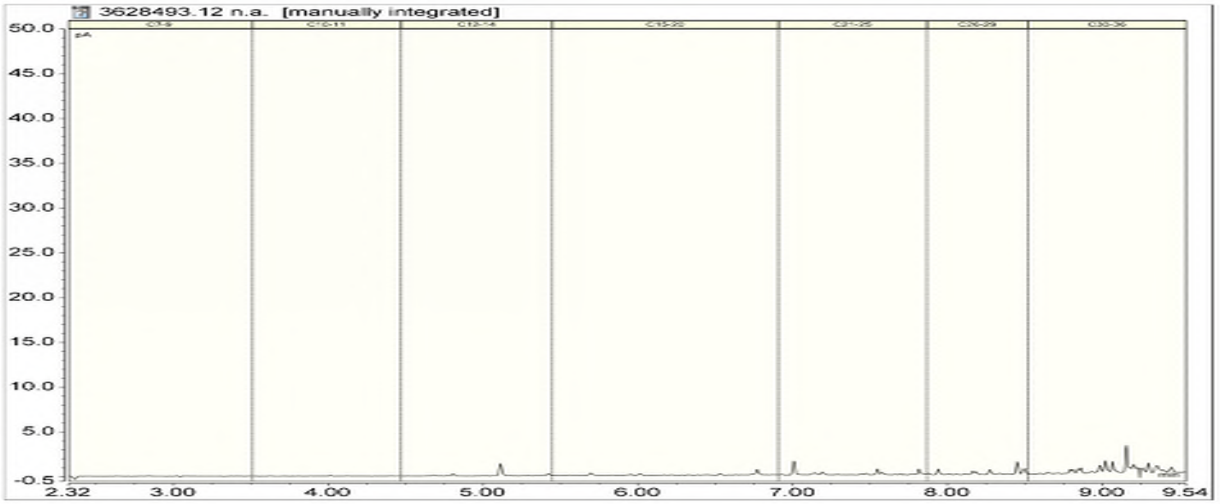
3628493.6
PP01_0.05 16-Jul-2024
Client Chromatogram for TPH by FID



3628493.9
PP01_0.40 16-Jul-2024
Client Chromatogram for TPH by FID



3628493.12
IP12_0.05 15-Jul-2024
Client Chromatogram for TPH by FID



Analyst's Comments

#1 It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample.

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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 7, 12, 14
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	2, 7, 12, 14
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	2, 7, 12, 14
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	2, 7, 12, 14
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	2, 7, 12, 14
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 7, 12, 14
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 7, 12, 14
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7, 12, 14
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7, 12, 14

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 7, 12, 14
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 7, 12, 14

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 6, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 6, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 6, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 6, 9
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 6, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 6, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 6, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 6, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 6, 9, 12
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 9
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 6, 9
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 6, 9
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 6, 9

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

Testing was completed between 17-Jul-2024 and 26-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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



Kim Harrison MSc
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3629426	A2Pv1
Contact:	Stuart Caird	**Date Received:**	17-Jul-2024	
	C/- Beca Limited	**Date Reported:**	22-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP24_0.1 17-Jul-2024	TP24_0.5 17-Jul-2024	TP26_0.1 17-Jul-2024	TP26_0.5 17-Jul-2024	TP28_0.1 17-Jul-2024
Lab Number:		3629426.1	3629426.3	3629426.6	3629426.8	3629426.11
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	684.0	824.7	690.5	823.2	681.1
Dry Weight	g	509.7	671.8	521.3	708.0	497.0
Moisture*	%	25	19	25	14	27
Sample Fraction >10mm	g dry wt	< 0.1	< 0.1	16.9	< 0.1	6.2
Sample Fraction <10mm to >2mm	g dry wt	7.0	12.5	30.3	26.5	36.6
Sample Fraction <2mm	g dry wt	501.5	658.1	473.0	680.1	452.7
<2mm Subsample Weight	g dry wt	52.6	53.0	54.6	57.7	55.3
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		TP28_0.5 17-Jul-2024	TP32_0.1 17-Jul-2024	TP32_0.5 17-Jul-2024	TP31_0.1 17-Jul-2024	TP31_0.5 17-Jul-2024
Lab Number:		3629426.13	3629426.16	3629426.18	3629426.21	3629426.23
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	1,134.5	729.2	765.7	800.5	795.7
Dry Weight	g	1,082.2	612.0	699.1	692.9	737.6
Moisture*	%	5	16	9	13	7

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

Sample Type: Soil						
Sample Name:		TP28_0.5 17-Jul-2024	TP32_0.1 17-Jul-2024	TP32_0.5 17-Jul-2024	TP31_0.1 17-Jul-2024	TP31_0.5 17-Jul-2024
Lab Number:		3629426.13	3629426.16	3629426.18	3629426.21	3629426.23
Sample Fraction >10mm	g dry wt	569.6	53.4	38.3	63.5	53.8
Sample Fraction <10mm to >2mm	g dry wt	334.9	90.9	13.0	137.8	115.8
Sample Fraction <2mm	g dry wt	176.8	466.6	645.9	490.1	566.8
<2mm Subsample Weight	g dry wt	56.7	56.4	53.2	50.2	55.7
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		TP30_0.1 17-Jul-2024	TP30_0.5 17-Jul-2024	TP27_0.1 17-Jul-2024	TP27_0.5 17-Jul-2024	TP23_0.1 17-Jul-2024
Lab Number:		3629426.27	3629426.29	3629426.32	3629426.34	3629426.37
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	746.5	1,124.5	809.6	841.3	636.8
Dry Weight	g	592.1	1,092.1	708.4	713.7	504.8
Moisture*	%	21	3	12	15	21
Sample Fraction >10mm	g dry wt	9.4	373.4	175.0	56.3	< 0.1
Sample Fraction <10mm to >2mm	g dry wt	39.7	405.9	121.1	73.4	9.5
Sample Fraction <2mm	g dry wt	541.8	312.0	411.3	582.9	494.0
<2mm Subsample Weight	g dry wt	52.3	52.5	59.9	55.5	56.3
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		TP23_0.5 17-Jul-2024
Lab Number:		3629426.39
Asbestos Presence / Absence		Asbestos NOT detected.
Description of Asbestos Form		-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001
As Received Weight	g	1,112.9
Dry Weight	g	1,060.4
Moisture*	%	5
Sample Fraction >10mm	g dry wt	438.3
Sample Fraction <10mm to >2mm	g dry wt	317.3
Sample Fraction <2mm	g dry wt	304.3
<2mm Subsample Weight	g dry wt	53.1
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001

Sample Type: Soil		
Sample Name:		TP23_0.5 17-Jul-2024
Lab Number:		3629426.39
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001

Glossary of Terms

• Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
• Trace - Trace levels of asbestos, as defined by AS4964-2004.
For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

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**
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 6, 8, 11, 13, 16, 18, 21, 23, 27, 29, 32, 34, 37, 39

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

Testing was completed on 22-Jul-2024. 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.

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Team Leader - Asbestos

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3630077 SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	18-Jul-2024 29-Jul-2024 129425 Rolleston 3338703/800 Stuart Caird

Sample Type: Soil

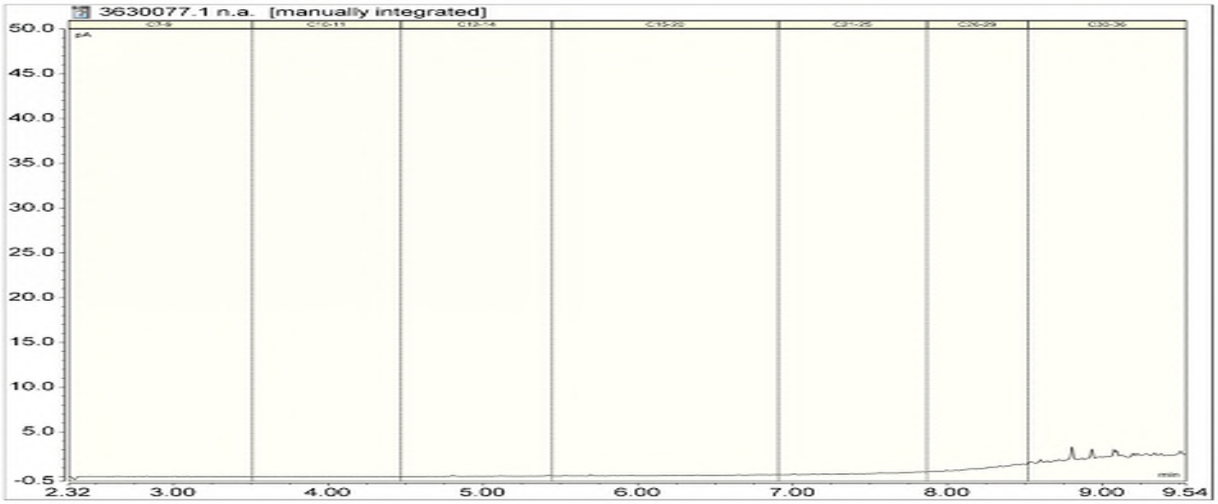
		Sample Name:	PP24_0.15 18-Jul-2024	DUP_J 18-Jul-2024
		Lab Number:	3630077.2	3630077.7
Individual Tests				
Dry Matter	g/100g as rcvd		96	96
Heavy Metals with Mercury, Screen Level				
Total Recoverable Arsenic	mg/kg dry wt		4	4
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		13	14
Total Recoverable Copper	mg/kg dry wt		7	7
Total Recoverable Lead	mg/kg dry wt		15.3	14.9
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		10	10
Total Recoverable Zinc	mg/kg dry wt		43	42
Polycyclic Aromatic Hydrocarbons Screening in Soil*				
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt		< 0.011	< 0.010
2-Methylnaphthalene	mg/kg dry wt		< 0.017	< 0.010
Acenaphthylene	mg/kg dry wt		< 0.011	< 0.010
Acenaphthene	mg/kg dry wt		< 0.011	< 0.010
Anthracene	mg/kg dry wt		< 0.011	< 0.010
Benzo[a]anthracene	mg/kg dry wt		< 0.011	< 0.010
Benzo[a]pyrene (BAP)	mg/kg dry wt		< 0.011	< 0.010
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.025	< 0.025
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.025	< 0.025
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		< 0.011	< 0.010
Benzo[e]pyrene	mg/kg dry wt		< 0.011	< 0.010
Benzo[g,h,i]perylene	mg/kg dry wt		< 0.011	< 0.010
Benzo[k]fluoranthene	mg/kg dry wt		< 0.011	< 0.010
Chrysene	mg/kg dry wt		< 0.011	< 0.010
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.011	< 0.010
Fluoranthene	mg/kg dry wt		< 0.011	< 0.010
Fluorene	mg/kg dry wt		< 0.011	< 0.010
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		< 0.011	< 0.010
Naphthalene	mg/kg dry wt		< 0.06	< 0.05
Perylene	mg/kg dry wt		< 0.011	< 0.010
Phenanthrene	mg/kg dry wt		< 0.011	< 0.010
Pyrene	mg/kg dry wt		< 0.011	< 0.010

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The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

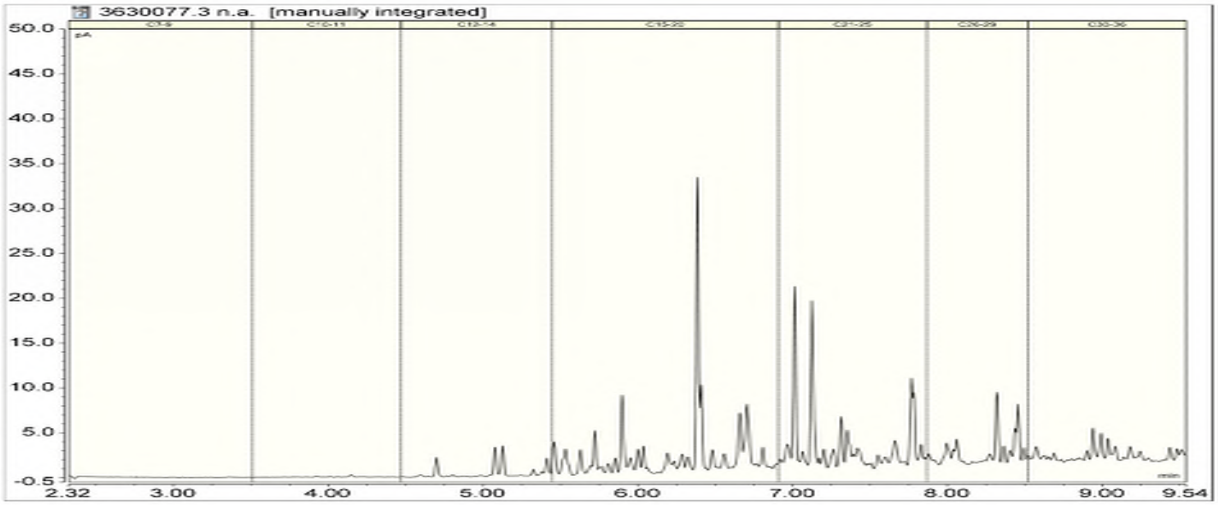
Sample Type: Soil				
Sample Name:		PP24_0.15 18-Jul-2024	DUP_J 18-Jul-2024	
Lab Number:		3630077.2	3630077.7	
Total Petroleum Hydrocarbons in Soil				
C7 - C9	mg/kg dry wt	< 20	< 20	
C10 - C14	mg/kg dry wt	< 20	< 20	
C15 - C36	mg/kg dry wt	< 40	< 40	
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	

Sample Type: Roading Material			
Sample Name:		PP24_0.05 18-Jul-2024	PP24_0.25 18-Jul-2024
Lab Number:		3630077.1	3630077.3
Individual Tests			
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*			
Total Recoverable Arsenic	mg/kg as rcvd	< 2	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	0.10
Total Recoverable Chromium	mg/kg as rcvd	3	5
Total Recoverable Copper	mg/kg as rcvd	11	7
Total Recoverable Lead	mg/kg as rcvd	102	150
Total Recoverable Nickel	mg/kg as rcvd	5	4
Total Recoverable Zinc	mg/kg as rcvd	28	29
Polycyclic Aromatic Hydrocarbons Screening in Rock*			
1-Methylnaphthalene*	mg/kg as rcvd	0.13	37
2-Methylnaphthalene*	mg/kg as rcvd	< 0.10	36
Acenaphthylene*	mg/kg as rcvd	< 0.10	22
Acenaphthene*	mg/kg as rcvd	0.16	25
Anthracene*	mg/kg as rcvd	0.11	96
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	109
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10	88
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24	130
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	128
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	< 0.10	86
Benzo[e]pyrene*	mg/kg as rcvd	0.14	39
Benzo[g,h,i]perylene*	mg/kg as rcvd	< 0.10	34
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	37
Chrysene*	mg/kg as rcvd	0.13	89
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	11.8
Fluoranthene*	mg/kg as rcvd	0.46	230
Fluorene*	mg/kg as rcvd	0.11	98
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	41
Naphthalene*	mg/kg as rcvd	< 0.5	28
Perylene*	mg/kg as rcvd	< 0.10	16.9
Phenanthrene*	mg/kg as rcvd	0.61	370
Pyrene*	mg/kg as rcvd	0.44	220
Total of Reported PAHs*	mg/kg as rcvd	3	1,710
Total Petroleum Hydrocarbons in Rock*			
C7 - C9*	mg/kg as rcvd	< 140	< 140
C10 - C14*	mg/kg as rcvd	< 120	220
C15 - C36*	mg/kg as rcvd	1,740	5,800
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	1,740	6,000

3630077.1
PP24_0.05 18-Jul-2024
Client Chromatogram for TPH by FID



3630077.3
PP24_0.25 18-Jul-2024
Client Chromatogram for TPH by FID



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**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 7
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	2, 7
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	2, 7

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	2, 7
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	2, 7
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2, 7
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 7
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 7
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 7
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 7

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 3
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 3
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 3
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 3
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 3
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 3
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 3
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 3
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 3
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 3
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 3
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 3
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 3
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 3
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 3
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 3

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

Testing was completed between 19-Jul-2024 and 29-Jul-2024. 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.

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Kim Harrison MSc
Client Services Manager - Environmental

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Christchurch 8024 New Zealand

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3631688	A2Pv1
Contact:	Stuart Caird	**Date Received:**	19-Jul-2024	
	C/- Beca Limited	**Date Reported:**	24-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP02_0.1 19-Jul-2024	TP02_0.5 19-Jul-2024	TP04_0.1 19-Jul-2024	TP04_0.5 19-Jul-2024	TP04_1.0 19-Jul-2024
Lab Number:		3631688.1	3631688.3	3631688.7	3631688.8	3631688.10
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	655.8	1,047.2	1,107.4	1,033.0	1,144.6
Dry Weight	g	551.3	985.8	1,055.5	952.5	1,090.8
Moisture*	%	16	6	5	8	5
Sample Fraction >10mm	g dry wt	1.3	448.3	509.8	402.3	533.6
Sample Fraction <10mm to >2mm	g dry wt	11.4	352.0	357.3	315.7	281.3
Sample Fraction <2mm	g dry wt	532.9	184.4	187.1	233.4	274.7
<2mm Subsample Weight	g dry wt	50.9	50.5	53.0	52.9	58.0
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		TP04_1.3 19-Jul-2024	TP04_1.5 19-Jul-2024
Lab Number:		3631688.11	3631688.12
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001
As Received Weight	g	885.1	1,042.7
Dry Weight	g	744.2	964.2
Moisture*	%	16	8
Sample Fraction >10mm	g dry wt	6.4	344.2

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

Sample Type: Soil			
Sample Name:		TP04_1.3 19-Jul-2024	TP04_1.5 19-Jul-2024
Lab Number:		3631688.11	3631688.12
Sample Fraction <10mm to >2mm	g dry wt	26.4	390.7
Sample Fraction <2mm	g dry wt	710.3	226.4
<2mm Subsample Weight	g dry wt	53.5	54.1
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001

Glossary of Terms
• Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
• Trace - Trace levels of asbestos, as defined by AS4964-2004.
For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

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**
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 7-8, 10-12
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 7-8, 10-12
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 7-8, 10-12
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 7-8, 10-12
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 7-8, 10-12
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 7-8, 10-12
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 7-8, 10-12
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 7-8, 10-12
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 7-8, 10-12
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 7-8, 10-12
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 7-8, 10-12

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

Testing was completed on 24-Jul-2024. 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.

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Laboratory Technician - Asbestos

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3636372	A2Pv1
Contact:	Stuart Caird	**Date Received:**	26-Jul-2024	
	C/- Beca Limited	**Date Reported:**	31-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Maisie Hopkins	

Sample Type: Soil

		Sample Name:	PP10_0.70 26-Jul-2024	PP10_1.05 26-Jul-2024
		Lab Number:	3636372.3	3636372.4
Asbestos Presence / Absence			Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form			-	-
Asbestos in ACM as % of Total Sample*	% w/w		< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w		< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w		< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w		< 0.001	< 0.001
As Received Weight	g		546.3	620.1
Dry Weight	g		445.1	489.9
Moisture*	%		19	21
Sample Fraction >10mm	g dry wt		79.6	71.6
Sample Fraction <10mm to >2mm	g dry wt		176.0	94.5
Sample Fraction <2mm	g dry wt		188.4	322.2
<2mm Subsample Weight	g dry wt		51.0	55.6
Weight of Asbestos in ACM (Non-Friable)	g dry wt		< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt		< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt		< 0.00001	< 0.00001

Glossary of Terms

• Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
• Trace - Trace levels of asbestos, as defined by AS4964-2004.
For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

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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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	3-4
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	3-4
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	3-4
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	3-4
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	3-4
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	3-4
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	3-4
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	3-4
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3-4
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-4
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3-4
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-4
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3-4
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-4
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3-4

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

Testing was completed on 31-Jul-2024. 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.

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3633918	A2Pv1
Contact:	Stuart Caird	**Date Received:**	23-Jul-2024	
	C/- Beca Limited	**Date Reported:**	29-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP16-0.1 23-Jul-2024	TP16-0.5 23-Jul-2024	TP17-0.1 23-Jul-2024	TP17-0.5 23-Jul-2024
Lab Number:		3633918.1	3633918.3	3633918.8	3633918.10
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	1,045.6	1,121.2	1,057.8	848.1
Dry Weight	g	1,015.7	1,078.3	1,026.2	733.1
Moisture*	%	3	4	3	14
Sample Fraction >10mm	g dry wt	472.2	462.8	505.4	6.5
Sample Fraction <10mm to >2mm	g dry wt	424.1	324.8	410.6	19.9
Sample Fraction <2mm	g dry wt	118.8	289.8	109.6	704.5
<2mm Subsample Weight	g dry wt	59.2	57.2	51.2	55.8
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Glossary of Terms

- Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
- Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
- ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
- ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
- Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
- Trace - Trace levels of asbestos, as defined by AS4964-2004.

For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

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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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 8, 10
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 8, 10
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 8, 10
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10

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

Testing was completed between 26-Jul-2024 and 29-Jul-2024. For completion dates of individual analyses please contact the laboratory.

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

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



Dexter Paguirigan Dip Chem Engineering Tech
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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3631687	SPv1
Contact:	Stuart Caird	**Date Received:**	19-Jul-2024	
	C/- Beca Limited	**Date Reported:**	26-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP02_0.1 19-Jul-2024	TP02_0.5 19-Jul-2024	TP04_0.1 19-Jul-2024	TP04_0.5 19-Jul-2024	TP04_1.0 19-Jul-2024
Lab Number:		3631687.1	3631687.3	3631687.7	3631687.8	3631687.10
Individual Tests						
Dry Matter	g/100g as rcvd	79	91	94	89	89
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	4	4	4	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	15	14	14	13
Total Recoverable Copper	mg/kg dry wt	9	4	15	11	5
Total Recoverable Lead	mg/kg dry wt	25	14.9	35	67	12.7
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	7	9	11	11	10
Total Recoverable Zinc	mg/kg dry wt	49	56	51	64	32
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05
Toluene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05
Ethylbenzene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05
m&p-Xylene	mg/kg dry wt	< 0.11	< 0.10	< 0.10	< 0.10	< 0.10
o-Xylene	mg/kg dry wt	< 0.06	< 0.05	< 0.05	< 0.05	< 0.05
Haloethers Trace in SVOC Soil Samples by GC-MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS						
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
2,4-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS						
Aldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

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The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil						
Sample Name:		TP02_0.1 19-Jul-2024	TP02_0.5 19-Jul-2024	TP04_0.1 19-Jul-2024	TP04_0.5 19-Jul-2024	TP04_1.0 19-Jul-2024
Lab Number:		3631687.1	3631687.3	3631687.7	3631687.8	3631687.10
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS						
Dieldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Endrin	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Heptachlor	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*						
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.33	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.33	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.35	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.14	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.14	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.39	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.60	< 0.10
Fluorene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.17	< 0.10
2-Methylnaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.37	< 0.10
Pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.67	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	0.48	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	0.48	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6	< 6	< 6	< 6
Phenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Plasticisers Trace in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

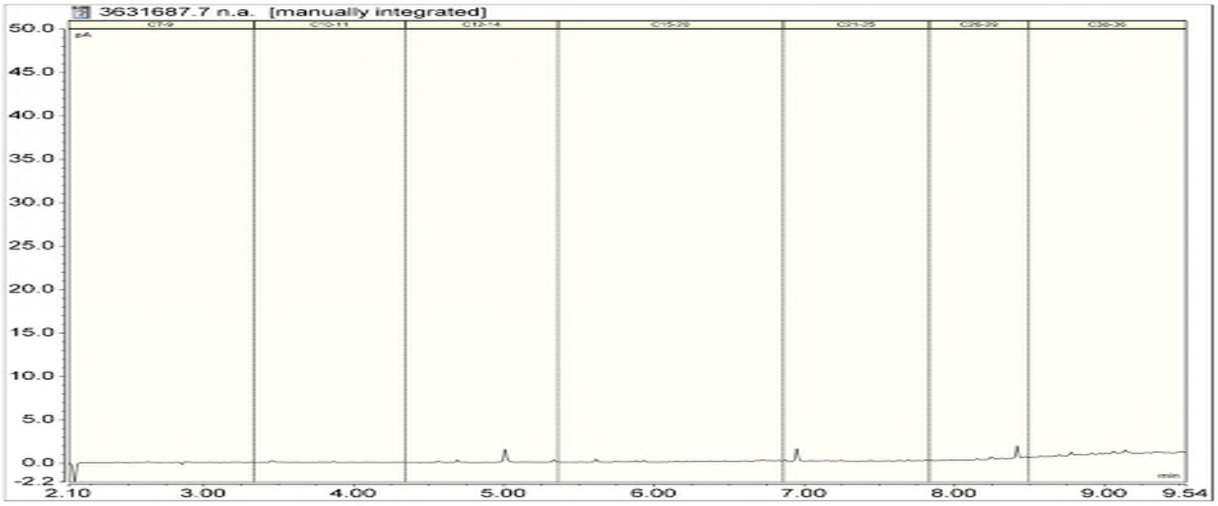
Sample Type: Soil						
Sample Name:		TP02_0.1 19-Jul-2024	TP02_0.5 19-Jul-2024	TP04_0.1 19-Jul-2024	TP04_0.5 19-Jul-2024	TP04_1.0 19-Jul-2024
Lab Number:		3631687.1	3631687.3	3631687.7	3631687.8	3631687.10
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
1,3-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
1,4-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
Hexachlorobutadiene	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
Hexachloroethane	mg/kg dry wt	< 0.14	< 0.12	< 0.12	< 0.12	< 0.13
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Other SVOC Trace in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Carbazole	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Isophorone	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	85	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	85	< 80	< 80

Sample Name:		TP04_1.3 19-Jul-2024	TP04_1.5 19-Jul-2024
Lab Number:		3631687.11	3631687.12
Individual Tests			
Dry Matter	g/100g as rcvd	84	86
Total Cyanide*	mg/kg dry wt	< 0.10	< 0.10
Heavy Metals with Mercury, Screen Level			
Total Recoverable Arsenic	mg/kg dry wt	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	13	12
Total Recoverable Copper	mg/kg dry wt	3	3
Total Recoverable Lead	mg/kg dry wt	12.0	11.6
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	8	8
Total Recoverable Zinc	mg/kg dry wt	48	49
BTEX in Soil by Headspace GC-MS			
Benzene	mg/kg dry wt	< 0.05	< 0.05
Toluene	mg/kg dry wt	< 0.05	< 0.05
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10
o-Xylene	mg/kg dry wt	< 0.05	< 0.05
Haloethers Trace in SVOC Soil Samples by GC-MS			
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.10	< 0.10
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS			
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.13	< 0.13
2,4-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.13	< 0.13
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS			
Aldrin	mg/kg dry wt	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	< 0.10	< 0.10

Sample Type: Soil			
Sample Name:		TP04_1.3 19-Jul-2024	TP04_1.5 19-Jul-2024
Lab Number:		3631687.11	3631687.12
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS			
gamma-BHC (Lindane)	mg/kg dry wt	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	< 0.2	< 0.2
Dieldrin	mg/kg dry wt	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	< 0.2	< 0.2
Endrin	mg/kg dry wt	< 0.13	< 0.13
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2
Heptachlor	mg/kg dry wt	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*			
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10
Anthracene	mg/kg dry wt	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	< 0.10	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.10	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.10	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10
Chrysene	mg/kg dry wt	< 0.10	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	< 0.10	< 0.10
Fluorene	mg/kg dry wt	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.10	< 0.10
2-Methylnaphthalene	mg/kg dry wt	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	< 0.10	< 0.10
Pyrene	mg/kg dry wt	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.25	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.25	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS			
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.5	< 0.5
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.4	< 0.4
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6
Phenol	mg/kg dry wt	< 0.2	< 0.2
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2
Plasticisers Trace in SVOC Soil Samples by GC-MS			
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2

Sample Type: Soil			
Sample Name:		TP04_1.3 19-Jul-2024	TP04_1.5 19-Jul-2024
Lab Number:		3631687.11	3631687.12
Plasticisers Trace in SVOC Soil Samples by GC-MS			
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS			
1,2-Dichlorobenzene	mg/kg dry wt	< 0.13	< 0.13
1,3-Dichlorobenzene	mg/kg dry wt	< 0.13	< 0.13
1,4-Dichlorobenzene	mg/kg dry wt	< 0.13	< 0.13
Hexachlorobutadiene	mg/kg dry wt	< 0.13	< 0.13
Hexachloroethane	mg/kg dry wt	< 0.13	< 0.13
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10
Other SVOC Trace in SVOC Soil Samples by GC-MS			
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0
Carbazole	mg/kg dry wt	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	< 0.10	< 0.10
Isophorone	mg/kg dry wt	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil			
C7 - C9	mg/kg dry wt	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80

3631687.7
TP04_0.1 19-Jul-2024
Client Chromatogram for TPH by FID



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**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 7-8, 10-12
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	1, 3, 7-8, 10-12
Total Cyanide Distillation*	Distillation of sample as received. APHA 4500-CN^- C (modified) : Online Edition.	-	11-12

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Cyanide*	Distillation, colorimetry. APHA 4500-CN^- C (modified) : Online Edition & Skalar Method I295-004(+P14). ISO 14403:2012(E).	0.10 mg/kg dry wt	11-12
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 7-8, 10-12
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	1, 3, 7-8, 10-12
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	1, 3, 7-8, 10-12
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	7
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 7-8, 10-12
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 7-8, 10-12
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 7-8, 10-12
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 7-8, 10-12

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

Testing was completed between 22-Jul-2024 and 26-Jul-2024. 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.

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3635582	SPv2
Contact:	Stuart Caird	**Date Received:**	25-Jul-2024	
	C/- Beca Limited	**Date Reported:**	09-Aug-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

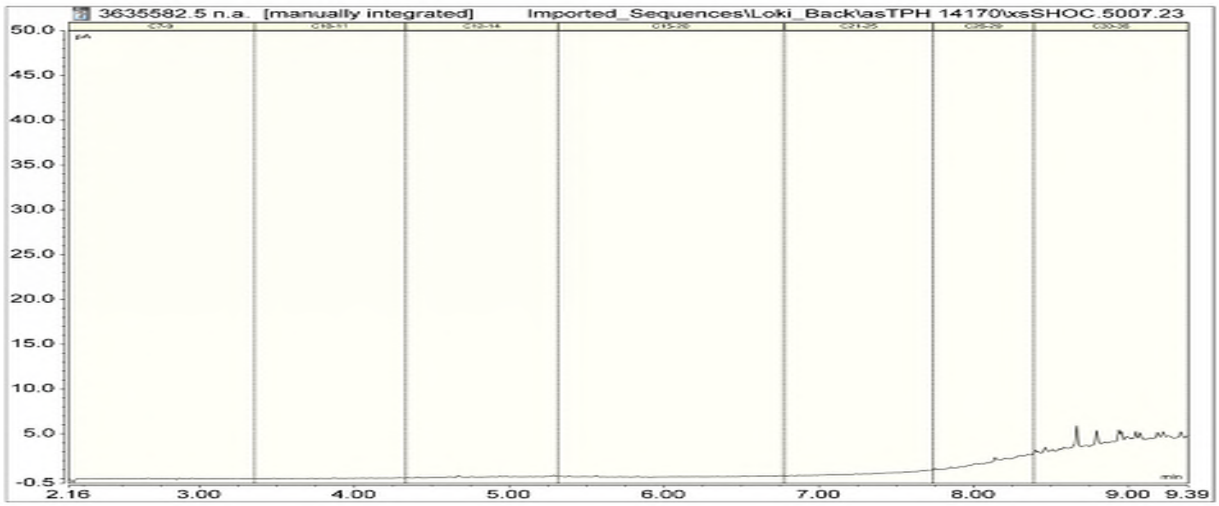
Sample Name:		UT12_0.1 25-Jul-2024	UT12_0.5 25-Jul-2024	PP09_0.15 25-Jul-2024	DUP_K 25-Jul-2024
Lab Number:		3635582.1	3635582.3	3635582.6	3635582.10
Individual Tests					
Dry Matter	g/100g as rcvd	88	89	96	95
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	4	3	5	5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	12	11	13	13
Total Recoverable Copper	mg/kg dry wt	10	8	8	9
Total Recoverable Lead	mg/kg dry wt	62	48	13.1	14.1
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	10	8	10	10
Total Recoverable Zinc	mg/kg dry wt	84	67	39	43
BTEX in Soil by Headspace GC-MS					
Benzene	mg/kg dry wt	< 0.05	< 0.05	-	-
Toluene	mg/kg dry wt	< 0.05	< 0.05	-	-
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	-	-
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	-	-
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	0.3	0.4	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
2-Methylnaphthalene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
Acenaphthylene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
Acenaphthene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
Anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
Benzo[a]anthracene	mg/kg dry wt	0.018	0.022	< 0.011	< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.028	0.031	< 0.011	< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.037	0.042	< 0.025	< 0.025
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.036	0.041	< 0.025	< 0.025
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.033	0.038	< 0.011	< 0.011
Benzo[e]pyrene	mg/kg dry wt	0.017	0.018	< 0.011	< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt	0.019	0.017	< 0.011	< 0.011
Benzo[k]fluoranthene	mg/kg dry wt	0.012	0.015	< 0.011	< 0.011
Chrysene	mg/kg dry wt	0.026	0.031	< 0.011	< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
Fluoranthene	mg/kg dry wt	0.053	0.064	< 0.011	< 0.011
Fluorene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011

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

Sample Type: Soil					
Sample Name:		UT12_0.1 25-Jul-2024	UT12_0.5 25-Jul-2024	PP09_0.15 25-Jul-2024	DUP_K 25-Jul-2024
Lab Number:		3635582.1	3635582.3	3635582.6	3635582.10
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.018	0.017	< 0.011	< 0.011
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	< 0.06	< 0.06
Perylene	mg/kg dry wt	< 0.012	< 0.011	< 0.011	< 0.011
Phenanthrene	mg/kg dry wt	0.036	0.050	0.012	< 0.011
Pyrene	mg/kg dry wt	0.054	0.064	< 0.011	< 0.011
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80

Sample Type: Roading Material		
Sample Name:		PP09_0.05 25-Jul-2024
Lab Number:		3635582.5
Individual Tests		
Total Recoverable Mercury*	mg/kg dry wt	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*		
Total Recoverable Arsenic	mg/kg as rcvd	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	3
Total Recoverable Copper	mg/kg as rcvd	4
Total Recoverable Lead	mg/kg as rcvd	5.9 #1
Total Recoverable Nickel	mg/kg as rcvd	3
Total Recoverable Zinc	mg/kg as rcvd	23 #1
Polycyclic Aromatic Hydrocarbons Screening in Rock*		
1-Methylnaphthalene*	mg/kg as rcvd	0.38
2-Methylnaphthalene*	mg/kg as rcvd	0.39
Acenaphthylene*	mg/kg as rcvd	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	0.10
Benzo[e]pyrene*	mg/kg as rcvd	0.12
Benzo[g,h,i]perylene*	mg/kg as rcvd	0.12
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5
Perylene*	mg/kg as rcvd	< 0.10
Phenanthrene*	mg/kg as rcvd	0.13
Pyrene*	mg/kg as rcvd	0.13
Total of Reported PAHs*	mg/kg as rcvd	< 3
Total Petroleum Hydrocarbons, Misc*		
C7 - C9*	mg/kg as rcvd	< 140
C10 - C14*	mg/kg as rcvd	< 120
C15 - C36*	mg/kg as rcvd	3,300
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	3,400

3635582.5
PP09_0.05 25-Jul-2024
Client Chromatogram for TPH by FID



Analyst's Comments

#1 It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample.

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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 6, 10
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	1, 3, 6, 10
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	1, 3, 6, 10
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	1, 3, 6, 10
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	1, 3, 6, 10
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	6, 10
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 6, 10
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.05 - 0.10 mg/kg dry wt	1, 3
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	1, 3
Total Petroleum Hydrocarbons in Soil			

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 10
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 6, 10
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 6, 10
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 6, 10

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	5
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	5
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	5
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	5
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	5
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	5
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	5
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	5
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	5
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	5
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	5
Total Petroleum Hydrocarbons, Misc			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	5
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	5
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	5
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	5
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	5

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

Testing was completed between 26-Jul-2024 and 01-Aug-2024. 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.

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3634746	A2Pv1
Contact:	Stuart Caird	**Date Received:**	24-Jul-2024	
	C/- Beca Limited	**Date Reported:**	29-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP18_0.1 24-Jul-2024	TP18_0.15 24-Jul-2024	TP18_0.5 24-Jul-2024	TP19_0.1 24-Jul-2024	TP19_0.5 24-Jul-2024
Lab Number:		3634746.1	3634746.2	3634746.4	3634746.9	3634746.11
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	1,075.9	912.3	869.8	1,029.4	899.7
Dry Weight	g	1,040.6	826.2	748.6	956.8	795.0
Moisture*	%	3	9	14	7	12
Sample Fraction >10mm	g dry wt	216.1	332.5	< 0.1	444.0	315.0
Sample Fraction <10mm to >2mm	g dry wt	528.5	198.8	1.6	285.8	294.4
Sample Fraction <2mm	g dry wt	295.1	293.8	744.4	225.9	184.4
<2mm Subsample Weight	g dry wt	50.1	57.8	57.0	50.3	54.3
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		IP10_0.1 24-Jul-2024	IP10_0.5 24-Jul-2024	IP10_0.7 24-Jul-2024
Lab Number:		3634746.16	3634746.18	3634746.19
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001
As Received Weight	g	1,056.4	830.5	776.0
Dry Weight	g	986.5	712.1	616.5
Moisture*	%	7	14	21
Sample Fraction >10mm	g dry wt	315.8	97.9	13.2

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Sample Type: Soil				
Sample Name:		IP10_0.1 24-Jul-2024	IP10_0.5 24-Jul-2024	IP10_0.7 24-Jul-2024
Lab Number:		3634746.16	3634746.18	3634746.19
Sample Fraction <10mm to >2mm	g dry wt	594.0	199.9	12.0
Sample Fraction <2mm	g dry wt	75.7	412.1	589.6
<2mm Subsample Weight	g dry wt	55.8	53.8	56.0
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001

Glossary of Terms
• Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
• Trace - Trace levels of asbestos, as defined by AS4964-2004.
For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

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**
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1-2, 4, 9, 11, 16, 18-19
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1-2, 4, 9, 11, 16, 18-19
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1-2, 4, 9, 11, 16, 18-19
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2, 4, 9, 11, 16, 18-19
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2, 4, 9, 11, 16, 18-19
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1-2, 4, 9, 11, 16, 18-19
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-2, 4, 9, 11, 16, 18-19
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1-2, 4, 9, 11, 16, 18-19

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2, 4, 9, 11, 16, 18-19
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2, 4, 9, 11, 16, 18-19
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2, 4, 9, 11, 16, 18-19
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2, 4, 9, 11, 16, 18-19
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2, 4, 9, 11, 16, 18-19
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2, 4, 9, 11, 16, 18-19
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2, 4, 9, 11, 16, 18-19

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

Testing was completed between 26-Jul-2024 and 29-Jul-2024. 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.

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3632808 SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	22-Jul-2024 29-Jul-2024 129425 Rolleston 338703/800 Stuart Caird

Sample Type: Soil

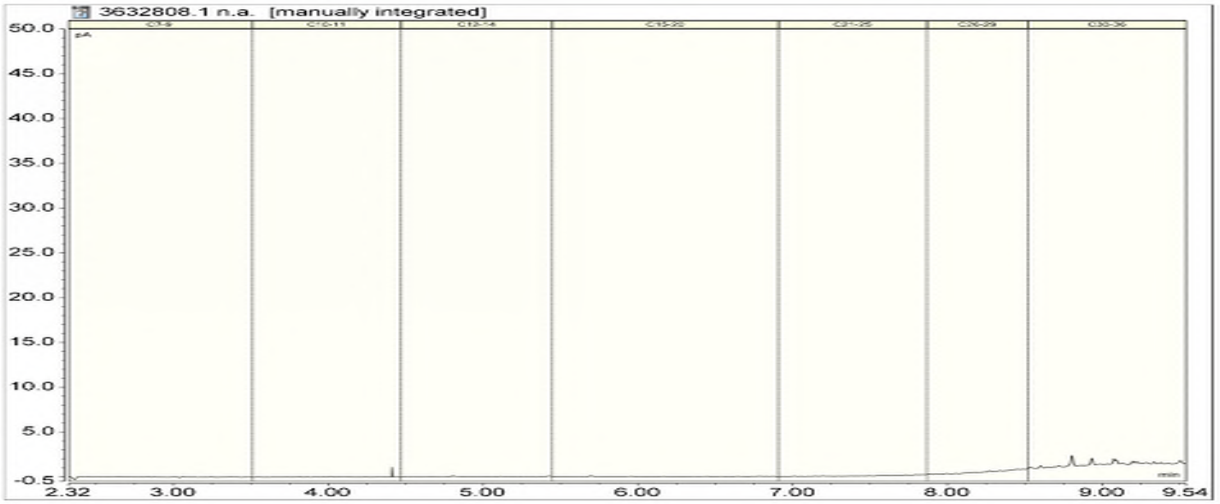
		Sample Name:	PP07_0.15 22-Jul-2024
		Lab Number:	3632808.2
Individual Tests			
Dry Matter	g/100g as rcvd		95
Heavy Metals with Mercury, Screen Level			
Total Recoverable Arsenic	mg/kg dry wt		3
Total Recoverable Cadmium	mg/kg dry wt		< 0.10
Total Recoverable Chromium	mg/kg dry wt		12
Total Recoverable Copper	mg/kg dry wt		5
Total Recoverable Lead	mg/kg dry wt		10.6
Total Recoverable Mercury	mg/kg dry wt		< 0.10
Total Recoverable Nickel	mg/kg dry wt		9
Total Recoverable Zinc	mg/kg dry wt		35
Polycyclic Aromatic Hydrocarbons Screening in Soil*			
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.3
1-Methylnaphthalene	mg/kg dry wt		< 0.011
2-Methylnaphthalene	mg/kg dry wt		< 0.017
Acenaphthylene	mg/kg dry wt		< 0.011
Acenaphthene	mg/kg dry wt		< 0.011
Anthracene	mg/kg dry wt		< 0.011
Benzo[a]anthracene	mg/kg dry wt		< 0.011
Benzo[a]pyrene (BAP)	mg/kg dry wt		< 0.011
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.025
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.025
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		< 0.011
Benzo[e]pyrene	mg/kg dry wt		< 0.011
Benzo[g,h,i]perylene	mg/kg dry wt		< 0.011
Benzo[k]fluoranthene	mg/kg dry wt		< 0.011
Chrysene	mg/kg dry wt		< 0.011
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.011
Fluoranthene	mg/kg dry wt		< 0.011
Fluorene	mg/kg dry wt		< 0.011
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		< 0.011
Naphthalene	mg/kg dry wt		< 0.06
Perylene	mg/kg dry wt		< 0.011
Phenanthrene	mg/kg dry wt		< 0.011
Pyrene	mg/kg dry wt		< 0.011

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Sample Type: Soil		
Sample Name:		PP07_0.15 22-Jul-2024
Lab Number:		3632808.2
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80

Sample Type: Roading Material		
Sample Name:		PP07_0.05 22-Jul-2024
Lab Number:		3632808.1
Individual Tests		
Total Recoverable Mercury*	mg/kg dry wt	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*		
Total Recoverable Arsenic	mg/kg as rcvd	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	4
Total Recoverable Copper	mg/kg as rcvd	8
Total Recoverable Lead	mg/kg as rcvd	8.6
Total Recoverable Nickel	mg/kg as rcvd	3
Total Recoverable Zinc	mg/kg as rcvd	36
Polycyclic Aromatic Hydrocarbons Screening in Rock*		
1-Methylnaphthalene*	mg/kg as rcvd	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	< 0.10
Acenaphthylene*	mg/kg as rcvd	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	< 0.10
Benzo[e]pyrene*	mg/kg as rcvd	0.11
Benzo[g,h,i]perylene*	mg/kg as rcvd	< 0.10
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5
Perylene*	mg/kg as rcvd	< 0.10
Phenanthrene*	mg/kg as rcvd	< 0.10
Pyrene*	mg/kg as rcvd	< 0.10
Total of Reported PAHs*	mg/kg as rcvd	< 3
Total Petroleum Hydrocarbons in Rock*		
C7 - C9*	mg/kg as rcvd	< 140
C10 - C14*	mg/kg as rcvd	< 120
C15 - C36*	mg/kg as rcvd	960
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	960

3632808.1
PP07_0.05 22-Jul-2024
Client Chromatogram for TPH by FID



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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2
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	2
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	2
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	2
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	2
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1

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

Testing was completed between 23-Jul-2024 and 29-Jul-2024. 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.

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Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3637648	SPv1
Contact:	Stuart Caird	**Date Received:**	29-Jul-2024	
	C/- Beca Limited	**Date Reported:**	05-Aug-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		TP22_0.1 29-Jul-2024	TP22_0.5 29-Jul-2024	UT13_0.1 29-Jul-2024	UT13_0.5 29-Jul-2024
Lab Number:		3637648.1	3637648.3	3637648.9	3637648.11
Individual Tests					
Dry Matter	g/100g as rcvd	95	87	83	86
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	4	< 2	6	4
Total Recoverable Cadmium	mg/kg dry wt	0.10	< 0.10	0.16	< 0.10
Total Recoverable Chromium	mg/kg dry wt	14	11	18	13
Total Recoverable Copper	mg/kg dry wt	10	2	14	12
Total Recoverable Lead	mg/kg dry wt	21	9.3	39	82
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.18
Total Recoverable Nickel	mg/kg dry wt	11	7	12	9
Total Recoverable Zinc	mg/kg dry wt	65	34	108	134
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	-	-	< 0.3	< 0.3
1-Methylnaphthalene	mg/kg dry wt	-	-	< 0.012	< 0.012
2-Methylnaphthalene	mg/kg dry wt	-	-	< 0.012	< 0.012
Acenaphthylene	mg/kg dry wt	-	-	< 0.012	< 0.012
Acenaphthene	mg/kg dry wt	-	-	< 0.012	< 0.012
Anthracene	mg/kg dry wt	-	-	< 0.012	< 0.012
Benzo[a]anthracene	mg/kg dry wt	-	-	0.014	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	0.023	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	-	0.030	< 0.027
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	-	0.029	< 0.027
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	0.025	< 0.012
Benzo[e]pyrene	mg/kg dry wt	-	-	0.015	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	0.017	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt	-	-	< 0.012	< 0.012
Chrysene	mg/kg dry wt	-	-	0.019	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	< 0.012	< 0.012
Fluoranthene	mg/kg dry wt	-	-	0.040	0.022
Fluorene	mg/kg dry wt	-	-	< 0.012	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	0.014	< 0.012
Naphthalene	mg/kg dry wt	-	-	< 0.06	< 0.06
Perylene	mg/kg dry wt	-	-	< 0.012	< 0.012
Phenanthrene	mg/kg dry wt	-	-	0.018	0.013
Pyrene	mg/kg dry wt	-	-	0.039	0.019

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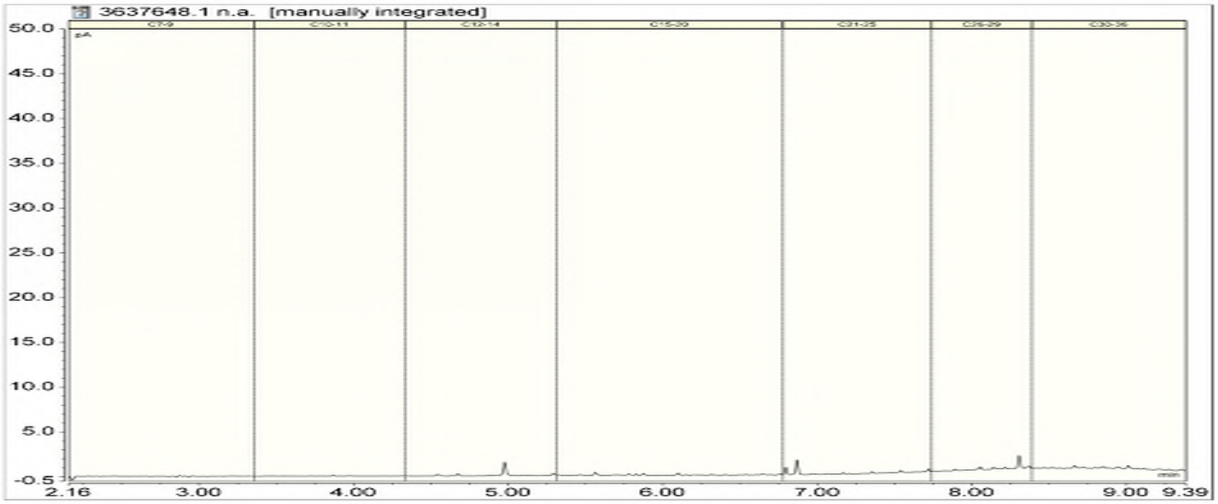
Sample Type: Soil						
Sample Name:		TP22_0.1 29-Jul-2024	TP22_0.5 29-Jul-2024	UT13_0.1 29-Jul-2024	UT13_0.5 29-Jul-2024
Lab Number:		3637648.1	3637648.3	3637648.9	3637648.11
Haloethers Trace in SVOC Soil Samples by GC-MS					
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.10	< 0.10	-	-
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.10	< 0.10	-	-
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.10	< 0.10	-	-
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	-	-
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	-	-
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS					
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.11	< 0.13	-	-
2,4-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	-	-
2,6-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	-	-
Nitrobenzene	mg/kg dry wt	< 0.10	< 0.10	-	-
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.11	< 0.13	-	-
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS					
Aldrin	mg/kg dry wt	< 0.10	< 0.10	-	-
alpha-BHC	mg/kg dry wt	< 0.10	< 0.10	-	-
beta-BHC	mg/kg dry wt	< 0.10	< 0.10	-	-
delta-BHC	mg/kg dry wt	< 0.10	< 0.10	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.10	< 0.10	-	-
4,4'-DDD	mg/kg dry wt	< 0.10	< 0.10	-	-
4,4'-DDE	mg/kg dry wt	< 0.10	< 0.10	-	-
4,4'-DDT	mg/kg dry wt	< 0.2	< 0.2	-	-
Dieldrin	mg/kg dry wt	< 0.10	< 0.10	-	-
Endosulfan I	mg/kg dry wt	< 0.2	< 0.2	-	-
Endosulfan II	mg/kg dry wt	< 0.5	< 0.5	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.2	< 0.2	-	-
Endrin	mg/kg dry wt	< 0.11	< 0.13	-	-
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2	-	-
Heptachlor	mg/kg dry wt	< 0.10	< 0.10	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*					
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10	-	-
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10	-	-
Anthracene	mg/kg dry wt	< 0.10	< 0.10	-	-
Benzo[a]anthracene	mg/kg dry wt	0.23	< 0.10	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.19	< 0.10	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.20	< 0.10	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.12	< 0.10	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10	-	-
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10	-	-
Chrysene	mg/kg dry wt	0.26	< 0.10	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10	-	-
Fluoranthene	mg/kg dry wt	0.39	< 0.10	-	-
Fluorene	mg/kg dry wt	< 0.10	< 0.10	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.14	< 0.10	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.10	< 0.10	-	-
Naphthalene	mg/kg dry wt	< 0.10	< 0.10	-	-
Phenanthrene	mg/kg dry wt	0.25	< 0.10	-	-
Pyrene	mg/kg dry wt	0.45	< 0.10	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.31	< 0.25	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.31	< 0.25	-	-

Sample Type: Soil						
	Sample Name:	TP22_0.1 29-Jul-2024	TP22_0.5 29-Jul-2024	UT13_0.1 29-Jul-2024	UT13_0.5 29-Jul-2024
	Lab Number:	3637648.1	3637648.3	3637648.9	3637648.11
Phenols Trace in SVOC Soil Samples by GC-MS					
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.5	< 0.5	-	-
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2	-	-
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2	-	-
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4	-	-
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.4	< 0.4	-	-
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2	-	-
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4	-	-
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6	-	-
Phenol	mg/kg dry wt	< 0.2	< 0.2	-	-
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2	-	-
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2	-	-
Plasticisers Trace in SVOC Soil Samples by GC-MS					
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5	-	-
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2	-	-
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2	-	-
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2	-	-
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2	-	-
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2	-	-
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2	-	-
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	< 0.11	< 0.13	-	-
1,3-Dichlorobenzene	mg/kg dry wt	< 0.11	< 0.13	-	-
1,4-Dichlorobenzene	mg/kg dry wt	< 0.11	< 0.13	-	-
Hexachlorobutadiene	mg/kg dry wt	< 0.11	< 0.13	-	-
Hexachloroethane	mg/kg dry wt	< 0.11	< 0.13	-	-
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10	-	-
Other SVOC Trace in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0	-	-
Carbazole	mg/kg dry wt	< 0.10	< 0.10	-	-
Dibenzofuran	mg/kg dry wt	< 0.10	< 0.10	-	-
Isophorone	mg/kg dry wt	< 0.10	< 0.10	-	-
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	104	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	106	< 80	< 80	< 80
BTEX in VOC Soils by Headspace GC-MS					
Benzene	mg/kg dry wt	< 0.014	< 0.017	-	-
Ethylbenzene	mg/kg dry wt	< 0.03	< 0.03	-	-
Toluene	mg/kg dry wt	< 0.03	< 0.03	-	-
m&p-Xylene	mg/kg dry wt	< 0.03	< 0.04	-	-
o-Xylene	mg/kg dry wt	< 0.03	< 0.03	-	-
Halogenated Aliphatics in VOC Soils by Headspace GC-MS					
Bromomethane (Methyl Bromide)	mg/kg dry wt	< 0.03	< 0.03	-	-
Carbon tetrachloride	mg/kg dry wt	< 0.03	< 0.03	-	-
Chloroethane	mg/kg dry wt	< 0.03	< 0.03	-	-
Chloromethane	mg/kg dry wt	< 0.03	< 0.03	-	-
1,2-Dibromo-3-chloropropane	mg/kg dry wt	< 0.05	< 0.05	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	< 0.03	< 0.03	-	-
Dibromomethane	mg/kg dry wt	< 0.03	< 0.03	-	-
1,3-Dichloropropane	mg/kg dry wt	< 0.03	< 0.03	-	-
Dichlorodifluoromethane	mg/kg dry wt	< 0.05	< 0.05	-	-
1,1-Dichloroethane	mg/kg dry wt	< 0.03	< 0.03	-	-

Sample Type: Soil						
Sample Name:		TP22_0.1 29-Jul-2024	TP22_0.5 29-Jul-2024	UT13_0.1 29-Jul-2024	UT13_0.5 29-Jul-2024	
Lab Number:		3637648.1	3637648.3	3637648.9	3637648.11	
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
1,2-Dichloroethane	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,1-Dichloroethene	mg/kg dry wt	< 0.03	< 0.03	-	-	
cis-1,2-Dichloroethene	mg/kg dry wt	< 0.03	< 0.03	-	-	
trans-1,2-Dichloroethene	mg/kg dry wt	< 0.03	< 0.03	-	-	
Dichloromethane (methylene chloride)	mg/kg dry wt	< 0.3	< 0.4	-	-	
1,2-Dichloropropane	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,1-Dichloropropene	mg/kg dry wt	< 0.03	< 0.03	-	-	
cis-1,3-Dichloropropene	mg/kg dry wt	< 0.03	< 0.03	-	-	
trans-1,3-Dichloropropene	mg/kg dry wt	< 0.03	< 0.03	-	-	
Hexachlorobutadiene	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,1,1,2-Tetrachloroethane	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,1,2,2-Tetrachloroethane	mg/kg dry wt	< 0.03	< 0.03	-	-	
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,1,1-Trichloroethane	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,1,2-Trichloroethane	mg/kg dry wt	< 0.03	< 0.03	-	-	
Trichloroethene (trichloroethylene)	mg/kg dry wt	< 0.03	< 0.03	-	-	
Trichlorofluoromethane	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,2,3-Trichloropropane	mg/kg dry wt	< 0.05	< 0.05	-	-	
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	< 0.03	< 0.03	-	-	
Vinyl chloride	mg/kg dry wt	< 0.03	< 0.03	-	-	
Halogenated Aromatics in VOC Soils by Headspace GC-MS*						
Bromobenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,3-Dichlorobenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
4-Chlorotoluene	mg/kg dry wt	< 0.03	< 0.03	-	-	
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,2-Dichlorobenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,2-Dichloropropane	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,4-Dichlorobenzene*	mg/kg dry wt	< 0.03	< 0.03	-	-	
2-Chlorotoluene	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,2,3-Trichlorobenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,3,5-Trichlorobenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS						
n-Butylbenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
tert-Butylbenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
Isopropylbenzene (Cumene)	mg/kg dry wt	< 0.03	< 0.03	-	-	
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	< 0.03	< 0.03	-	-	
n-Propylbenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
sec-Butylbenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
Styrene	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,2,4-Trimethylbenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
1,3,5-Trimethylbenzene	mg/kg dry wt	< 0.03	< 0.03	-	-	
Ketones in VOC Soils by Headspace GC-MS						
2-Butanone (MEK)	mg/kg dry wt	< 3	< 4	-	-	
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	< 0.6	< 0.7	-	-	
Acetone	mg/kg dry wt	< 3	< 4	-	-	
Methyl tert-butylether (MTBE)	mg/kg dry wt	< 0.03	< 0.03	-	-	
Trihalomethanes in VOC Soils by Headspace GC-MS						
Bromodichloromethane	mg/kg dry wt	< 0.03	< 0.03	-	-	
Bromoform (tribromomethane)	mg/kg dry wt	< 0.05	< 0.05	-	-	
Chloroform (Trichloromethane)	mg/kg dry wt	< 0.03	< 0.03	-	-	
Dibromochloromethane	mg/kg dry wt	< 0.03	< 0.03	-	-	

Sample Type: Soil					
Sample Name:		TP22_0.1 29-Jul-2024	TP22_0.5 29-Jul-2024	UT13_0.1 29-Jul-2024	UT13_0.5 29-Jul-2024
Lab Number:		3637648.1	3637648.3	3637648.9	3637648.11
Other VOC in Soils by Headspace GC-MS					
Carbon disulphide	mg/kg dry wt	< 0.05	< 0.05	-	-
Naphthalene	mg/kg dry wt	< 0.03	< 0.03	-	-

3637648.1
TP22_0.1 29-Jul-2024
Client Chromatogram for TPH by FID



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**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 9, 11
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	9, 11
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	1, 3, 9, 11
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	9, 11
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	9, 11
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	9, 11
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 9, 11

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	1, 3
Volatile Organic Compounds Trace in Soil by Headspace GC-MS	Sonication extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.010 - 3 mg/kg dry wt	1, 3
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 9, 11
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 9, 11
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 9, 11
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 9, 11

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

Testing was completed between 30-Jul-2024 and 05-Aug-2024. For completion dates of individual analyses please contact the laboratory.

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

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



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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3633917 SPv1
Contact:	Stuart Caird	**Date Received:**	23-Jul-2024
	C/- Beca Limited	**Date Reported:**	02-Aug-2024
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	Rolleston 338703
		Add. Client Ref:	3338703/800
		Submitted By:	Stuart Caird

Sample Type: Soil

Sample Name:		TP16_0.1 23-Jul-2024	TP16_0.5 23-Jul-2024	TP17_0.1 23-Jul-2024	TP17_0.5 23-Jul-2024
Lab Number:		3633917.2	3633917.4	3633917.10	3633917.12
Individual Tests					
Dry Matter	g/100g as rcvd	96	95	96	85
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	4	3	4	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	15	10	16	13
Total Recoverable Copper	mg/kg dry wt	9	6	8	3
Total Recoverable Lead	mg/kg dry wt	15.2	13.9	17.3	36
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	11	8	10	9
Total Recoverable Zinc	mg/kg dry wt	47	36	46	43
Haloethers Trace in SVOC Soil Samples by GC-MS					
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS					
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.11	< 0.12	< 0.12	< 0.13
2,4-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.11	< 0.12	< 0.12	< 0.13
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS					
Aldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Dieldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Endrin	mg/kg dry wt	< 0.11	< 0.12	< 0.12	< 0.13

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

Sample Type: Soil					
Sample Name:		TP16_0.1 23-Jul-2024	TP16_0.5 23-Jul-2024	TP17_0.1 23-Jul-2024	TP17_0.5 23-Jul-2024
Lab Number:		3633917.2	3633917.4	3633917.10	3633917.12
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS					
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Heptachlor	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*					
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
2-Methylnaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS					
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6	< 6	< 6
Phenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Plasticisers Trace in SVOC Soil Samples by GC-MS					
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	< 0.11	< 0.12	< 0.12	< 0.13
1,3-Dichlorobenzene	mg/kg dry wt	< 0.11	< 0.12	< 0.12	< 0.13
1,4-Dichlorobenzene	mg/kg dry wt	< 0.11	< 0.12	< 0.12	< 0.13
Hexachlorobutadiene	mg/kg dry wt	< 0.11	< 0.12	< 0.12	< 0.13
Hexachloroethane	mg/kg dry wt	< 0.11	< 0.12	< 0.12	< 0.13
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10

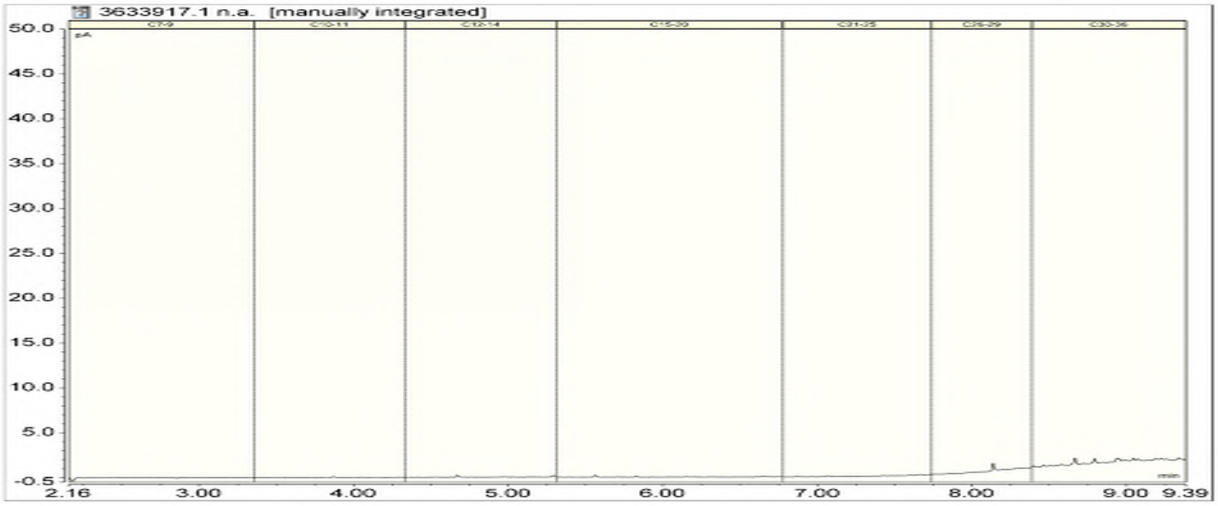
Sample Type: Soil					
Sample Name:		TP16_0.1 23-Jul-2024	TP16_0.5 23-Jul-2024	TP17_0.1 23-Jul-2024	TP17_0.5 23-Jul-2024
Lab Number:		3633917.2	3633917.4	3633917.10	3633917.12
Other SVOC Trace in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0	< 1.0	< 1.0
Carbazole	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Isophorone	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	75	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80
BTEX in VOC Soils by Headspace GC-MS					
Benzene	mg/kg dry wt	< 0.14	< 0.14	< 0.14	< 0.17
Ethylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Toluene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
m&p-Xylene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.4
o-Xylene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Halogenated Aliphatics in VOC Soils by Headspace GC-MS					
Bromomethane (Methyl Bromide)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Carbon tetrachloride	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Chloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Chloromethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,2-Dibromo-3-chloropropane	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Dibromomethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,3-Dichloropropane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Dichlorodifluoromethane	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,2-Dichloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,1-Dichloroethene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
cis-1,2-Dichloroethene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
trans-1,2-Dichloroethene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Dichloromethane (methylene chloride)	mg/kg dry wt	< 3	< 3	< 3	< 4
1,2-Dichloropropane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,1-Dichloropropene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
cis-1,3-Dichloropropene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
trans-1,3-Dichloropropene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Hexachlorobutadiene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,1,1,2-Tetrachloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,1,2,2-Tetrachloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,1,1-Trichloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,1,2-Trichloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Trichloroethene (trichloroethylene)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Trichlorofluoromethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,2,3-Trichloropropane	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Vinyl chloride	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Haloaromatics in VOC Soils by Headspace GC-MS					
Bromobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,3-Dichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
4-Chlorotoluene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3

Sample Type: Soil					
Sample Name:		TP16_0.1 23-Jul-2024	TP16_0.5 23-Jul-2024	TP17_0.1 23-Jul-2024	TP17_0.5 23-Jul-2024
Lab Number:		3633917.2	3633917.4	3633917.10	3633917.12
Haloaromatics in VOC Soils by Headspace GC-MS					
1,2-Dichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,4-Dichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
2-Chlorotoluene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,2,3-Trichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,3,5-Trichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS					
n-Butylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
tert-Butylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Isopropylbenzene (Cumene)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
n-Propylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
sec-Butylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Styrene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,2,4-Trimethylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
1,3,5-Trimethylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Ketones in VOC Soils by Headspace GC-MS					
2-Butanone (MEK)	mg/kg dry wt	< 30	< 30	< 30	< 40
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	< 6	< 6	< 6	< 7
Acetone	mg/kg dry wt	< 30	< 30	< 30	< 40
Methyl tert-butylether (MTBE)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Trihalomethanes in VOC Soils by Headspace GC-MS					
Bromodichloromethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Bromoform (tribromomethane)	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform (Trichloromethane)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Dibromochloromethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Other VOC in Soils by Headspace GC-MS					
Carbon disulphide	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3
Naphthalene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3

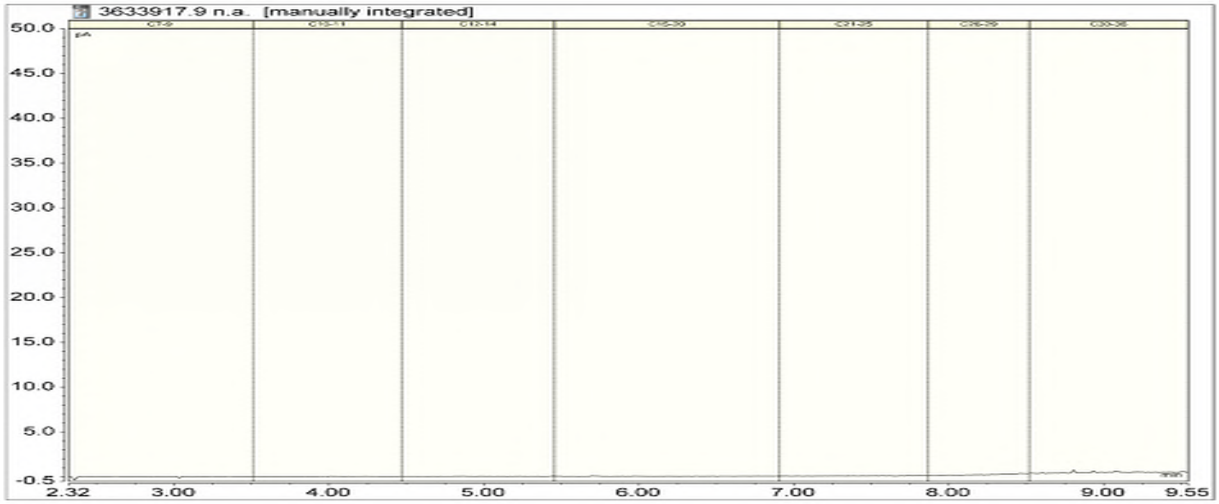
Sample Type: Roading Material			
Sample Name:		TP16_0.05 23-Jul-2024	TP17_0.05 23-Jul-2024
Lab Number:		3633917.1	3633917.9
Individual Tests			
Total Recoverable Mercury*	mg/kg dry wt	< 0.10	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*			
Total Recoverable Arsenic	mg/kg as rcvd	< 2	2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	4	5
Total Recoverable Copper	mg/kg as rcvd	6 #1	7
Total Recoverable Lead	mg/kg as rcvd	4.8	11.0
Total Recoverable Nickel	mg/kg as rcvd	4	4
Total Recoverable Zinc	mg/kg as rcvd	17 #1	32
Polycyclic Aromatic Hydrocarbons Screening in Rock*			
1-Methylnaphthalene*	mg/kg as rcvd	< 0.10	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	0.13	< 0.10
Acenaphthylene*	mg/kg as rcvd	< 0.10	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3	< 0.3

Sample Type: Roading Material			
Sample Name:		TP16_0.05 23-Jul-2024	TP17_0.05 23-Jul-2024
Lab Number:		3633917.1	3633917.9
Polycyclic Aromatic Hydrocarbons Screening in Rock*			
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[e]pyrene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[g,h,i]perylene*	mg/kg as rcvd	< 0.10	< 0.10
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10	< 0.10
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5	< 0.5
Perylene*	mg/kg as rcvd	< 0.10	< 0.10
Phenanthrene*	mg/kg as rcvd	< 0.10	< 0.10
Pyrene*	mg/kg as rcvd	< 0.10	< 0.10
Total of Reported PAHs*	mg/kg as rcvd	< 3	< 3
Total Petroleum Hydrocarbons in Rock*			
C7 - C9*	mg/kg as rcvd	< 140	< 140
C10 - C14*	mg/kg as rcvd	< 120	< 120
C15 - C36*	mg/kg as rcvd	1,250	430
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	1,270	< 500

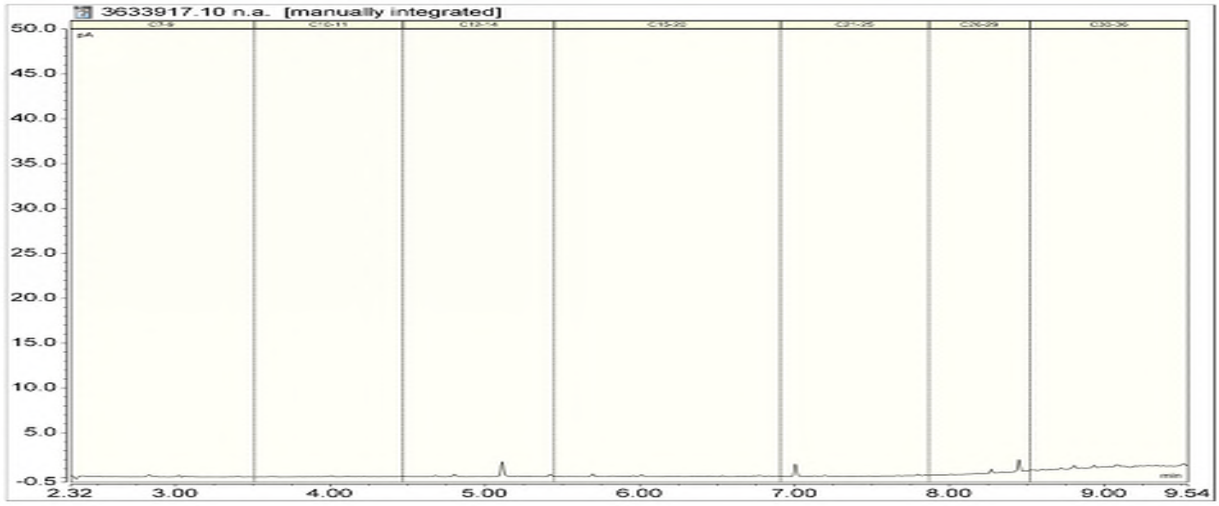
3633917.1
TP16_0.05 23-Jul-2024
Client Chromatogram for TPH by FID



3633917.9
TP17_0.05 23-Jul-2024
Client Chromatogram for TPH by FID



3633917.10
TP17_0.1 23-Jul-2024
Client Chromatogram for TPH by FID



Analyst's Comments

It has been noted that some of the System Monitoring Compounds in the SVOC analysis on samples 3633917.4 and .12 had lower than expected recoveries, whereby 2-fluorophenol was 34% & 36% and Phenol-d5 was 34% & 34% respectively. Therefore the phenolic compounds may be underestimated.

#1 It should be noted that the replicate analyses performed on this sample as part of our in-house Quality Assurance procedures showed greater variation than would normally be expected. This may reflect the heterogeneity of the sample.

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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 4, 10, 12

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	2, 4, 10, 12
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 4, 10, 12
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	2, 4, 10, 12
Volatile Organic Compounds Screening in Soil by Headspace GC-MS	Sonication extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.13 - 30 mg/kg dry wt	2, 4, 10, 12
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4, 10, 12
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4, 10, 12
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 4, 10, 12
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 4, 10, 12

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1, 9
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1, 9
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 9
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1, 9
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 9
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 9
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1, 9
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1, 9
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1, 9
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1, 9
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1, 9
Total Petroleum Hydrocarbons in Rock			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 9-10
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 9
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1, 9
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1, 9
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1, 9

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

Testing was completed between 24-Jul-2024 and 02-Aug-2024. For completion dates of individual analyses please contact the laboratory.

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

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



Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3636373	SPv2
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:**	26-Jul-2024	
		Date Reported:	06-Aug-2024	**(Amended)**
		Quote No:	129425	
		Order No:		
		Client Reference:	3338703/800	
		Submitted By:	Maisie Hopkins	

Sample Type: Soil

Sample Name:		PP10_0.10 26-Jul-2024	PP10_0.70 26-Jul-2024	PP10_1.05 26-Jul-2024	PP10_1.3 26-Jul-2024
Lab Number:		3636373.2	3636373.4	3636373.5	3636373.6
Individual Tests					
Dry Matter	g/100g as rcvd	95	84	84	-
Heavy Metals with Mercury, Screen Level					
Total Recoverable Arsenic	mg/kg dry wt	4	49	27	13
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	1.84	0.77	< 0.10
Total Recoverable Chromium	mg/kg dry wt	13	27	17	13
Total Recoverable Copper	mg/kg dry wt	6	126	27	8
Total Recoverable Lead	mg/kg dry wt	13.2	340	240	16.4
Total Recoverable Mercury	mg/kg dry wt	< 0.10	0.13	0.34	< 0.10
Total Recoverable Nickel	mg/kg dry wt	9	36	15	11
Total Recoverable Zinc	mg/kg dry wt	39	1,500	470	90
Polycyclic Aromatic Hydrocarbons Screening in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt	< 0.3	-	-	-
1-Methylnaphthalene	mg/kg dry wt	< 0.011	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.011	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.011	-	-	-
Acenaphthene	mg/kg dry wt	< 0.011	-	-	-
Anthracene	mg/kg dry wt	< 0.011	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.011	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.025	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.025	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.011	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	-	-	-
Chrysene	mg/kg dry wt	< 0.011	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	-	-	-
Fluoranthene	mg/kg dry wt	< 0.011	-	-	-
Fluorene	mg/kg dry wt	< 0.011	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	-	-	-
Naphthalene	mg/kg dry wt	< 0.06	-	-	-
Perylene	mg/kg dry wt	< 0.011	-	-	-
Phenanthrene	mg/kg dry wt	< 0.011	-	-	-
Pyrene	mg/kg dry wt	< 0.011	-	-	-

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

Sample Type: Soil						
Sample Name:		PP10_0.10 26-Jul-2024	PP10_0.70 26-Jul-2024	PP10_1.05 26-Jul-2024	PP10_1.3 26-Jul-2024	
Lab Number:		3636373.2	3636373.4	3636373.5	3636373.6	
Haloethers Trace in SVOC Soil Samples by GC-MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	-	< 0.10	< 0.10	-	
Bis(2-chloroethyl)ether	mg/kg dry wt	-	< 0.10	< 0.10	-	
Bis(2-chloroisopropyl)ether	mg/kg dry wt	-	< 0.10	< 0.10	-	
4-Bromophenyl phenyl ether	mg/kg dry wt	-	< 0.10	< 0.10	-	
4-Chlorophenyl phenyl ether	mg/kg dry wt	-	< 0.10	< 0.10	-	
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS						
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	-	< 0.13	< 0.15	-	
2,4-Dinitrotoluene	mg/kg dry wt	-	< 0.2	< 0.2	-	
2,6-Dinitrotoluene	mg/kg dry wt	-	< 0.2	< 0.2	-	
Nitrobenzene	mg/kg dry wt	-	< 0.10	< 0.10	-	
N-Nitrosodi-n-propylamine	mg/kg dry wt	-	< 0.13	< 0.15	-	
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS						
Aldrin	mg/kg dry wt	-	< 0.10	< 0.10	-	
alpha-BHC	mg/kg dry wt	-	< 0.10	< 0.10	-	
beta-BHC	mg/kg dry wt	-	< 0.10	< 0.10	-	
delta-BHC	mg/kg dry wt	-	< 0.10	< 0.10	-	
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.10	< 0.10	-	
4,4'-DDD	mg/kg dry wt	-	< 0.10	< 0.10	-	
4,4'-DDE	mg/kg dry wt	-	< 0.10	< 0.10	-	
4,4'-DDT	mg/kg dry wt	-	< 0.2	< 0.2	-	
Dieldrin	mg/kg dry wt	-	< 0.10	< 0.10	-	
Endosulfan I	mg/kg dry wt	-	< 0.2	< 0.2	-	
Endosulfan II	mg/kg dry wt	-	< 0.5	< 0.5	-	
Endosulfan sulphate	mg/kg dry wt	-	< 0.2	< 0.2	-	
Endrin	mg/kg dry wt	-	< 0.13	< 0.15	-	
Endrin ketone	mg/kg dry wt	-	< 0.2	< 0.2	-	
Heptachlor	mg/kg dry wt	-	< 0.10	< 0.10	-	
Heptachlor epoxide	mg/kg dry wt	-	< 0.10	< 0.10	-	
Hexachlorobenzene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*						
Acenaphthene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Acenaphthylene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Anthracene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Benzo[a]anthracene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	< 0.10	< 0.10	-	
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.10	< 0.10	-	
1&2-Chloronaphthalene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Chrysene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Fluoranthene	mg/kg dry wt	-	0.11	< 0.10	-	
Fluorene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.10	< 0.10	-	
2-Methylnaphthalene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Naphthalene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Phenanthrene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Pyrene	mg/kg dry wt	-	0.14	< 0.10	-	
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	< 0.25	< 0.25	-	
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	< 0.25	< 0.25	-	

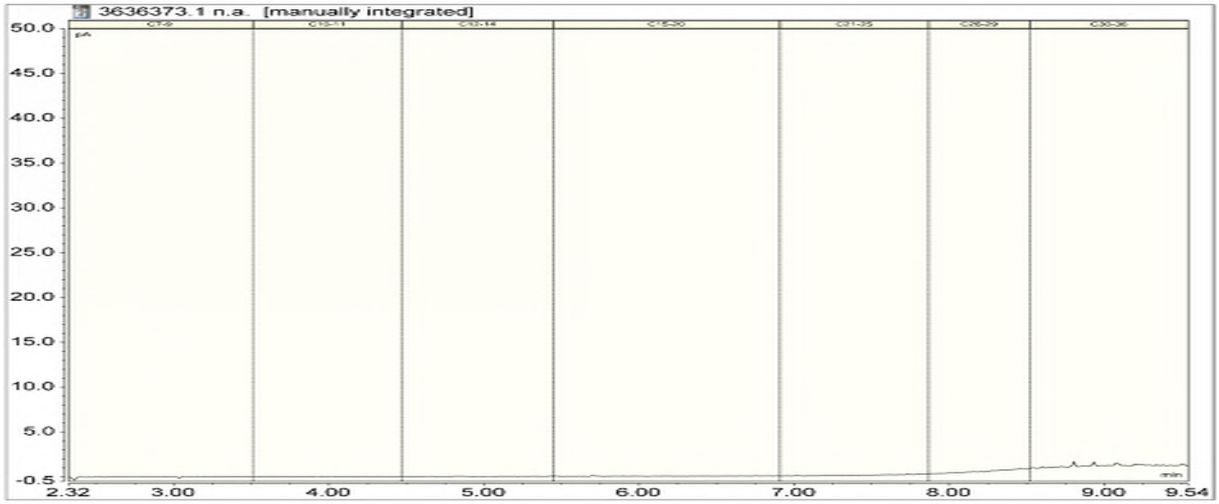
Sample Type: Soil						
Sample Name:		PP10_0.10 26-Jul-2024	PP10_0.70 26-Jul-2024	PP10_1.05 26-Jul-2024	PP10_1.3 26-Jul-2024	
Lab Number:		3636373.2	3636373.4	3636373.5	3636373.6	
Phenols Trace in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	-	< 0.5	< 0.5	-	
2-Chlorophenol	mg/kg dry wt	-	< 0.2	< 0.2	-	
2,4-Dichlorophenol	mg/kg dry wt	-	< 0.2	< 0.2	-	
2,4-Dimethylphenol	mg/kg dry wt	-	< 0.4	< 0.4	-	
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	-	< 0.4	< 0.4	-	
2-Methylphenol (o-cresol)	mg/kg dry wt	-	< 0.2	< 0.2	-	
2-Nitrophenol	mg/kg dry wt	-	< 0.4	< 0.4	-	
Pentachlorophenol (PCP)	mg/kg dry wt	-	< 6	< 6	-	
Phenol	mg/kg dry wt	-	< 0.2	< 0.2	-	
2,4,5-Trichlorophenol	mg/kg dry wt	-	< 0.2	< 0.2	-	
2,4,6-Trichlorophenol	mg/kg dry wt	-	< 0.2	< 0.2	-	
Plasticisers Trace in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	-	< 0.5	< 0.5	-	
Butylbenzylphthalate	mg/kg dry wt	-	< 0.2	< 0.2	-	
Di(2-ethylhexyl)adipate	mg/kg dry wt	-	< 0.2	< 0.2	-	
Diethylphthalate	mg/kg dry wt	-	< 0.2	< 0.2	-	
Dimethylphthalate	mg/kg dry wt	-	< 0.2	< 0.2	-	
Di-n-butylphthalate	mg/kg dry wt	-	< 0.2	< 0.2	-	
Di-n-octylphthalate	mg/kg dry wt	-	< 0.2	< 0.2	-	
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	-	< 0.13	< 0.15	-	
1,3-Dichlorobenzene	mg/kg dry wt	-	< 0.13	< 0.15	-	
1,4-Dichlorobenzene	mg/kg dry wt	-	< 0.13	< 0.15	-	
Hexachlorobutadiene	mg/kg dry wt	-	< 0.13	< 0.15	-	
Hexachloroethane	mg/kg dry wt	-	< 0.13	< 0.15	-	
1,2,4-Trichlorobenzene	mg/kg dry wt	-	< 0.10	< 0.10	-	
Other SVOC Trace in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	-	< 1.0	< 1.0	-	
Carbazole	mg/kg dry wt	-	< 0.10	< 0.10	-	
Dibenzofuran	mg/kg dry wt	-	< 0.10	< 0.10	-	
Isophorone	mg/kg dry wt	-	< 0.10	< 0.10	-	
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	-	
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	-	
C15 - C36	mg/kg dry wt	< 40	59	< 40	-	
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	-	
BTEX in VOC Soils by Headspace GC-MS						
Benzene	mg/kg dry wt	-	< 0.018	< 0.017	-	
Ethylbenzene	mg/kg dry wt	-	< 0.03	< 0.03	-	
Toluene	mg/kg dry wt	-	< 0.03	< 0.03	-	
m&p-Xylene	mg/kg dry wt	-	< 0.04	< 0.04	-	
o-Xylene	mg/kg dry wt	-	< 0.03	< 0.03	-	
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
Bromomethane (Methyl Bromide)	mg/kg dry wt	-	< 0.03	< 0.03	-	
Carbon tetrachloride	mg/kg dry wt	-	< 0.03	< 0.03	-	
Chloroethane	mg/kg dry wt	-	< 0.03	< 0.03	-	
Chloromethane	mg/kg dry wt	-	< 0.03	< 0.03	-	
1,2-Dibromo-3-chloropropane	mg/kg dry wt	-	< 0.05	< 0.05	-	
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	-	< 0.03	< 0.03	-	
Dibromomethane	mg/kg dry wt	-	< 0.03	< 0.03	-	
1,3-Dichloropropane	mg/kg dry wt	-	< 0.03	< 0.03	-	
Dichlorodifluoromethane	mg/kg dry wt	-	< 0.05	< 0.05	-	
1,1-Dichloroethane	mg/kg dry wt	-	< 0.03	< 0.03	-	

Sample Type: Soil					
Sample Name:		PP10_0.10 26-Jul-2024	PP10_0.70 26-Jul-2024	PP10_1.05 26-Jul-2024	PP10_1.3 26-Jul-2024
Lab Number:		3636373.2	3636373.4	3636373.5	3636373.6
Halogenated Aliphatics in VOC Soils by Headspace GC-MS					
1,2-Dichloroethane	mg/kg dry wt	-	< 0.03	< 0.03	-
1,1-Dichloroethene	mg/kg dry wt	-	< 0.03	< 0.03	-
cis-1,2-Dichloroethene	mg/kg dry wt	-	< 0.03	< 0.03	-
trans-1,2-Dichloroethene	mg/kg dry wt	-	< 0.03	< 0.03	-
Dichloromethane (methylene chloride)	mg/kg dry wt	-	< 0.4	< 0.4	-
1,2-Dichloropropane	mg/kg dry wt	-	< 0.03	< 0.03	-
1,1-Dichloropropene	mg/kg dry wt	-	< 0.03	< 0.03	-
cis-1,3-Dichloropropene	mg/kg dry wt	-	< 0.03	< 0.03	-
trans-1,3-Dichloropropene	mg/kg dry wt	-	< 0.03	< 0.03	-
Hexachlorobutadiene	mg/kg dry wt	-	< 0.03	< 0.03	-
1,1,1,2-Tetrachloroethane	mg/kg dry wt	-	< 0.03	< 0.03	-
1,1,2,2-Tetrachloroethane	mg/kg dry wt	-	< 0.03	< 0.03	-
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	-	< 0.03	< 0.03	-
1,1,1-Trichloroethane	mg/kg dry wt	-	< 0.03	< 0.03	-
1,1,2-Trichloroethane	mg/kg dry wt	-	< 0.03	< 0.03	-
Trichloroethene (trichloroethylene)	mg/kg dry wt	-	< 0.03	< 0.03	-
Trichlorofluoromethane	mg/kg dry wt	-	< 0.03	< 0.03	-
1,2,3-Trichloropropane	mg/kg dry wt	-	< 0.05	< 0.05	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	-	< 0.03	< 0.03	-
Vinyl chloride	mg/kg dry wt	-	< 0.03	< 0.03	-
Halogenated Aromatics in VOC Soils by Headspace GC-MS*					
Bromobenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
1,3-Dichlorobenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
4-Chlorotoluene	mg/kg dry wt	-	< 0.03	< 0.03	-
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	-	< 0.03	< 0.03	-
1,2-Dichlorobenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
1,2-Dichloropropane	mg/kg dry wt	-	< 0.03	< 0.03	-
1,4-Dichlorobenzene*	mg/kg dry wt	-	< 0.03	< 0.03	-
2-Chlorotoluene	mg/kg dry wt	-	< 0.03	< 0.03	-
1,2,3-Trichlorobenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
1,2,4-Trichlorobenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
1,3,5-Trichlorobenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS					
n-Butylbenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
tert-Butylbenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
Isopropylbenzene (Cumene)	mg/kg dry wt	-	< 0.03	< 0.03	-
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	-	< 0.03	< 0.03	-
n-Propylbenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
sec-Butylbenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
Styrene	mg/kg dry wt	-	< 0.03	< 0.03	-
1,2,4-Trimethylbenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
1,3,5-Trimethylbenzene	mg/kg dry wt	-	< 0.03	< 0.03	-
Ketones in VOC Soils by Headspace GC-MS					
2-Butanone (MEK)	mg/kg dry wt	-	< 4	< 4	-
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	-	< 0.7	< 0.7	-
Acetone	mg/kg dry wt	-	< 4	< 4	-
Methyl tert-butylether (MTBE)	mg/kg dry wt	-	< 0.03	< 0.03	-
Trihalomethanes in VOC Soils by Headspace GC-MS					
Bromodichloromethane	mg/kg dry wt	-	< 0.03	< 0.03	-
Bromoform (tribromomethane)	mg/kg dry wt	-	< 0.05	< 0.05	-
Chloroform (Trichloromethane)	mg/kg dry wt	-	< 0.03	< 0.03	-

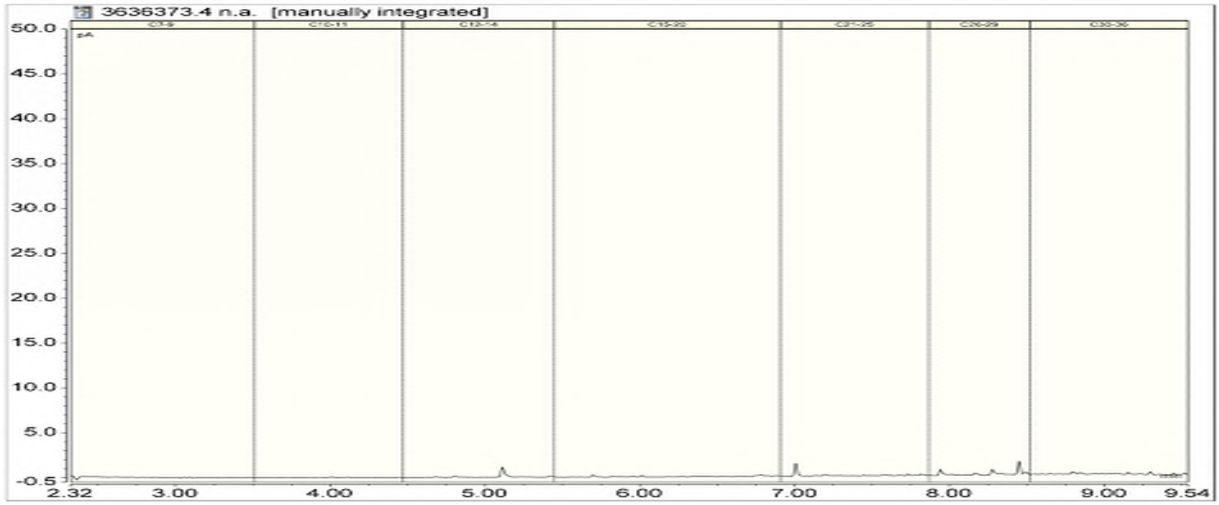
Sample Type: Soil					
Sample Name:		PP10_0.10 26-Jul-2024	PP10_0.70 26-Jul-2024	PP10_1.05 26-Jul-2024	PP10_1.3 26-Jul-2024
Lab Number:		3636373.2	3636373.4	3636373.5	3636373.6
Trihalomethanes in VOC Soils by Headspace GC-MS					
Dibromochloromethane	mg/kg dry wt	-	< 0.03	< 0.03	-
Other VOC in Soils by Headspace GC-MS					
Carbon disulphide	mg/kg dry wt	-	< 0.05	< 0.05	-
Naphthalene	mg/kg dry wt	-	< 0.03	< 0.03	-

Sample Type: Roading Material		
Sample Name:		PP10_0.05 26-Jul-2024
Lab Number:		3636373.1
Individual Tests		
Total Recoverable Mercury*	mg/kg dry wt	< 0.10
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*		
Total Recoverable Arsenic	mg/kg as rcvd	< 2
Total Recoverable Cadmium*	mg/kg as rcvd	< 0.10
Total Recoverable Chromium	mg/kg as rcvd	3
Total Recoverable Copper	mg/kg as rcvd	3
Total Recoverable Lead	mg/kg as rcvd	3.6
Total Recoverable Nickel	mg/kg as rcvd	4
Total Recoverable Zinc	mg/kg as rcvd	20
Polycyclic Aromatic Hydrocarbons Screening in Rock*		
1-Methylnaphthalene*	mg/kg as rcvd	< 0.10
2-Methylnaphthalene*	mg/kg as rcvd	< 0.10
Acenaphthylene*	mg/kg as rcvd	< 0.10
Acenaphthene*	mg/kg as rcvd	< 0.10
Anthracene*	mg/kg as rcvd	< 0.10
Benzo[a]anthracene*	mg/kg as rcvd	< 0.10
Benzo[a]pyrene (BAP)*	mg/kg as rcvd	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg as rcvd	< 0.24
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg as rcvd	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene*	mg/kg as rcvd	< 0.10
Benzo[e]pyrene*	mg/kg as rcvd	< 0.10
Benzo[g,h,i]perylene*	mg/kg as rcvd	< 0.10
Benzo[k]fluoranthene*	mg/kg as rcvd	< 0.10
Chrysene*	mg/kg as rcvd	< 0.10
Dibenzo[a,h]anthracene*	mg/kg as rcvd	< 0.10
Fluoranthene*	mg/kg as rcvd	< 0.10
Fluorene*	mg/kg as rcvd	< 0.10
Indeno(1,2,3-c,d)pyrene*	mg/kg as rcvd	< 0.10
Naphthalene*	mg/kg as rcvd	< 0.5
Perylene*	mg/kg as rcvd	< 0.10
Phenanthrene*	mg/kg as rcvd	< 0.10
Pyrene*	mg/kg as rcvd	< 0.10
Total of Reported PAHs*	mg/kg as rcvd	< 3
Total Petroleum Hydrocarbons, Misc*		
C7 - C9*	mg/kg as rcvd	< 140
C10 - C14*	mg/kg as rcvd	< 120
C15 - C36*	mg/kg as rcvd	1,040
Total hydrocarbons (C7 - C36)*	mg/kg as rcvd	1,050

3636373.1
PP10_0.05 26-Jul-2024
Client Chromatogram for TPH by FID



3636373.4
PP10_0.70 26-Jul-2024
Client Chromatogram for TPH by FID



Analyst's Comments

Amended Report: This certificate of analysis replaces report '3636373-SPv1' issued on 05-Aug-2024 at 11:45 am.
Reason for amendment: At the client's request, testing has been added.

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
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 4-6
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	2
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	2, 4-5

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	2
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	2
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 4-6
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	4-5
Volatile Organic Compounds Trace in Soil by Headspace GC-MS	Sonication extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.010 - 3 mg/kg dry wt	4-5
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4-5
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4-5
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 4-5
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 4-5

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
SHOC Macro Extraction 10x Dilution*		-	1
Macro Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1
Total Recoverable Arsenic	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Cadmium*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg as rcvd	1
Total Recoverable Chromium	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Copper	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Lead	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.4 mg/kg as rcvd	1
Total Recoverable Mercury*	Dried sample, Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 mg/kg dry wt	1
Total Recoverable Nickel	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	2 mg/kg as rcvd	1
Total Recoverable Zinc	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	4 mg/kg as rcvd	1
Heavy metals, MacroDig, screen, As,Cd,Cr,Cu,Ni,Pb,Zn*	Tested on as received sample. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg as rcvd	1
Total Petroleum Hydrocarbons, Misc			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1, 4
C7 - C9*	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg as rcvd	1
C10 - C14*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg as rcvd	1

Sample Type: Roading Material			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
C15 - C36*	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg as rcvd	1
Total hydrocarbons (C7 - C36)*	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg as rcvd	1

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

Testing was completed between 27-Jul-2024 and 06-Aug-2024. For completion dates of individual analyses please contact the laboratory.

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

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



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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3634747 SPv1
Contact:	Stuart Caird C/- Beca Limited PO Box 13960 Christchurch 8141	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	24-Jul-2024 02-Aug-2024 129425 3338703/800 Rolleston 338703 Stuart Caird

Sample Type: Soil

Sample Name:		TP18_0.15 24-Jul-2024	TP18_0.5 24-Jul-2024	TP19_0.1 24-Jul-2024	TP19_0.5 24-Jul-2024	IP10_0.1 24-Jul-2024
Lab Number:		3634747.2	3634747.4	3634747.9	3634747.11	3634747.16
Individual Tests						
Dry Matter	g/100g as rcvd	85	86	90	86	91
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	6	3	5	5	5
Total Recoverable Cadmium	mg/kg dry wt	0.26	< 0.10	0.14	< 0.10	0.15
Total Recoverable Chromium	mg/kg dry wt	17	10	14	13	17
Total Recoverable Copper	mg/kg dry wt	33	3	14	12	18
Total Recoverable Lead	mg/kg dry wt	84	10.5	19.1	27	50
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	0.13	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	15	6	10	10	14
Total Recoverable Zinc	mg/kg dry wt	72	36	106	55	114
Haloethers Trace in SVOC Soil Samples by GC-MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS						
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.13	< 0.13	< 0.12	< 0.13	< 0.12
2,4-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.13	< 0.13	< 0.12	< 0.13	< 0.12
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS						
Aldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dieldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Endrin	mg/kg dry wt	< 0.13	< 0.13	< 0.12	< 0.13	< 0.12
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

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

Sample Type: Soil						
Sample Name:		TP18_0.15 24-Jul-2024	TP18_0.5 24-Jul-2024	TP19_0.1 24-Jul-2024	TP19_0.5 24-Jul-2024	IP10_0.1 24-Jul-2024
Lab Number:		3634747.2	3634747.4	3634747.9	3634747.11	3634747.16
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS						
Heptachlor	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*						
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg dry wt	0.11	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	0.29	< 0.10	< 0.10	< 0.10	0.32
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.14	< 0.10	< 0.10	< 0.10	0.27
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.18	< 0.10	< 0.10	< 0.10	0.31
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	0.15
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	0.11
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg dry wt	0.35	< 0.10	< 0.10	< 0.10	0.36
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	0.36	< 0.10	< 0.10	< 0.10	0.47
Fluorene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.10	< 0.10	< 0.10	< 0.10	0.16
2-Methylnaphthalene	mg/kg dry wt	1.71	< 0.10	< 0.10	< 0.10	0.31
Naphthalene	mg/kg dry wt	1.03	< 0.10	< 0.10	< 0.10	0.22
Phenanthrene	mg/kg dry wt	1.13	< 0.10	< 0.10	< 0.10	0.35
Pyrene	mg/kg dry wt	0.53	< 0.10	< 0.10	0.13	0.54
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	< 0.25	0.41
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	< 0.25	0.41
Phenols Trace in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6	< 6	< 6	< 6
Phenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Plasticisers Trace in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	0.3
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	< 0.13	< 0.13	< 0.12	< 0.13	< 0.12
1,3-Dichlorobenzene	mg/kg dry wt	< 0.13	< 0.13	< 0.12	< 0.13	< 0.12
1,4-Dichlorobenzene	mg/kg dry wt	< 0.13	< 0.13	< 0.12	< 0.13	< 0.12
Hexachlorobutadiene	mg/kg dry wt	< 0.13	< 0.13	< 0.12	< 0.13	< 0.12
Hexachloroethane	mg/kg dry wt	< 0.13	< 0.13	< 0.12	< 0.13	< 0.12
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Sample Type: Soil						
Sample Name:		TP18_0.15 24-Jul-2024	TP18_0.5 24-Jul-2024	TP19_0.1 24-Jul-2024	TP19_0.5 24-Jul-2024	IP10_0.1 24-Jul-2024
Lab Number:		3634747.2	3634747.4	3634747.9	3634747.11	3634747.16
Other SVOC Trace in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Carbazole	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	1.10	< 0.10	< 0.10	< 0.10	0.15
Isophorone	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	52	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	560	< 40	136	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	620	< 80	136	< 80	< 80
BTEX in VOC Soils by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.17	< 0.18	< 0.16	< 0.18	< 0.15
Ethylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Toluene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
m&p-Xylene	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.3
o-Xylene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
Bromomethane (Methyl Bromide)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Carbon tetrachloride	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Chloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Chloromethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2-Dibromo-3-chloropropane	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Dibromomethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,3-Dichloropropane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Dichlorodifluoromethane	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2-Dichloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1-Dichloroethene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
cis-1,2-Dichloroethene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
trans-1,2-Dichloroethene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Dichloromethane (methylene chloride)	mg/kg dry wt	< 4	< 4	< 4	< 4	< 3
1,2-Dichloropropane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1-Dichloropropene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
cis-1,3-Dichloropropene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
trans-1,3-Dichloropropene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Hexachlorobutadiene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1,1,2-Tetrachloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1,2,2-Tetrachloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1,1-Trichloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,1,2-Trichloroethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Trichloroethene (trichloroethylene)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Trichlorofluoromethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2,3-Trichloropropane	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Vinyl chloride	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Haloaromatics in VOC Soils by Headspace GC-MS						
Bromobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,3-Dichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Chlorotoluene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Sample Type: Soil						
Sample Name:		TP18_0.15 24-Jul-2024	TP18_0.5 24-Jul-2024	TP19_0.1 24-Jul-2024	TP19_0.5 24-Jul-2024	IP10_0.1 24-Jul-2024
Lab Number:		3634747.2	3634747.4	3634747.9	3634747.11	3634747.16
Haloaromatics in VOC Soils by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2-Dichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,4-Dichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
2-Chlorotoluene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2,3-Trichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,3,5-Trichlorobenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS						
n-Butylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
tert-Butylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Isopropylbenzene (Cumene)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
n-Propylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
sec-Butylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Styrene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2,4-Trimethylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,3,5-Trimethylbenzene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Ketones in VOC Soils by Headspace GC-MS						
2-Butanone (MEK)	mg/kg dry wt	< 40	< 40	< 40	< 40	< 30
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	< 7	< 7	< 7	< 7	< 6
Acetone	mg/kg dry wt	< 40	< 40	< 40	< 40	< 30
Methyl tert-butylether (MTBE)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Trihalomethanes in VOC Soils by Headspace GC-MS						
Bromodichloromethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bromoform (tribromomethane)	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform (Trichloromethane)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Dibromochloromethane	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Other VOC in Soils by Headspace GC-MS						
Carbon disulphide	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Naphthalene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

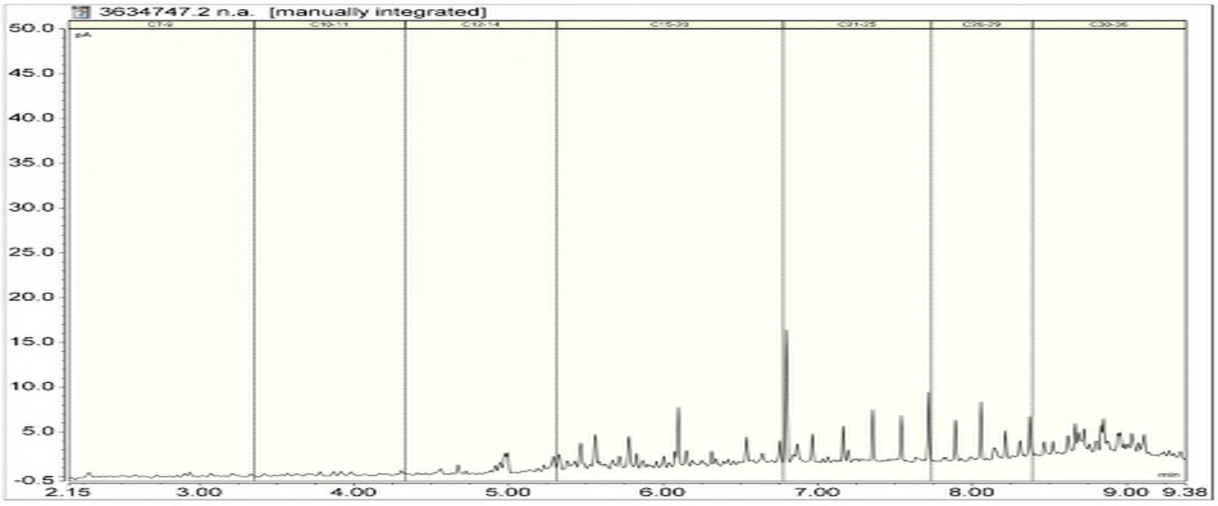
Sample Name:		IP10_0.5 24-Jul-2024	IP10_0.7 24-Jul-2024
Lab Number:		3634747.18	3634747.19
Individual Tests			
Dry Matter	g/100g as rcvd	82	82
Heavy Metals with Mercury, Screen Level			
Total Recoverable Arsenic	mg/kg dry wt	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	12	12
Total Recoverable Copper	mg/kg dry wt	6	3
Total Recoverable Lead	mg/kg dry wt	28	12.2
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	8	7
Total Recoverable Zinc	mg/kg dry wt	48	43
Haloethers Trace in SVOC Soil Samples by GC-MS			
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.10	< 0.10
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS			
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.14	< 0.13
2,4-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2

Sample Type: Soil			
Sample Name:		IP10_0.5 24-Jul-2024	IP10_0.7 24-Jul-2024
Lab Number:		3634747.18	3634747.19
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS			
2,6-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.14	< 0.13
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS			
Aldrin	mg/kg dry wt	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	< 0.2	< 0.2
Dieldrin	mg/kg dry wt	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	< 0.2	< 0.2
Endrin	mg/kg dry wt	< 0.14	< 0.13
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2
Heptachlor	mg/kg dry wt	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*			
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10
Anthracene	mg/kg dry wt	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	< 0.10	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.10	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.10	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10
Chrysene	mg/kg dry wt	< 0.10	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	< 0.10	< 0.10
Fluorene	mg/kg dry wt	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.10	< 0.10
2-Methylnaphthalene	mg/kg dry wt	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	< 0.10	< 0.10
Pyrene	mg/kg dry wt	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.25	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.25	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS			
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.5	< 0.5
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.4	< 0.4
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6
Phenol	mg/kg dry wt	< 0.2	< 0.2

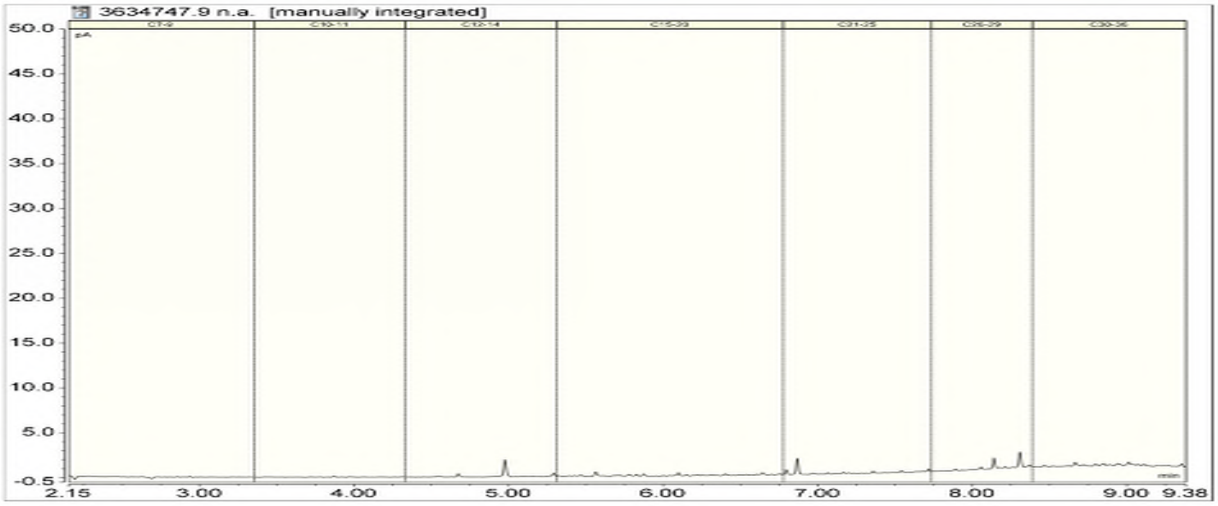
Sample Type: Soil			
Sample Name:		IP10_0.5 24-Jul-2024	IP10_0.7 24-Jul-2024
Lab Number:		3634747.18	3634747.19
Phenols Trace in SVOC Soil Samples by GC-MS			
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.2	< 0.2
Plasticisers Trace in SVOC Soil Samples by GC-MS			
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS			
1,2-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.13
1,3-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.13
1,4-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.13
Hexachlorobutadiene	mg/kg dry wt	< 0.14	< 0.13
Hexachloroethane	mg/kg dry wt	< 0.14	< 0.13
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10
Other SVOC Trace in SVOC Soil Samples by GC-MS			
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0
Carbazole	mg/kg dry wt	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	< 0.10	< 0.10
Isophorone	mg/kg dry wt	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil			
C7 - C9	mg/kg dry wt	< 20	< 20
C10 - C14	mg/kg dry wt	48	< 20
C15 - C36	mg/kg dry wt	500	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	540	< 80
BTEX in VOC Soils by Headspace GC-MS			
Benzene	mg/kg dry wt	< 0.18	< 0.19
Ethylbenzene	mg/kg dry wt	< 0.3	< 0.3
Toluene	mg/kg dry wt	< 0.3	< 0.3
m&p-Xylene	mg/kg dry wt	< 0.4	< 0.4
o-Xylene	mg/kg dry wt	< 0.3	< 0.3
Halogenated Aliphatics in VOC Soils by Headspace GC-MS			
Bromomethane (Methyl Bromide)	mg/kg dry wt	< 0.3	< 0.3
Carbon tetrachloride	mg/kg dry wt	< 0.3	< 0.3
Chloroethane	mg/kg dry wt	< 0.3	< 0.3
Chloromethane	mg/kg dry wt	< 0.3	< 0.3
1,2-Dibromo-3-chloropropane	mg/kg dry wt	< 0.5	< 0.5
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	< 0.3	< 0.3
Dibromomethane	mg/kg dry wt	< 0.3	< 0.3
1,3-Dichloropropane	mg/kg dry wt	< 0.3	< 0.3
Dichlorodifluoromethane	mg/kg dry wt	< 0.5	< 0.5
1,1-Dichloroethane	mg/kg dry wt	< 0.3	< 0.3
1,2-Dichloroethane	mg/kg dry wt	< 0.3	< 0.3
1,1-Dichloroethene	mg/kg dry wt	< 0.3	< 0.3
cis-1,2-Dichloroethene	mg/kg dry wt	< 0.3	< 0.3
trans-1,2-Dichloroethene	mg/kg dry wt	< 0.3	< 0.3
Dichloromethane (methylene chloride)	mg/kg dry wt	< 4	< 4
1,2-Dichloropropane	mg/kg dry wt	< 0.3	< 0.3
1,1-Dichloropropene	mg/kg dry wt	< 0.3	< 0.3
cis-1,3-Dichloropropene	mg/kg dry wt	< 0.3	< 0.3
trans-1,3-Dichloropropene	mg/kg dry wt	< 0.3	< 0.3

Sample Type: Soil			
Sample Name:		IP10_0.5 24-Jul-2024	IP10_0.7 24-Jul-2024
Lab Number:		3634747.18	3634747.19
Halogenated Aliphatics in VOC Soils by Headspace GC-MS			
Hexachlorobutadiene	mg/kg dry wt	< 0.3	< 0.3
1,1,1,2-Tetrachloroethane	mg/kg dry wt	< 0.3	< 0.3
1,1,2,2-Tetrachloroethane	mg/kg dry wt	< 0.3	< 0.3
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	< 0.3	< 0.3
1,1,1-Trichloroethane	mg/kg dry wt	< 0.3	< 0.3
1,1,2-Trichloroethane	mg/kg dry wt	< 0.3	< 0.3
Trichloroethene (trichloroethylene)	mg/kg dry wt	< 0.3	< 0.3
Trichlorofluoromethane	mg/kg dry wt	< 0.3	< 0.3
1,2,3-Trichloropropane	mg/kg dry wt	< 0.5	< 0.5
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	< 0.3	< 0.3
Vinyl chloride	mg/kg dry wt	< 0.3	< 0.3
Haloaromatics in VOC Soils by Headspace GC-MS			
Bromobenzene	mg/kg dry wt	< 0.3	< 0.3
1,3-Dichlorobenzene	mg/kg dry wt	< 0.3	< 0.3
4-Chlorotoluene	mg/kg dry wt	< 0.3	< 0.3
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	< 0.3	< 0.3
1,2-Dichlorobenzene	mg/kg dry wt	< 0.3	< 0.3
1,4-Dichlorobenzene	mg/kg dry wt	< 0.3	< 0.3
2-Chlorotoluene	mg/kg dry wt	< 0.3	< 0.3
1,2,3-Trichlorobenzene	mg/kg dry wt	< 0.3	< 0.3
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.3	< 0.3
1,3,5-Trichlorobenzene	mg/kg dry wt	< 0.3	< 0.3
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS			
n-Butylbenzene	mg/kg dry wt	< 0.3	< 0.3
tert-Butylbenzene	mg/kg dry wt	< 0.3	< 0.3
Isopropylbenzene (Cumene)	mg/kg dry wt	< 0.3	< 0.3
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	< 0.3	< 0.3
n-Propylbenzene	mg/kg dry wt	< 0.3	< 0.3
sec-Butylbenzene	mg/kg dry wt	< 0.3	< 0.3
Styrene	mg/kg dry wt	< 0.3	< 0.3
1,2,4-Trimethylbenzene	mg/kg dry wt	< 0.3	< 0.3
1,3,5-Trimethylbenzene	mg/kg dry wt	< 0.3	< 0.3
Ketones in VOC Soils by Headspace GC-MS			
2-Butanone (MEK)	mg/kg dry wt	< 40	< 40
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	< 8	< 8
Acetone	mg/kg dry wt	< 40	< 40
Methyl tert-butylether (MTBE)	mg/kg dry wt	< 0.3	< 0.3
Trihalomethanes in VOC Soils by Headspace GC-MS			
Bromodichloromethane	mg/kg dry wt	< 0.3	< 0.3
Bromoform (tribromomethane)	mg/kg dry wt	< 0.5	< 0.5
Chloroform (Trichloromethane)	mg/kg dry wt	< 0.3	< 0.3
Dibromochloromethane	mg/kg dry wt	< 0.3	< 0.3
Other VOC in Soils by Headspace GC-MS			
Carbon disulphide	mg/kg dry wt	< 0.3	< 0.3
Naphthalene	mg/kg dry wt	< 0.3	< 0.3

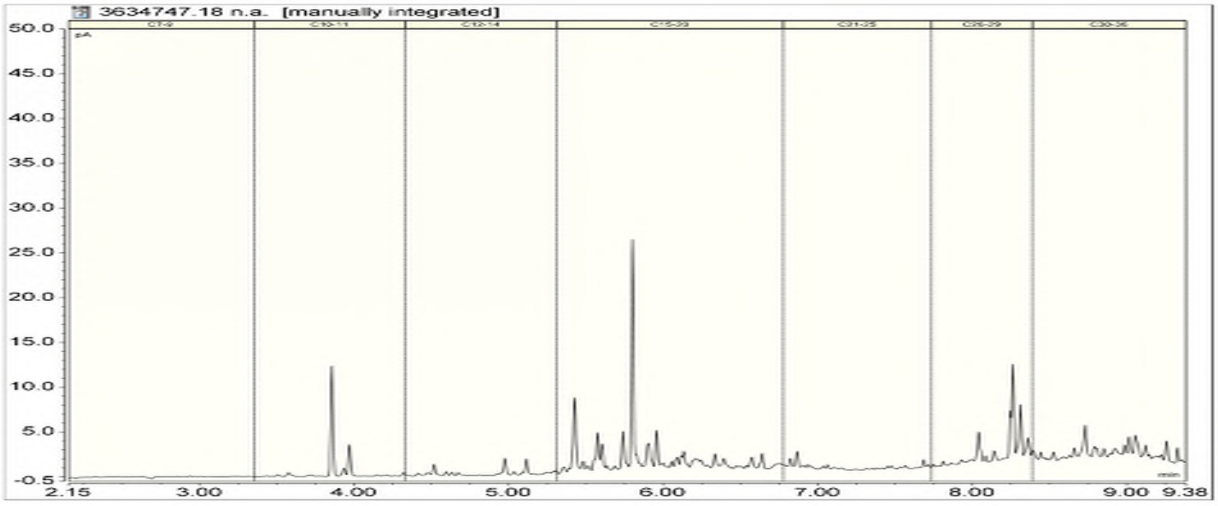
3634747.2
TP18_0.15 24-Jul-2024
Client Chromatogram for TPH by FID



3634747.9
TP19_0.1 24-Jul-2024
Client Chromatogram for TPH by FID



3634747.18
IP10_0.5 24-Jul-2024
Client Chromatogram for TPH by FID



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**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	2, 4, 9, 11, 16, 18-19
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	2, 4, 9, 11, 16, 18-19
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
Volatile Organic Compounds Screening in Soil by Headspace GC-MS	Sonication extraction, Headspace GC-MS analysis. Tested on as received sample. In-house based on US EPA 8260 and 5021.	0.13 - 30 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	2, 9, 18
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2, 4, 9, 11, 16, 18-19
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2, 4, 9, 11, 16, 18-19

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

Testing was completed between 25-Jul-2024 and 02-Aug-2024. For completion dates of individual analyses please contact the laboratory.

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

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



Kim Harrison MSc
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3637649	A2Pv1
Contact:	Stuart Caird	**Date Received:**	29-Jul-2024	
	C/- Beca Limited	**Date Reported:**	31-Jul-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	Rolleston 338703	
		Add. Client Ref:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

Sample Name:		T22_0.1 29-Jul-2024	T22_0.5 29-Jul-2024
Lab Number:		3637649.1	3637649.3
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001
As Received Weight	g	1,085.3	854.1
Dry Weight	g	1,050.2	747.8
Moisture*	%	3	12
Sample Fraction >10mm	g dry wt	358.4	3.1
Sample Fraction <10mm to >2mm	g dry wt	395.7	8.2
Sample Fraction <2mm	g dry wt	294.9	734.9
<2mm Subsample Weight	g dry wt	58.0	59.4
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001

Glossary of Terms

• Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
• Trace - Trace levels of asbestos, as defined by AS4964-2004.
For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

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

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
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3

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

Testing was completed on 31-Jul-2024. 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.

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John Keneth Paglingayen BApSc
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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3640489 A2Pv1
Contact:	Stuart Caird	**Date Received:**	01-Aug-2024
	C/- Beca Limited	**Date Reported:**	05-Aug-2024
	PO Box 13960	**Quote No:**	129425
	Christchurch 8141	**Order No:**	
		Client Reference:	Rolleston 338703/800
		Submitted By:	Stuart Caird

Sample Type: Soil

Sample Name:		TP03_0.1 01-Aug-2024	TP03_0.5 01-Aug-2024	TP11_0.1 01-Aug-2024	TP11_0.5 01-Aug-2024	TP10_0.1 01-Aug-2024
Lab Number:		3640489.1	3640489.3	3640489.8	3640489.10	3640489.13
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	736.3	1,117.7	722.5	1,029.5	743.0
Dry Weight	g	598.1	1,070.1	592.9	979.6	595.3
Moisture*	%	19	4	18	5	20
Sample Fraction >10mm	g dry wt	121.5	709.2	96.8	404.9	87.3
Sample Fraction <10mm to >2mm	g dry wt	179.5	148.9	142.2	323.1	95.3
Sample Fraction <2mm	g dry wt	295.2	211.4	351.9	251.0	410.5
<2mm Subsample Weight	g dry wt	51.0	59.7	53.4	59.4	58.3
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		TP10_0.5 01-Aug-2024
Lab Number:		3640489.15
Asbestos Presence / Absence		Asbestos NOT detected.
Description of Asbestos Form		-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001
As Received Weight	g	1,079.2
Dry Weight	g	1,018.3
Moisture*	%	6
Sample Fraction >10mm	g dry wt	536.4

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

Sample Type: Soil		
Sample Name:		TP10_0.5 01-Aug-2024
Lab Number:		3640489.15
Sample Fraction <10mm to >2mm	g dry wt	288.7
Sample Fraction <2mm	g dry wt	192.4
<2mm Subsample Weight	g dry wt	53.8
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001

Glossary of Terms
• Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
• Trace - Trace levels of asbestos, as defined by AS4964-2004.
For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

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**
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10, 13, 15
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 3, 8, 10, 13, 15
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 3, 8, 10, 13, 15
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10, 13, 15
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10, 13, 15
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 3, 8, 10, 13, 15
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 3, 8, 10, 13, 15
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3, 8, 10, 13, 15
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10, 13, 15

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10, 13, 15
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10, 13, 15
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10, 13, 15
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 3, 8, 10, 13, 15
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10, 13, 15
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3, 8, 10, 13, 15

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

Testing was completed on 05-Aug-2024. 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.

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Certificate of Analysis

Client:	Beca Limited	**Lab No:**	3640488	SPv1
Contact:	Stuart Caird	**Date Received:**	01-Aug-2024	
	C/- Beca Limited	**Date Reported:**	08-Aug-2024	
	PO Box 13960	**Quote No:**	129425	
	Christchurch 8141	**Order No:**		
		Client Reference:	3338703/800	
		Submitted By:	Stuart Caird	

Sample Type: Soil

		Sample Name:	IP03_0.1 01-Aug-2024	IP03_0.5 01-Aug-2024	Dup_L 01-Aug-2024	TP11_0.1 01-Aug-2024	TP11_0.5 01-Aug-2024
		Lab Number:	3640488.1	3640488.3	3640488.8	3640488.9	3640488.11
Individual Tests							
Dry Matter	g/100g as rcvd		76	89	75	78	92
Total Recoverable Antimony	mg/kg dry wt		< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Total Recoverable Tin	mg/kg dry wt		1.3	1.1	1.4	1.1	< 1.0
Heavy Metals with Mercury, Screen Level							
Total Recoverable Arsenic	mg/kg dry wt		4	5	3	3	4
Total Recoverable Cadmium	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt		12	16	13	12	16
Total Recoverable Copper	mg/kg dry wt		4	5	4	4	5
Total Recoverable Lead	mg/kg dry wt		25	16.5	25	31	13.2
Total Recoverable Mercury	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt		8	12	8	8	12
Total Recoverable Zinc	mg/kg dry wt		80	48	83	55	40
Haloethers Trace in SVOC Soil Samples by GC-MS							
Bis(2-chloroethoxy) methane	mg/kg dry wt		< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
Bis(2-chloroethyl)ether	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS							
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt		< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
2,4-Dinitrotoluene	mg/kg dry wt		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt		< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS							
Aldrin	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
beta-BHC	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
delta-BHC	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dieldrin	mg/kg dry wt		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

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The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil						
Sample Name:		IP03_0.1 01-Aug-2024	IP03_0.5 01-Aug-2024	Dup_L 01-Aug-2024	TP11_0.1 01-Aug-2024	TP11_0.5 01-Aug-2024
Lab Number:		3640488.1	3640488.3	3640488.8	3640488.9	3640488.11
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS						
Endrin	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Heptachlor	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*						
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
2-Methylnaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.8	< 0.7	< 0.9	< 0.8	< 0.7
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.8	< 0.7	< 0.9	< 0.8	< 0.7
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6	< 6	< 6	< 6
Phenol	mg/kg dry wt	< 0.8	< 0.7	< 0.9	< 0.8	< 0.7
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.8	< 0.7	< 0.9	< 0.8	< 0.7
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.8	< 0.7	< 0.9	< 0.8	< 0.7
Plasticisers Trace in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
1,3-Dichlorobenzene	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
1,4-Dichlorobenzene	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
Hexachlorobutadiene	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14
Hexachloroethane	mg/kg dry wt	< 0.16	< 0.14	< 0.17	< 0.16	< 0.14

Sample Type: Soil						
Sample Name:		IP03_0.1 01-Aug-2024	IP03_0.5 01-Aug-2024	Dup_L 01-Aug-2024	TP11_0.1 01-Aug-2024	TP11_0.5 01-Aug-2024
Lab Number:		3640488.1	3640488.3	3640488.8	3640488.9	3640488.11
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS						
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Other SVOC Trace in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Carbazole	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Isophorone	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80	< 80	< 80

Sample Name:		DUP_M 01-Aug-2024	TP10_0.1 01-Aug-2024	TP10_0.5 01-Aug-2024
Lab Number:		3640488.14	3640488.15	3640488.17
Individual Tests				
Dry Matter	g/100g as rcvd	91	78	89
Total Recoverable Antimony	mg/kg dry wt	< 0.4	< 0.4	< 0.4
Total Recoverable Tin	mg/kg dry wt	< 1.0	1.0	1.2
Heavy Metals with Mercury, Screen Level				
Total Recoverable Arsenic	mg/kg dry wt	4	10	6
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	15	12	19
Total Recoverable Copper	mg/kg dry wt	5	4	6
Total Recoverable Lead	mg/kg dry wt	13.3	19.0	16.8
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	12	7	15
Total Recoverable Zinc	mg/kg dry wt	41	51	47
Haloethers Trace in SVOC Soil Samples by GC-MS				
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.14	< 0.16	< 0.14
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS				
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.14	< 0.16	< 0.14
2,4-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2
2,6-Dinitrotoluene	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Nitrobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.14	< 0.16	< 0.14
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS				
Aldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10
alpha-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10
beta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10
delta-BHC	mg/kg dry wt	< 0.10	< 0.10	< 0.10
gamma-BHC (Lindane)	mg/kg dry wt	< 0.10	< 0.10	< 0.10
4,4'-DDD	mg/kg dry wt	< 0.10	< 0.10	< 0.10
4,4'-DDE	mg/kg dry wt	< 0.10	< 0.10	< 0.10
4,4'-DDT	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Dieldrin	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Endosulfan I	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Endosulfan II	mg/kg dry wt	< 0.5	< 0.5	< 0.5
Endosulfan sulphate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Endrin	mg/kg dry wt	< 0.14	< 0.16	< 0.14
Endrin ketone	mg/kg dry wt	< 0.2	< 0.2	< 0.2

Sample Type: Soil				
Sample Name:		DUP_M 01-Aug-2024	TP10_0.1 01-Aug-2024	TP10_0.5 01-Aug-2024
Lab Number:		3640488.14	3640488.15	3640488.17
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS				
Heptachlor	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Heptachlor epoxide	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Hexachlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples*				
Acenaphthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Acenaphthylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
2-Methylnaphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Naphthalene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	< 0.25	< 0.25	< 0.25
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	< 0.25	< 0.25	< 0.25
Phenols Trace in SVOC Soil Samples by GC-MS				
4-Chloro-3-methylphenol	mg/kg dry wt	< 0.7	< 0.8	< 0.7
2-Chlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	< 0.2	< 0.2
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.7	< 0.8	< 0.7
2-Methylphenol (o-cresol)	mg/kg dry wt	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg dry wt	< 0.4	< 0.4	< 0.4
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	< 6	< 6
Phenol	mg/kg dry wt	< 0.7	< 0.8	< 0.7
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.7	< 0.8	< 0.7
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.7	< 0.8	< 0.7
Plasticisers Trace in SVOC Soil Samples by GC-MS				
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	< 0.5	< 0.5
Butylbenzylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Diethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Dimethylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Di-n-butylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Di-n-octylphthalate	mg/kg dry wt	< 0.2	< 0.2	< 0.2
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS				
1,2-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.16	< 0.14
1,3-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.16	< 0.14
1,4-Dichlorobenzene	mg/kg dry wt	< 0.14	< 0.16	< 0.14
Hexachlorobutadiene	mg/kg dry wt	< 0.14	< 0.16	< 0.14
Hexachloroethane	mg/kg dry wt	< 0.14	< 0.16	< 0.14
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	< 0.10	< 0.10

Sample Type: Soil				
Sample Name:		DUP_M 01-Aug-2024	TP10_0.1 01-Aug-2024	TP10_0.5 01-Aug-2024
Lab Number:		3640488.14	3640488.15	3640488.17
Other SVOC Trace in SVOC Soil Samples by GC-MS				
Benzyl alcohol	mg/kg dry wt	< 1.0	< 1.0	< 1.0
Carbazole	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Dibenzofuran	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Isophorone	mg/kg dry wt	< 0.10	< 0.10	< 0.10
Total Petroleum Hydrocarbons in Soil				
C7 - C9	mg/kg dry wt	< 20	< 20	< 20
C10 - C14	mg/kg dry wt	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80	< 80	< 80

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**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1, 3, 8-9, 11, 14-15, 17
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	1, 3, 8-9, 11, 14-15, 17
Total Recoverable Antimony	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Total Recoverable Tin	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	1.0 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GC-MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.10 - 6 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1, 3, 8-9, 11, 14-15, 17

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

Testing was completed between 02-Aug-2024 and 08-Aug-2024. For completion dates of individual analyses please contact the laboratory.

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

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



Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Appendix G – Results Analysis Tables

Annotations

(-) Not Analysed

BDL - Below Detection Limit

1 - MfE. 2012. Users' Guide: NES for Assessing and Managing Contaminants in Soil to Protect Human Health. Table B2 Soil contaminant standards for health for inorganic substances and Table B3 Soil contaminant standards for health for organic compounds

2 - Australian National Environmental Protection (Assessment of Site Contamination) Measure (NEPC 1999, amended 2013). Volume 2, Schedule B1, Table 1(A)1 Health Investigation Levels for Soil Contaminants.

3 - Australia and New Zealand Guidelines (ANZG) for Fresh and Marine Quality (2018). Toxicant Default Guideline Values for Sediment Quality - DGV.

4 - Landcare Research (2022).Exploring the implementation of ecological soil guildeline values for soil contaminants. Trigger value for 80% species protection selected – Tables 13, 14 and 22. TPH values applicable to 'coarse' grained soils adopted. For copper and zinc sensitive aged soil values selected

5 - Canterbury Regional Council (n.d.) online GIS Map Viewer: CanterburyMaps (Trace Elements Level 2). As the site straddles two soil groups (recent and gley soils), the most conservative level for each heavy metal was used.

6 - MfE Hazardous Waste Guidelines. Landfill Waste Acceptance Criteria and Landfill Classification, 2004. Table 1.

7 - MfE Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (revised 2011). Module 4, Tables 4.13 and 4.14. Tier 1 soil acceptance criteria for TPH all pathways. 'Commercial/Industrial' land use and soil type 'Sandy Silt'values selected for a depth < 1m.

8 - US Environmental Protection Agency Regional Screening Levels (Industrial Soils Applied) (Nov 2023).

9 - New Zealand Guidelines for Assessing and Managing Asbestos in Soil (2017). Table 5 - Soil guideline values for asbestos in New Zealand (GAMAS).

10 - DDT background - Landcare Research Manaaki Whenua Background soil concentrations of selected trace elements and organic contaminants in New Zealand. Envirolink Tools Grant: C09X1402. Table 21 mean value selected. This value is adopted by ECan in Canterbury.

11 - Environment Canterbury Contaminated Land Management - User Guide Background/Typical concentrations of polycyclic aromatic hydrocarbons (PAHs) in Christchurch urban soils

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Results Analysis Table - Heavy Metals

Rolleston Drive	Main South Rd	Hoskyns

Assessment Criteria and Screening Key	Heavy Metals							
	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ANZG Toxicant Default Guideline Values for Sediment Quality - DGV [3]	20	1.5	80	65	50	0.15	21	200
Eco SGVs Investigation Trigger (80%) Values [4]	*60*	*12*	*390*	*180*	*900*	-	-	*260*
Heavy Metal Background Concentrations [5]	**6.35**	**0.14**	**19.89**	**11.68**	**19.75**	**0.07**	**13.91**	**69.58**
MfE Hazardous Waste Guidelines Class A Screening [6]	100	20	-	100	100	4	200	200
Australian NEPM Measure 1999 (updated 2013) - Commerical/Industrial [2]	-	-	-	-	-	-	6,000	400,000
NESCS Commercial/industrial outoor worker (unpaved) [1]	70	1,300	6,300	10,000	3,300	4,200	-	-

Lab Report Number	Sample Code	Field ID	Targeting	Date	Depth								
3617400	3617400_27	BH02_0.5-0.7	Road Verge/Swale	01 Jul 2024	0.5 - 0.7	3	<0.10	13	5	14.1	<0.10	10	44
3625446	3625446_26	BH05_0.4-0.5	Railyard/HAIL F6	11 Jul 2024	0.4 - 0.5	**9**	0.13	15	**18**	**63**	**0.11**	13	56
3625446	3625446_27	BH05_0.6	Railyard/HAIL F6	11 Jul 2024	0.6	3	<0.10	12	4	16.2	<0.10	8	44
3613940	3613940_3	IP07_0.5	Proposed Overpass	25 Jun 2024	0.5	4	<0.10	14	4	14.4	<0.10	11	45
3613940	3613940_9	IP08_0.5	Proposed Overpass	25 Jun 2024	0.5	5	<0.10	15	4	13.7	<0.10	10	45
3613940	3613940_15	IP09_0.5	Former Buildings/ Soakage Basin	25 Jun 2024	0.5	4	<0.10	14	4	14.0	<0.10	11	42
3634747	3634747_18	IP10_0.5	Soakage Basin/Railyard - HAIL F6	24 Jul 2024	0.5	3	<0.10	12	6	**28**	<0.10	8	48
3634747	3634747_19	IP10_0.7	Soakage Basin/Railyard - HAIL F6	24 Jul 2024	0.7	3	<0.10	12	3	12.2	<0.10	7	43
3615826	3615826_3	TP15_0.5	Road Verge	27 Jun 2024	0.5	3	<0.10	12	4	12.4	<0.10	11	39
3633917	3633917_4	TP16_0.5	Railyard/HAIL F6	23 Jul 2024	0.5	3	<0.10	10	6	13.9	<0.10	8	36
3633917	3633917_12	TP17_0.5	Railyard/HAIL F6	23 Jul 2024	0.5	3	<0.10	13	3	**36**	<0.10	9	43
3634747	3634747_4	TP18_0.5	Railyard/HAIL F6	24 Jul 2024	0.5	3	<0.10	10	3	10.5	<0.10	6	36
3634747	3634747_11	TP19_0.5	Railyard/HAIL F6	24 Jul 2024	0.5	5	<0.10	13	**12**	**27**	<0.10	10	55
3637648	3637648_3	TP22_0.5	Railyard/HAIL F6	29 Jul 2024	0.5	<2	<0.10	11	2	9.3	<0.10	7	34
3629427	3629427_40	TP23_0.5	Former Buildings/ Soakage Basin	17 Jul 2024	0.5	4	<0.10	15	5	16.1	<0.10	12	45
3629427	3629427_3	TP24_0.5	Former Building/ Soakage Basin	17 Jul 2024	0.5	5	<0.10	19	5	**21**	<0.10	**15**	60
3625446	3625446_3	TP25_0.5	Former Buildings	11 Jul 2024	0.5	3	<0.10	13	4	14.1	<0.10	10	45
3629427	3629427_8	TP26_0.5	Former Buildings/ Soakage Basin	17 Jul 2024	0.5	4	<0.10	16	4	17.0	<0.10	10	57
3629427	3629427_35	TP27_0.5	Former Buildings	17 Jul 2024	0.5	4	<0.10	15	4	**37**	<0.10	10	54
3629427	3629427_14	TP28_0.5	Former Buildings/ Soakage Basin	17 Jul 2024	0.5	5	<0.10	15	6	**28**	<0.10	10	57
3625446	3625446_8	TP29_0.5	Former Buildings/ Soakage Basin	11 Jul 2024	0.5	4	<0.10	13	4	15.8	<0.10	10	45
3629427	3629427_30	TP30_0.5	Former Buildings	17 Jul 2024	0.5	4	<0.10	12	6	17.4	<0.10	10	44
3629427	3629427_24	TP31_0.5	Former Buildings/ Soakage Basin	17 Jul 2024	0.5	4	<0.10	13	6	**26**	<0.10	9	64
3629427	3629427_19	TP32_0.5	Former Buildings/ Soakage Basin	17 Jul 2024	0.5	3	<0.10	13	4	17.9	<0.10	8	49
3615826	3615826_11	TP33_0.5	Former Buildings	27 Jun 2024	0.5	3	<0.10	11	3	10.9	<0.10	9	40
3623104	3623104_6	TP34_0.5	Former Buildings	09 Jul 2024	0.5	4	<0.10	12	5	13.8	<0.10	11	40
3615826	3615826_16	TP35_0.5	Former Buildings/Swale	27 Jun 2024	0.5	3	<0.10	13	4	12.9	<0.10	11	40

Assessment Criteria and Screening Key	Heavy Metals							
	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ANZG Toxicant Default Guideline Values for Sediment Quality - DGV [3]	20	1.5	80	65	50	0.15	21	200
Eco SGVs Investigation Trigger (80%) Values [4]	*60*	*12*	*390*	*180*	*900*	-	-	*260*
Heavy Metal Background Concentrations [5]	**6.35**	**0.14**	**19.89**	**11.68**	**19.75**	**0.07**	**13.91**	**69.58**
MfE Hazardous Waste Guidelines Class A Screening [6]	100	20	-	100	100	4	200	200
Australian NEPM Measure 1999 (updated 2013) - Commerical/Industrial [2]	-	-	-	-	-	-	6,000	400,000
NESCS Commercial/industrial outoor worker (unpaved) [1]	70	1,300	6,300	10,000	3,300	4,200	-	-

Lab Report Number	Sample Code	Field ID	Targeting	Date	Depth								
3612947	3612947_1	IP04_0.1	Road Verge	24 Jun 2024	0.1	3	<0.10	11	5	16.7	<0.10	7	53
3612947	3612947_3	IP04_0.5	Road Verge	24 Jun 2024	0.5	4		17	5	14.3	<0.10	12	55
3621255	3621255_1	IP11_0.1	Road Verge	05 Jul 2024	0.1	5	**0.28**	17	**39**	**250**	<0.10	10	**175**
3621255	3621255_3	IP11_0.5	Road Verge	05 Jul 2024	0.5	5		18	7	18.3	<0.10	**14**	45
3628493	3628493_12	IP12_0.05	Road Verge	15 Jul 2024	0.05	3	<0.10	13	11	**70**	<0.10	7	67
3628493	3628493_14	IP12_0.5	Road Verge	15 Jul 2024	0.5	4	<0.10	14	5	14.0	<0.10	11	41
3635582	3635582_1	UT12_0.1	Road Verge/Proposed Swale	25 Jul 2024	0.1	4	<0.10	12	10	**62**	<0.10	10	**84**
3635582	3635582_3	UT12_0.5	Road Verge/Proposed Swale	25 Jul 2024	0.5	3	<0.10	11	8	**48**	<0.10	8	67
3622315	3622315_10	UT12A_0.1	Former Service Station/HAIL F7	08 Jul 2024	0.1	4	<0.10	13	9	**28**	<0.10	10	52
3622315	3622315_11	UT12A_0.5	Former Service Station/HAIL F7	08 Jul 2024	0.5	4		15	4	15.0	<0.10	10	56
3637648	3637648_9	UT13_0.1	Road Verge/Proposed Swale	29 Jul 2024	0.1	6	**0.16**	18	**14**	**39**	<0.10	12	**108**
3637648	3637648_11	UT13_0.5	Road Verge/Proposed Swale	29 Jul 2024	0.5	4	<0.10	13	**12**	**82**	**0.18**	9	**134**

Assessment Criteria and Screening Key	Heavy Metals							
	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ANZG Toxicant Default Guideline Values for Sediment Quality - DGV [3]	20	1.5	80	65	50	0.15	21	200
Eco SGVs Investigation Trigger (80%) Values [4]	*60*	*12*	*390*	*180*	*900*	-	-	*260*
Heavy Metal Background Concentrations [5]	**6.35**	**0.14**	**19.89**	**11.68**	**19.75**	**0.07**	**13.91**	**69.58**
MfE Hazardous Waste Guidelines Class A Screening [6]	100	20	-	100	100	4	200	200
Australian NEPM Measure 1999 (updated 2013) - Commerical/Industrial [2]	-	-	-	-	-	-	6,000	400,000
NESCS Commercial/industrial outoor worker (unpaved) [1]	70	1,300	6,300	10,000	3,300	4,200	-	-

Lab Report Number	Sample Code	Field ID	Targeting	Date	Depth								
3623104	3623104_1	TP14_0.1	Road Verge/Swale	09 Jul 2024	0.1	4	<0.10	14	7	15.9	<0.10	10	58
3623104	3623104_3	TP14_0.6	Road Verge/Swale	09 Jul 2024	0.6	4	<0.10	13	5	15.3	<0.10	9	52
3624497	3624497_1	IP13_0.1	Road Verge	10 Jul 2024	0.1	4	<0.10	13	7	**23**	<0.10	10	56
3624497	3624497_3	IP13_0.5	Road Verge	10 Jul 2024	0.5	4	<0.10	14	8	**25**	<0.10	11	61
3624497	3624497_7	TP13_0.1	Road Verge/Swale	10 Jul 2024	0.1	4	0.14	13	7	17.5	<0.10	9	58
3624497	3624497_9	TP13_0.5	Road Verge/Swale	10 Jul 2024	0.5	4	<0.10	14	5	12.2	<0.10	12	43
3625446	3625446_11	TP12_0.1	Road Verge/Swale	11 Jul 2024	0.1	4	<0.10	12	9	**20**	<0.10	9	**89**
3625446	3625446_13	TP12_0.5	Road Verge/Swale	11 Jul 2024	0.5	4	<0.10	12	4	**24**	<0.10	8	44

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Results Analysis Table - Heavy Metals (Pavement Pits)

Rolleston Drive	Main South Rd	Hoskyns

Assessment Criteria and Screening Key	Heavy Metals							
	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ANZG Toxicant Default Guideline Values for Sediment Quality - DGV [3]	20	1.5	80	65	50	0.15	21	200
Eco SGVs Investigation Trigger (80%) Values [4]	*60*	*12*	*390*	-	*900*	-	-	-
Heavy Metal Background Concentrations [5]	**6.35**	**0.14**	**19.89**	**11.68**	**19.75**	**0.07**	**13.91**	**69.58**
MfE Hazardous Waste Guidelines Class A Screening [6]	100	20	-	100	100	4	200	200
Australian NEPM Measure 1999 (updated 2013) - Commerical/Industrial [2]	-	-	-	-	-	-	6,000	400,000
NESCS Commercial/industrial outoor worker (unpaved) [1]	70	1,300	6,300	10,000	3,300	4,200	-	-

Lab Report Number	Sample Code	Field ID	Targeting	Date	Depth								
3610093	3610093_1	PP08_0.05	Road Surface Material	19 Jun 2024	0.05	<2	<0.10	3	6	4	<0.10	5	19
3610093	3610093_3	PP08_0.3	Basecourse	19 Jun 2024	0.3	4	<0.10	12	7	12.7	<0.10	10	41
3610093	3610093_6	PP13_0.05	Road Surface Material	19 Jun 2024	0.05	<2	<0.10	5	9	5.8	<0.10	8	18
3610093	3610093_8	PP13_0.3	Basecourse/HAIL A17, E5	19 Jun 2024	0.3	5	<0.10	12	8	13.6	<0.10	10	40
3610093	3610093_9	PP13_0.45	Basecourse/HAIL A17, E5	19 Jun 2024	0.45	4	<0.10	12	8	19.4	<0.10	9	48
3611080	3611080_1	PP15_0.05	Road Surface Material	20 Jun 2024	0.05	<2	<0.10	3	3	4.4	<0.10	3	13
3611080	3611080_3	PP15_0.3	Basecourse/HAIL A17, E5	20 Jun 2024	0.3	4	<0.10	12	7	13.3	<0.10	10	41
3611080	3611080_4	PP14_0.05	Road Surface Material	20 Jun 2024	0.05	<2	<0.10	3	3	3.7	<0.10	2	14
3611080	3611080_7	PP14_0.5	Basecourse/HAIL F4	20 Jun 2024	0.5	4	<0.10	12	4	10.8	<0.10	9	36
3611982	3611982_1	PP06_0.05	Road Surface Material	21 Jun 2024	0.05	<2	<0.10	4	4	3.9	<0.10	4	12
3611982	3611982_3	PP06_0.3	Basecourse	21 Jun 2024	0.3	4	<0.10	13	8	14.4	<0.10	10	46
3611982	3611982_5	PP11_0.05	Road Surface Material	21 Jun 2024	0.05	<2	<0.10	4	3	4.9	<0.10	3	16
3611982	3611982_7	PP11_0.3	Basecourse/HAIL A10	21 Jun 2024	0.3	4	<0.10	11	6	10.3	<0.10	9	35
3611982	3611982_8	PP11_0.5	Basecourse/HAIL A10	21 Jun 2024	0.5	4	<0.10	10	5	9.9	<0.10	8	34
3611080	3611080_10	PP12_0.1	Basecourse/HAIL A10,A17,A8,A18,F3,F4,G4	20 Jun 2024	0.1	4	<0.10	11	**15**	13.6	<0.10	**15**	37
3611080	3611080_12	PP12_0.5	Basecourse/HAIL A10,A17,A8,A18,F3,F4,G4	20 Jun 2024	0.5	4	<0.10	14	5	14.3	<0.10	11	40
3621255	3621255_8	PP19_0.05	Road Surface Material	05 Jul 2024	0.05	<2	<0.10	3	8	11.6	<0.10	3	25
3621255	3621255_9	PP19_0.15	Basecourse	05 Jul 2024	0.15	4	<0.10	13	10	13.7	<0.10	12	41
3621255	3621255_10	PP19_0.25	Road Surface Material	05 Jul 2024	0.25	<2	<0.10	6	8	**108**	<0.10	5	26
3622315	3622315_1	PP05_0.05	Road Surface Material	08 Jul 2024	0.05	<2	<0.10	4	6	8.3	<0.10	3	**30**
3622315	3622315_2	PP05_0.15	Basecourse	08 Jul 2024	0.15	4	<0.10	12	8	**22**	<0.10	10	**40**
3622315	3622315_6	PP21_0.05	Road Surface Material	08 Jul 2024	0.05	<2	<0.10	2	3	2.7	<0.10	3	11
3622315	3622315_7	PP21_0.15	Basecourse	08 Jul 2024	0.15	3	<0.10	11	7	12.9	<0.10	10	38
3625446	3625446_18	PP20_0.05	Road Surface Material	11 Jul 2024	0.05	<2	<0.10	2	3	7.8	-	<2	18
3625446	3625446_19	PP20_0.15	Basecourse	11 Jul 2024	0.15	4	<0.10	12	6	14.3	<0.10	10	42
3625446	3625446_20	PP20_0.2	Road Surface Material	11 Jul 2024	0.2	<2	<0.10	3	2	**20**	-	2	14
3628493	3628493_1	PP25_0.1	Road Surface Material	16 Jul 2024	0.1	<2	<0.10	5	8	**52**	<0.10	3	29
3628493	3628493_2	PP25_0.2	Basecourse	16 Jul 2024	0.2	4	**0.22**	12	11	**93**	<0.10	9	55
3630077	3630077_1	PP24_0.05	Road Surface Material	18 Jul 2024	0.05	<2	<0.10	3	11	**102**	<0.10	5	28
3630077	3630077_2	PP24_0.15	Basecourse	18 Jul 2024	0.15	4	<0.10	13	7	15.3	<0.10	10	43
3630077	3630077_3	PP24_0.25	Road Surface Material	18 Jul 2024	0.25	<2	0.1	5	7	**150**	<0.10	4	29
3632808	3632808_1	PP07_0.05	Road Surface Material	22-Jul-24	0.05	<2	<0.10	4	8	8.6	<0.10	3	36
3632808	3632808_2	PP07_0.15	Basecourse	23-Jul-24	0.15	3	<0.10	12	5	10.6	<0.10	9	35
3635582	3635582_5	PP09_0.05	Road Surface Material	25-Jul-24	0.05	<2	<0.10	3	4	5.9	<0.10	3	23
3635582	3635582_6	PP09_0.15	Basecourse	25-Jul-24	0.15	5	<0.10	13	8	13.1	<0.10	10	39
3636373	3636373_1	PP10_0.05	Road Surface Material	25-Jul-24	0.05	<2	<0.10	3	3	3.6	<0.10	4	20
3636373	3636373_2	PP10_0.10	Basecourse	25-Jul-24	0.1	4	<0.10	13	6	13.2	<0.10	9	39
3636373	3636373_4	PP10_0.70	Basecourse	25-Jul-24	0.7	**49**	**1.84**	**27**	**126**	**340**	**0.13**	**36**	**1,500**
3636373	3636373_5	PP10_1.05	Basecourse	25-Jul-24	1.05	**27**	**0.77**	17	**27**	**240**	**0.34**	**15**	**470**
3636373	3636373_6	PP10_1.3	Basecourse	25-Jul-24	1.3	**13**	<0.10	13	8	16.4	<0.10	11	**90**
3620180	3620180_1	PP23_0.05	Road Surface Material	04 Jul 2024	0.05	<2	<0.10	3	9	**66**	<0.10	2	29
3620180	3620180_2	PP23_0.15	Basecourse	04 Jul 2024	0.15	4	<0.10	12	6	15.7	<0.10	10	39
3620180	3620180_4	PP23_0.35	Road Surface Material	04 Jul 2024	0.35	<2	<0.10	4	5	**69**	<0.10	3	21
3620180	3620180_7	PP22_0.05	Road Surface Material	04 Jul 2024	0.05	<2	<0.10	3	9	**63**	<0.10	3	24
3620180	3620180_8	PP22_0.15	Basecourse	04 Jul 2024	0.15	4	<0.10	12	8	16.3	<0.10	11	41
3620180	3620180_9	PP22_0.25	Road Surface Material	04 Jul 2024	0.25	<2	<0.10	3	6	**58**	<0.10	3	19
3620180	3620180_10	PP22_0.3	Basecourse	04 Jul 2024	0.3	-	-	-	-	-	-	-	-

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Results Analysis Table - TPH and PAH

Rolleston Drive	Main South Rd	Hoskyns

								PAH																			TPH					
Assessment Criteria and Screening Key								B(a)P PEF (NZ NES)	1-Methylnaphthalene	2-methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(e)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Perylene	Pyrene	PAHs (Sum of total)	C7-C9 Fraction	C10-C14 Fraction	C15-C36 Fraction	Total Hydrocarbons (C7-C36 Fraction)	C6-C9 Fraction	C7-C36 Fraction
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ANZG Toxicant Default Guideline Values for Sediment Quality - DGV [3]				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10				280		
Eco SGVs Investigation Trigger (80%) Values [4]				-	-	-	-	-	-	-	-	-	-	-	*22*	-	-	-	-	-	*89*	-	-	-	-	-	-	-	*130*	*110*	*300*	-		
Ecan User Guide PAH Background Concentrations Christchurch [11]				**-**	**-**	**-**	**0.055**	**0.069**	**0.113**	**0.47**	**0.595**	**0.947**	**-**	**0.459**	**0.296**	**0.539**	**0.112**	**1.345**	**0.06**	**0.385**	**0.029**	**0.703**	**-**	**1.362**	**-**	**-**	**-**	**-**	**-**						
MfE Hazardous Waste Guidelines Class A Screening [6]				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	-	-
NESCS Commercial/industrial outoor worker (unpaved) [1]				35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Module 4, Tier 1 Commercial / Industrial (SAND) [7]				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	190	-	-	-	-	-	-	-	-	-
Lab Report Number	**Sample Code**	**Field ID**	**Targeting**	**Date**	**Depth**																														
3617400	**3617400_25**	**BH02_0.1-0.2**	**Road Verge/Swale**	**01 Jul 2024**	**0.1 - 0.2**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
3617400	**3617400_27**	**BH02_0.5-0.7**	**Road Verge/Swale**	**01 Jul 2024**	**0.5 - 0.7**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
3625446	**3625446_24**	**BH05_0.1**	**Railyard/HAIL F6**	**11 Jul 2024**	**0.1**	<0.010	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
3625446	**3625446_26**	**BH05_0.4-0.5**	**Railyard/HAIL F6**	**11 Jul 2024**	**0.4 - 0.5**	<0.010	-	0.43	<0.010	<0.010	<0.010	0.18	0.16	0.18	-	<0.10	<0.10	0.20	<0.10	0.33	<0.10	0.11	**0.25**	0.35	-	0.37	-	<0.10	<0.10	91	96	-	-
3625446	**3625446_27**	**BH05_0.6**	**Railyard/HAIL F6**	**11 Jul 2024**	**0.6**	<0.010	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-	<0.10	<0.10	<50	<50	-	-
3613940	**3613940_1**	**IP07_0.1**	**Proposed Overpass**	**25 Jun 2024**	**0.1**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010	<0.010	<0.010	-	-	-	-	-
3613940	**3613940_3**	**IP07_0.5**	**Proposed Overpass**	**25 Jun 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-	-	-	-
3613940	**3613940_7**	**IP08_0.1**	**Proposed Overpass**	**25 Jun 2024**	**0.1**	0.061	0.035	0.033	<0.010	<0.010	<0.010	0.032	0.041	0.054	0.027	0.029	0.021	0.042	<0.010	0.075	<0.010	0.027	<0.10	0.047	0.012	0.076	0.6	<0.10	<0.10	<50	-	-	-	-	-
3613940	**3613940_9**	**IP08_0.5**	**Proposed Overpass**	**25 Jun 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<50	-	-	-	-	-
3613940	**3613940_13**	**IP09_0.1**	**Former Buildings/ Soakage Basin**	**25 Jun 2024**	**0.1**	<0.010	0.037	0.035	<0.010	<0.010	<0.010	0.013	0.015	0.018	<0.010	<0.010	<0.010	0.016	<0.010	0.026	<0.010	<0.010	<0.10	0.035	<0.10	0.031	0.3	<0.10	<0.10	<50	-	-	-	-	-
3613940	**3613940_15**	**IP09_0.5**	**Former Buildings/ Soakage Basin**	**25 Jun 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<50	-	-	-	-	-
3634747	**3634747_16**	**IP10_0.1**	**Soakage Basin/Railyard - HAIL F6**	**24 Jul 2024**	**0.1**	0.41	-	0.31	<0.010	<0.010	<0.010	0.32	0.27	0.31	-	0.15	0.11	0.36	<0.10	0.47	<0.10	0.16	**0.22**	0.35	-	0.54	-	<0.10	<0.10	<50	-	-	-	-	-
3634747	**3634747_18**	**IP10_0.5**	**Soakage Basin/Railyard - HAIL F6**	**24 Jul 2024**	**0.5**	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-	<0.10	<0.10	*500*	540	-	-	-	-
3634747	**3634747_19**	**IP10_0.7**	**Soakage Basin/Railyard - HAIL F6**	**24 Jul 2024**	**0.7**	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-	<0.10	<0.10	<50	<50	-	-	-	-
3615826	**3615826_1**	**TP15_0.1**	**Road Berm**	**27 Jun 2024**	**0.1**	<0.010	0.029	0.027	<0.010	<0.010	<0.010	<0.010	0.015	0.018	<0.010	<0.010	<0.010	0.013	<0.010	0.031	<0.010	<0.010	<0.10	0.032	<0.10	0.028	<0.1	<0.10	<0.10	72	<50	-	-	-	-
3615826	**3615826_3**	**TP15_0.5**	**Road Berm**	**27 Jun 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3633917	**3633917_1**	**TP16_0.05**	**Asphalt/Railyard**	**23 Jul 2024**	**0.05**	<0.010	<0.010	0.13	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	1,250	<50	-	-	-	-
3633917	**3633917_2**	**TP16_0.1**	**Railyard/HAIL F6**	**23 Jul 2024**	**0.1**	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-	<0.10	<0.10	<50	<50	-	-	-	-
3633917	**3633917_4**	**TP16_0.5**	**Railyard/HAIL F6**	**23 Jul 2024**	**0.5**	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-	<0.10	<0.10	<50	<50	-	-	-	-
3633917	**3633917_9**	**TP17_0.05**	**Asphalt/Railyard**	**23 Jul 2024**	**0.05**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	430	<50	-	-	-	-
3633917	**3633917_10**	**TP17_0.1**	**Railyard/HAIL F6**	**23 Jul 2024**	**0.1**	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-	<0.10	<0.10	75	<50	-	-	-	-
3633917	**3633917_12**	**TP17_0.5**	**Railyard/HAIL F6**	**23 Jul 2024**	**0.5**	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-	<0.10	<0.10	<50	<50	-	-	-	-
3634747	**3634747_2**	**TP18_0.15**	**Railyard/HAIL F6**	**24 Jul 2024**	**0.15**	<0.010	-	1.71	<0.010	<0.010	0.11	0.29	0.14	0.18	-	<0.10	<0.10	0.35	<0.10	0.36	<0.10	0.10	0.53	**1.13**	-	0.53	-	<0.10	<0.10	*560*	620	-	-	-	-
3634747	**3634747_4**	**TP18_0.5**	**Railyard/HAIL F6**	**24 Jul 2024**	**0.5**	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<0.10	<0.10	<50	<50	-	-	-	-
3634747	**3634747_9**	**TP19_0.1**	**Railyard/HAIL F6**	**24 Jul 2024**	**0.1**	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<0.10	<0.10	136	136	-	-	-	-
3634747	**3634747_11**	**TP19_0.5**	**Railyard/HAIL F6**	**24 Jul 2024**	**0.5**	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	0.13	-	<0.10	<0.10	<50	<50	-	-	-	-
3637648	**3637648_1**	**TP22_0.1**	**Railyard/HAIL F6**	**29 Jul 2024**	**0.1**	0.31	-	<0.010	<0.010	<0.010	<0.010	0.23	0.19	0.20	-	0.12	<0.10	0.26	<0.10	0.39	<0.10	0.14	<0.10	0.25	-	0.45	-	<0.10	<0.10	104	106	-	-	-	-
3637648	**3637648_3**	**TP22_0.5**	**Railyard/HAIL F6**	**29 Jul 2024**	**0.5**	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	-	<0.10	<0.10	<50	<50	-	-	-	-
3629427	**3629427_38**	**TP23_0.1**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.1**	<0.010	0.027	0.027	<0.010	<0.010	<0.010	<0.010	<0.010	0.016	<0.010	<0.10	<0.10	0.012	<0.10	0.028	<0.10	<0.10	<0.10	0.027	<0.10	0.025	<0.1	<0.10	<0.10	59	<50	-	-	-	-
3629427	**3629427_40**	**TP23_0.5**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3629427	**3629427_1**	**TP24_0.1**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.1**	<0.010	0.044	0.042	<0.010	<0.010	<0.010	0.018	0.019	0.026	<0.010	<0.10	<0.10	0.018	<0.10	0.040	<0.10	0.014	<0.10	0.047	<0.10	0.043	0.4	<0.10	<0.10	102	110	-	-	-	-
3629427	**3629427_3**	**TP24_0.5**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3625446	**3625446_1**	**TP25_0.1**	**Former Buildings**	**11 Jul 2024**	**0.1**	<0.010	0.040	0.038	<0.010	<0.010	<0.010	0.012	0.015	0.017	<0.010	0.020	<0.10	0.016	<0.10	0.035	<0.10	0.014	<0.10	0.043	<0.10	0.034	0.4	<0.10	<0.10	65	<50	-	-	-	-
3625446	**3625446_3**	**TP25_0.5**	**Former Buildings**	**11 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3629427	**3629427_6**	**TP26_0.1**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.1**	0.043	0.073	0.064	<0.010	<0.010	<0.010	0.026	0.029	0.039	0.020	0.020	<0.10	0.027	<0.10	0.057	<0.10	0.021	<0.10	0.080	0.016	0.062	0.6	<0.10	<0.10	109	111	-	-	-	-
3629427	**3629427_8**	**TP26_0.5**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3629427	**3629427_33**	**TP27_0.1**	**Former Buildings**	**17 Jul 2024**	**0.1**	<0.010	0.024	0.024	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	0.014	<0.10	<0.10	<0.10	0.021	<0.10	0.016	<0.1	<0.10	<0.10	47	<50	-	-	-	-
3629427	**3629427_35**	**TP27_0.5**	**Former Buildings**	**17 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3629427	**3629427_12**	**TP28_0.1**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.1**	0.174	0.094	0.082	<0.010	<0.010	0.036	0.098	0.121	0.145	0.075	0.081	0.052	0.098	<0.10	0.24	<0.10	0.078	<0.10	0.169	0.035	0.22	1.7	<0.10	<0.10	120	131	-	-	-	-
3629427	**3629427_14**	**TP28_0.5**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3625446	**3625446_6**	**TP29_0.1**	**Former Buildings/ Soakage Basin**	**11 Jul 2024**	**0.1**	<0.010	0.028	0.028	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	<0.010	<0.10	<0.10	<0.10	<0.10	0.018	<0.10	<0.10	<0.10	0.022	<0.10	0.022	0.3	<0.10	<0.10	50	<50	-	-	-	-
3625446	**3625446_8**	**TP29_0.5**	**Former Buildings/ Soakage Basin**	**11 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	44	<50	-	-	-	-
3629427	**3629427_28**	**TP30_0.1**	**Former Buildings**	**17 Jul 2024**	**0.1**	<0.010	0.034	0.032	<0.010	<0.010	<0.010	0.013	<0.010	0.017	<0.010	<0.10	<0.10	<0.10	<0.10	0.025	<0.10	<0.10	<0.10	0.032	<0.10	0.028	<0.1	<0.10	<0.10	57	<50	-	-	-	-
3629427	**3629427_30**	**TP30_0.5**	**Former Buildings**	**17 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3629427	**3629427_22**	**TP31_0.1**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.1**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	0.014	0.015	<0.010	<0.10	<0.10	0.011	<0.10	0.025	<0.10	<0.10	<0.10	0.017	<0.10	0.024	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3629427	**3629427_24**	**TP31_0.5**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	0.013	<0.010	<0.10	<0.10	<0.10	<0.10	0.024	<0.10	<0.10	<0.10	0.020	<0.10	0.022	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3629427	**3629427_17**	**TP32_0.1**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.1**	<0.010	0.032	0.031	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010	<0.10	<0.10	<0.10	<0.10	0.025	<0.10	<0.10	<0.10	0.031	<0.10	0.025	<0.1	<0.10	<0.10	58	<50	-	-	-	-
3629427	**3629427_19**	**TP32_0.5**	**Former Buildings/ Soakage Basin**	**17 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010	<0.10	<0.10	<0.10	<0.10	0.018	<0.10	<0.10	<0.10	0.012	<0.10	0.018	<0.1	<0.10	<0.10	89	93	-	-	-	-
3615826	**3615826_9**	**TP33_0.1**	**Former Buildings**	**27 Jun 2024**	**0.1**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	0.017	<0.10	<0.10	<0.10	<0.10	<0.10	0.016	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3615826	**3615826_11**	**TP33_0.5**	**Former Buildings**	**27 Jun 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3623104	**3623104_4**	**TP34_0.1**	**Former Buildings**	**09 Jul 2024**	**0.1**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	0.014	0.016	<0.010	<0.10	<0.10	0.012	<0.10	0.027	<0.10	<0.10	<0.10	0.026	<0.10	0.028	<0.1	<0.10	<0.10	54	<50	-	-	-	-
3623104	**3623104_6**	**TP34_0.5**	**Former Buildings**	**09 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3615826	**3615826_14**	**TP35_0.1**	**Former Buildings/Swale**	**27 Jun 2024**	**0.1**	<0.010	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	0.021	<0.10	<0.10	<0.10	0.018	<0.10	0.019	<0.1	<0.10	<0.10	<50	<50	-	-	-	-
3615826	**3615826_16**	**TP35_0.5**	**Former Buildings/Swale**	**27 Jun 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-	-	-

				PAH																							TPH			
Assessment Criteria and Screening Key				B(a)P PEF (NZ NES)	1-Methylnaphthalene	2-methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(e)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Perylene	Pyrene	PAHs (Sum of total)	C7-C9 Fraction	C10-C14 Fraction	C15-C36 Fraction	C7-C36 Fraction
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ANZG Toxicant Default Guideline Values for Sediment Quality - DGV [3]				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10				280
Eco SGVs Investigation Trigger (80%) Values [4]				-	-	-	-	-	-	-	*22*	-	-	-	-	-	-	*89*	-	-	-	-	-	-	-	*130*	*110*	*300*	-
Ecan User Guide PAH Background Concentrations Christchurch [11]				**-**	**-**	**-**	**0.055**	**0.069**	**0.113**	**0.47**	**0.595**	**0.947**	**-**	**0.459**	**0.296**	**0.539**	**0.112**	**1.345**	**0.06**	**0.385**	**0.029**	**0.703**	**-**	**1.362**	**-**	**-**	**-**	**-**	**-**
MfE Hazardous Waste Guidelines Class A Screening [6]				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	-
NESCS Commercial/industrial outoor worker (unpaved) [1]				35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Module 4, Tier 1 Commercial / Industrial (SAND) [7]				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	190	-	-	-	-	120	1,500	-	-
Lab Report Number	**Sample Code**	**Field ID**	**Targeting**	**Date**	**Depth**																								
3624497	**3624497_1**	**IP13_0.1**	**Road Verge**	**10 Jul 2024**	**0.1**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	0.016	<0.10	<0.10	<0.10	0.011	<0.10	0.015	<0.1	<0.10	<0.10	<50	<50	-	-
3624497	**3624497_3**	**IP13_0.5**	**Road Verge**	**10 Jul 2024**	**0.5**	<0.010	0.015	0.017	<0.010	<0.010	<0.010	<0.010	0.011	0.013	<0.010	<0.10	<0.10	<0.10	<0.10	0.021	<0.10	<0.10	<0.10	0.015	<0.10	0.021	<0.1	<0.10	<0.10	<50	<50	-	-
3625446	**3625446_11**	**TP12_0.1**	**Road Verge/Swale**	**11 Jul 2024**	**0.1**	<0.010	0.016	0.015	<0.010	<0.010	<0.010	<0.010	0.012	0.013	<0.010	<0.10	<0.10	<0.10	<0.10	0.023	<0.10	<0.10	<0.10	0.021	<0.10	0.025	<0.1	<0.10	<0.10	71	<50	-	-
3625446	**3625446_13**	**TP12_0.5**	**Road Verge/Swale**	**11 Jul 2024**	**0.5**	0.038	-	-	<0.010	<0.010	<0.010	0.018	0.026	0.033	0.016	0.016	0.013	0.021	<0.10	0.050	<0.10	0.018	<0.10	0.034	<0.10	0.054	0.3	<0.10	46	*460*	510	-	-
3624497	**3624497_7**	**TP13_0.1**	**Road Verge/Swale**	**10 Jul 2024**	**0.1**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-
3624497	**3624497_9**	**TP13_0.5**	**Road Verge/Swale**	**10 Jul 2024**	**0.5**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-
3623104	**3623104_1**	**TP14_0.1**	**Road Verge/Swale**	**09 Jul 2024**	**0.1**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.013	<0.1	<0.10	<0.10	43	<50	-	-
3623104	**3623104_3**	**TP14_0.6**	**Road Verge/Swale**	**09 Jul 2024**	**0.6**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	<50	<50	-	-

beca

Results Analysis Table - TPH and PAH (Pavement Pits)

Rolleston Drive	Main South Rd	Hoskyns

	PAH																							TPH					
	B(a)PTEF (NZ NES)	1-Methylnaphthalene	2-methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(e) pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Peeylene	Pyrene	PAHs (Sum of total)	C7-C9 Fraction	C10-C14 Fraction	C15-C36 Fraction	Total Hydrocarbons (C7 - C36)	C6-C9 Fraction	C6-C36 Fraction
Assessment Criteria and Screening Key	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ANZG Toxicant Default Guideline Values for Sediment Quality - DGV [3]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10				280	-	-
Eco SGVs Investigation Trigger (80%) Values [4]	-	-	-	-	-	-	-	*22*	-	-	-	-	-	-	-	-	*89*	-	-	-	-	*130*	*110*	*300*	-	-	-
Ecan User Guide PAH Background Concentrations Christchurch [11]	**0.922**	-	-	**0.055**	**0.069**	**0.113**	**0.47**	**0.595**	**0.947**	-	**0.459**	**0.296**	**0.539**	**0.112**	**1.345**	**0.06**	**0.385**	**0.029**	**0.703**	-	**1.362**	-	-	-	-	-	-
MfE Hazardous Waste Guidelines Class A Screening [6]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	-	-
NESCS Commercial/industrial outoor worker (unpaved) [1]	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Module 4, Tier 1 Commercial / Industrial (SAND) [2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	190	-	-	-	120	1,500	-	-	-	-

Lab Report Number	Sample Code	Field ID	Targeting	Date	Depth																										
3610093	3610093_1	PP08_0.05	Road Surface Material	19 Jun 2024	0.05	0.31	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	0.21	0.21	0.21	0.21	<0.10	0.14	<0.10	0.23	<0.10	0.14	<0.10	0.13	<0.10	0.37	2	<100	<100	1,090	1,100	-	-
3610093	3610093_3	PP08_0.3	Basecourse	19 Jun 2024	0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3610093	3610093_6	PP13_0.05	Road Surface Material	19 Jun 2024	0.05	<0.10	0.39	0.39	<0.10	<0.10	<0.10	0.13	0.14	0.22	0.17	<0.10	0.10	<0.10	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	0.27	3	<100	127	1,920	2,100	-	-
3610093	3610093_8	PP13_0.3	Basecourse/HAIL A17, E5	19 Jun 2024	0.3	0.046	<0.10	<0.10	<0.10	<0.10	<0.10	0.027	0.03	0.034	0.017	0.017	0.015	0.024	<0.10	0.056	<0.10	0.022	<0.10	0.034	<0.10	0.060	0.4	<100	<100	<100	<100	-	-
3610093	3610093_9	PP13_0.45	Basecourse/HAIL A17, E5	19 Jun 2024	0.45	0.22	0.072	0.062	<0.10	0.029	0.067	0.152	0.143	0.163	0.076	0.072	0.075	0.145	0.023	0.33	0.038	0.086	<0.10	0.30	0.032	0.32	2.2	<100	<100	<100	<100	-	-
3611080	3611080_1	PP15_0.05	Road Surface Material	20 Jun 2024	0.05	0.39	<0.10	<0.10	<0.10	<0.10	<0.10	0.15	0.26	0.25	0.25	0.25	<0.10	0.17	<0.10	0.28	<0.10	0.18	<0.10	0.12	<0.10	0.48	3	<100	<100	1,250	1,280	-	-
3611080	3611080_3	PP15_0.3	Basecourse/HAIL A17, E5	20 Jun 2024	0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.01	0.014	0.015	<0.10	<0.10	<0.10	0.011	<0.10	0.018	<0.10	<0.10	<0.10	0.010	<0.10	0.019	-	<100	<100	<100	<100	-	-
3611080	3611080_4	PP14_0.05	Road Surface Material	20 Jun 2024	0.05	0.32	<0.10	<0.10	<0.10	<0.10	<0.10	0.15	0.21	0.23	0.21	0.21	0.10	0.15	<0.10	0.26	<0.10	0.15	<0.10	0.10	<0.10	0.40	2	<100	<100	970	990	-	-
3611080	3611080_7	PP14_0.5	Basecourse/HAIL F4	20 Jun 2024	0.5	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3611982	3611982_1	PP06_0.05	Road Surface Material	21 Jun 2024	0.05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	1,330	1,350	-	-
3611982	3611982_3	PP06_0.3	Basecourse	21 Jun 2024	0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3611982	3611982_5	PP11_0.05	Road Surface Material	21 Jun 2024	0.05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	1,310	1,330	-	-
3611982	3611982_7	PP11_0.3	Basecourse/HAIL A10	21 Jun 2024	0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3611982	3611982_8	PP11_0.5	Basecourse/HAIL A10	21 Jun 2024	0.5	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3611080	3611080_10	PP12_0.1	Basecourse/HAIL A10,A17,A8,A18,F3,F4,G4	20 Jun 2024	0.1	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	60	-	-	-
3611080	3611080_12	PP12_0.5	Basecourse/HAIL A10,A17,A8,A18,F3,F4,G4	20 Jun 2024	0.5	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3621255	3621255_8	PP19_0.05	Road Surface Material	05 Jul 2024	0.05	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	0.19	0.16	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	0.38	2	<100	230	3,500	3,800	-	-
3621255	3621255_9	PP19_0.15	Basecourse	05 Jul 2024	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3621255	3621255_10	PP19_0.25	Road Surface Material	05 Jul 2024	0.25	<0.10	<0.10	<0.10	**0.11**	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	<0.10	0.11	0.4	<100	<100	1,420	1,600	-	-
3622315	3622315_1	PP05_0.05	Road Surface Material	08 Jul 2024	0.05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.15	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	2,200	2,400	-	-
3622315	3622315_2	PP05_0.15	Basecourse	08 Jul 2024	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.013	0.016	0.016	0.011	0.014	<0.10	0.012	<0.10	0.024	<0.10	0.012	<0.10	0.011	<0.10	0.027	-	<100	<100	<100	<100	-	-
3622315	3622315_6	PP21_0.05	Road Surface Material	08 Jul 2024	0.05	0.36	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.14	0.17	<0.10	0.18	0.12	0.17	**0.17**	<0.10	<0.10	0.15	<0.10	0.17	<0.10	0.11	0.4	<100	<100	1,490	1,660	-	-
3622315	3622315_7	PP21_0.15	Basecourse	08 Jul 2024	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.010	-	<100	<100	96	109	-	-
3625446	3625446_18	PP20_0.05	Road Surface Material	11 Jul 2024	0.05	<0.10	0.51	0.48	<0.10	<0.10	<0.10	<0.10	0.10	<0.10	0.18	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.22	<0.10	0.42	3	<100	300	3,200	4,500	-	-
3625446	3625446_19	PP20_0.15	Basecourse	11 Jul 2024	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3625446	3625446_20	PP20_0.2	Road Surface Material	11 Jul 2024	0.2	<0.10	0.44	0.49	<0.10	<0.10	<0.10	<0.10	0.15	0.18	0.23	0.21	<0.10	0.17	<0.10	0.29	<0.10	<0.10	<0.10	0.41	<0.10	0.34	3	<100	290	4,100	3,500	-	-
3628493	3628493_1	PP25_0.1	Road Surface Material	16 Jul 2024	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	1,110	1,230	-	-
3628493	3628493_2	PP25_0.2	Basecourse	16 Jul 2024	0.2	0.056	<0.10	<0.10	<0.10	0.012	0.011	0.033	0.037	0.043	0.022	0.022	0.017	0.034	<0.10	0.072	<0.10	0.023	<0.10	0.052	<0.10	0.072	0.5	<100	<100	<100	<100	-	-
3630077	3630077_1	PP24_0.05	Road Surface Material	18 Jul 2024	0.05	<0.10	0.13	<0.10	**0.16**	<0.10	0.11	<0.10	<0.10	<0.10	0.14	<0.10	<0.10	0.13	<0.10	0.46	**0.11**	<0.10	<0.10	0.61	<0.10	0.44	3	<100	<100	1,740	1,740	-	-
3630077	3630077_2	PP24_0.15	Basecourse	18 Jul 2024	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3630077	3630077_3	PP24_0.25	Road Surface Material	18 Jul 2024	0.25	130	37	36	**25**	**22**	**96**	**109**	**88**	**86**	39	**34**	**37**	**89**	**11.8**	**230**	**98**	**41**	**28**	**370**	16.9	**220**	1,710	<100	220	5,800	6,000	-	-
3632808	3632808_1	PP07_0.05	Road Surface Material	22 Jul 2024	0.05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.012	<0.10	<0.10	-	<100	<100	960	960	-	-
3632808	3632808_2	PP07_0.15	Basecourse	22 Jul 2024	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3635582	3635582_5	PP09_0.05	Road Surface Material	25 Jul 2024	0.05	<0.10	0.38	0.39	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.12	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	<0.10	0.13	0.5	<100	<100	3,300	3,400	-	-
3635582	3635582_6	PP09_0.15	Basecourse	25 Jul 2024	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.012	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3636373	3636373_1	PP10_0.05	Road Surface Material	26 Jul 2024	0.05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	1,040	1,050	-	-
3636373	3636373_2	PP10_0.10	Basecourse	26 Jul 2024	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	<100	<100	<100	<100	-	-
3636373	3636373_4	PP10_0.70	Basecourse	26 Jul 2024	0.7	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	0.14	-	<100	<100	59	-	-	-
3636373	3636373_5	PP10_1.05	Basecourse	26 Jul 2024	1.05	<0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	<100	<100	<100	<100	-	-
3620180	3620180_1	PP23_0.05	Road Surface Material	04 Jul 2024	0.05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.17	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	0.10	-	<100	<100	2,100	2,300	-	-
3620180	3620180_2	PP23_0.15	Basecourse	04 Jul 2024	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.011	<0.10	<0.10	<0.10	0.016	<0.10	0.011	-	<100	<100	<100	<100	-	-
3620180	3620180_4	PP23_0.35	Road Surface Material	04 Jul 2024	0.35	118	30	29	**19.9**	**23**	84	92	80	73	35	**33**	33	78	11.2	230	76	38	24	400	16.3	210	1,620	<100	260	5,800	6,100	-	-
3620180	3620180_5	PP23_0.45	Basecourse	04 Jul 2024	0.45	0.144	0.028	0.026	0.017	0.024	0.093	0.114	0.100	0.091	0.043	0.041	0.041	0.101	0.012	0.24	**0.075**	0.046	<0.10	0.35	0.018	0.25	1.7	<100	<100	<100	<100	-	-
3620180	3620180_7	PP22_0.05	Road Surface Material	04 Jul 2024	0.05	<0.10	<0.10	<0.10	<0.10	0.15	<0.10	<0.10	<0.10	0.10	0.23	0.18	<0.10	<0.10	<0.10	0.11	<0.10	0.11	<0.10	0.18	<0.10	0.16	-	<100	<100	2,400	2,600	-	-
3620180	3620180_8	PP22_0.15	Basecourse	04 Jul 2024	0.15	0.21	0.026	0.030	0.031	0.018	**0.122**	0.149	0.141	0.142	0.069	0.072	0.060	0.118	0.019	0.40	**0.089**	0.074	<0.10	0.45	0.028	0.34	2.4	<100	<100	<100	<100	-	-
3620180	3620180_9	PP22_0.25	Road Surface Material	04 Jul 2024	0.25	**330**	109	143	**98**	**18.8**	**240**	**240**	**230**	**210**	98	**94**	**91**	**220**	**30**	**710**	**280**	**110**	**220**	**1,220**	48	**590**	5,000	<100	820	11,900	12,800	-	-
3620180	3620180_10	PP22_0.3	Basecourse	04 Jul 2024	0.3	0.33	0.050	0.060	0.039	0.026	**0.143**	0.22	0.23	0.23	0.116	0.114	0.093	0.185	0.028	0.47	**0.126**	0.115	**0.08**	0.56	0.046	0.45	3.4	<100	<100	<100	<100	-	-

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Results Analysis Table - SVOC, VOC, OCPs + ONPPs

Rolleston Drive	Main South Rd	Hoskyns

Assessment Criteria and Screening Key	SVOC, VOC, OCP + ONPPs							
	Total DDT Isomers	2,4-DDT	4,4-DDE	DDD	DDT	Bis(2-ethylhexyl)adipate	Dibenzofuran	Additional 203 Compounds Analysed
	mg/kg dry wt	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ANZG Toxicant Default Guideline Values for Sediment Quality - DGV [3]	0.012	-	-	-	0.012	-	-	-
Eco SGVs Investigation Trigger (80%) Values [4]	*4.8*	-	-	-	*4.8*	-	-	-
Background Concentrations [10]	**0.431**	**-**	**-**	**-**	**0.431**	**-**	**-**	**-**
MfE Hazardous Waste Guidelines Class A Screening [6]	500	-	-	-	500	-	-	-
NESCS Commercial/industrial outoor worker (unpaved) [1]	1,000	-	-	-	1,000	-	-	-
USEPA RSLs Industrial Soil THQ=1.0 [8]	8.5	-	9.3	9.6	8.5	1,900	1,200	

Lab Report Number	Sample Code	Field ID	Target	Date	Depth								
3625446	3625446_24	BH05_0.1	Railyard/HAIL F6	11 Jul 2024	0.1	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3625446	3625446_26	BH05_0.4-0.5	Railyard/HAIL F6	11 Jul 2024	0.4 - 0.5	-	-	<0.10	<0.10	<0.2	<0.2	0.18	BDL
3625446	3625446_27	BH05_0.6	Railyard/HAIL F6	11 Jul 2024	0.6	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3634747	3634747_16	IP10_0.1	Soakage Basin/Railyard/HAIL F6	24 Jul 2024	0.1	-	-	<0.10	<0.10	<0.2	0.3	0.15	BDL
3634747	3634747_18	IP10_0.5	Soakage Basin/Railyard/HAIL F6	24 Jul 2024	0.5	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3634747	3634747_19	IP10_0.7	Soakage Basin/Railyard/HAIL F6	24 Jul 2024	0.7	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3636373	3636373_4	PP10_0.70	Basecourse	26 Jul 2024	0.7	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3636373	3636373_5	PP10_1.05	Basecourse	26 Jul 2024	1.05	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3611982	3611982_7	PP11_0.3	Basecourse/HAIL A10	21 Jun 2024	0.3	<0.07	<0.011	<0.011	<0.011	<0.011	-	-	BDL
3611982	3611982_8	PP11_0.5	Basecourse/HAIL A10	21 Jun 2024	0.5	<0.07	<0.011	<0.011	<0.011	<0.011	-	-	BDL
3611080	3611080_10	PP12_0.1	Basecourse/HAIL A10,A17,A8,A18,F3,F4,G4	20 Jun 2024	0.1	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3611080	3611080_12	PP12_0.5	Basecourse/HAIL A10,A17,A8,A18,F3,F4,G4	20 Jun 2024	0.5	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3611080	3611080_7	PP14_0.5	Basecourse/HAIL F4	20 Jun 2024	0.5	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3625446	3625446_11	TP12_0.1	Road Verge	11 Jul 2024	0.1	<0.07	<0.011	0.019	<0.011	<0.011	-	-	BDL
3625446	3625446_13	TP12_0.5	Road Verge	11 Jul 2024	0.5	<0.08	<0.012	<0.012	<0.012	<0.012	-	-	BDL
3633917	3633917_2	TP16_0.1	Railyard/HAIL F6	23 Jul 2024	0.1	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3633917	3633917_4	TP16_0.5	Railyard/HAIL F6	23 Jul 2024	0.5	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3633917	3633917_9	TP17_0.05	Railyard/HAIL F6	23 Jul 2024	0.05	-	-	-	-	-	-	-	BDL
3633917	3633917_10	TP17_0.1	Railyard/HAIL F6	23 Jul 2024	0.1	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3633917	3633917_12	TP17_0.5	Railyard/HAIL F6	23 Jul 2024	0.5	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3634747	3634747_2	TP18_0.15	Railyard/HAIL F6	24 Jul 2024	0.15	-	-	<0.10	<0.10	<0.2	<0.2	1.10	BDL
3634747	3634747_4	TP18_0.5	Railyard/HAIL F6	24 Jul 2024	0.5	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3634747	3634747_9	TP19_0.1	Railyard/HAIL F6	24 Jul 2024	0.1	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3634747	3634747_11	TP19_0.5	Railyard/HAIL F6	24 Jul 2024	0.5	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3637648	3637648_1	TP22_0.1	Railyard/HAIL F6	29 Jul 2024	0.1	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3637648	3637648_3	TP22_0.5	Railyard/HAIL F6	29 Jul 2024	0.5	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3622315	3622315_10	UT12A_0.1	Former Service Station/HAIL F7	08 Jul 2024	0.1	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL
3622315	3622315_11	UT12A_0.5	Former Service Station/HAIL F7	08 Jul 2024	0.5	-	-	<0.10	<0.10	<0.2	<0.2	<0.10	BDL

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Results Analysis Table - Asbestos

Rolleston Drive	Main South Rd	Hoskyns Rd

	Asbestos					
	Asbestos Presence/Absence	Description	Asbestos as Asbestos Fines as % of Total Sample	Asbestos as Fibrous Asbestos as % of Total Sample	Asbestos in ACM as % of Total Sample	Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample
Assessment Criteria and Screening Key	NA	NA	% w/w	% w/w	% w/w	% w/w
GAMAS - Asbestos in Soil - Commercial and industrial [9]	-	-	-	-	0.05	0.001

Lab Report Number	Sample Code	Field ID	Targeting	Date	Depth						
3634746	3634746_16	IP10_0.1	Soakage Basin/Railyard - HAIL F6	24 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3634746	3634746_18	IP10_0.5	Soakage Basin/Railyard - HAIL F7	24 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3634746	3634746_19	IP10_0.7	Soakage Basin/Railyard - HAIL F8	24 Jul 2024	0.7	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3636372	3636372_3	PP10_0.70	Basecourse	26 Jul 2024	0.7	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3636372	3636372_4	PP10_1.05	Basecourse	26 Jul 2024	1.05	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3637649	3637649_1	TP22_0.1	Railyard/HAIL F6	29 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3637649	3637649_3	TP22_0.5	Railyard/HAIL F6	29 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3615825	3615825_1	TP15_0.1	Road Berm	27 Jun 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3615825	3615825_3	TP15_0.5	Road Berm	27 Jun 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3633918	3633918_1	TP16-0.1	Railyard/HAIL F6	23 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3633918	3633918_3	TP16-0.5	Railyard/HAIL F6	23 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3633918	3633918_8	TP17-0.1	Railyard/HAIL F6	23 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3633918	3633918_10	TP17-0.5	Railyard/HAIL F6	23 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3634746	3634746_1	TP18_0.1	Railyard/HAIL F6	24 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3634746	3634746_2	TP18_0.15	Railyard/HAIL F6	24 Jul 2024	0.15	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3634746	3634746_4	TP18_0.5	Railyard/HAIL F6	24 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3634746	3634746_9	TP19_0.1	Railyard/HAIL F6	24 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3634746	3634746_11	TP19_0.5	Railyard/HAIL F6	24 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_37	TP23_0.1	Former Buildings/ Soakage Basin	17 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_39	TP23_0.5	Former Buildings/ Soakage Basin	17 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_1	TP24_0.1	Former Buildings/ Soakage Basin	17 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_3	TP24_0.5	Former Buildings/ Soakage Basin	17 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3625445	3625445_1	TP25_0.1	Former Buildings	11 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3625445	3625445_3	TP25_0.5	Former Buildings	11 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_6	TP26_0.1	Former Buildings/ Soakage Basin	17 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_8	TP26_0.5	Former Buildings/ Soakage Basin	17 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_32	TP27_0.1	Former Buildings	17 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_34	TP27_0.5	Former Buildings	17 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_11	TP28_0.1	Former Buildings/ Soakage Basin	17 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_13	TP28_0.5	Former Buildings/ Soakage Basin	17 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3625445	3625445_6	TP29_0.1	Former Buildings/ Soakage Basin	11 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3625445	3625445_8	TP29_0.5	Former Buildings/ Soakage Basin	11 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_27	TP30_0.1	Former Buildings	17 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_29	TP30_0.5	Former Buildings	17 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_21	TP31_0.1	Former Buildings/ Soakage Basin	17 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_23	TP31_0.5	Former Buildings/ Soakage Basin	17 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_16	TP32_0.1	Former Buildings/ Soakage Basin	17 Jul 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3629426	3629426_18	TP32_0.5	Former Buildings/ Soakage Basin	17 Jul 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3615825	3615825_6	TP33_0.1	Former Buildings	27 Jun 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3615825	3615825_8	TP33_0.5	Former Buildings	27 Jun 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3615825	3615825_11	TP35_0.1	Former Buildings	27 Jun 2024	0.1	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001
3615825	3615825_13	TP35_0.5	Former Buildings	27 Jun 2024	0.5	Asbestos NOT detected	-	<0.001	<0.001	<0.001	<0.001