Appendix C – Application for Landowner Approval

Application for landowner approval

Land Advisory Services, Community Facilities

The following is to be completed for the assessment of the project by the Land Advisory team. If you do not provide the necessary information, your application may not be accepted for processing.
Each landowner approval application requires the support of the relevant local board prior to approval/decline by Land Advisory Services.

1. Applicant details

Name	Aurecon New Zealand
Address	110 Carlton Gore Road, Auckland 1023, New Zealand
Mobile	+64 211006287
Email	Tracy.Howe@aurecongroup.com
Consultant details	Tracy Howe, Lead Consultant

2. Site details

Park name	Basque Reserve
Park address	13 Norwich Street, Auckland 1021, New Zealand
Legal description	Section 8 SO 433443, Part Lot 46 DP 7541

Lease number N/A Expiry date N/A

Resource consent number N/A Building consent number N/A

Have you previously applied for landowner approval for this site or a related project? Yes ☐ No ☑
If yes, please specify:

3. General application details

This application is for: (tick all of the boxes necessary to cover the proposal)

- [ ] Installing a public facility or service over or on the park
- [ ] Installing a private utility or service over or on the park
- [ ] Creating a new asset on the park
- [ ] Modifying an existing private / club / user group asset on the park
- [ ] Undertaking planting on a park / establishing a community garden on a park
- [ ] Plant or seed collection / research on a park
- [ ] Requesting an easement or right of way on a park
- [ ] Requesting temporary access over a park
- [ ] Licence to occupy / mobile trading
- [x] Other – please describe: Geotechnical investigation including the drilling of three boreholes and installation of groundwater monitoring at one of the boreholes.

4. Project details

4.1 Detailed description of project *(please also include photos of the proposed works site to assist us with processing the application)*

Geotechnical investigations are being undertaken on behalf of Watercare Services Limited to inform consenting and design of a new wastewater network from the Auckland CBD to Western Springs Reserve. Investigations required to support the project at this location include three geotechnical boreholes and groundwater monitoring. Please refer to the attached site plan for location details. To minimise disruption to both Auckland Council and reserve patrons the drilling schedule can be flexible – Aurecon are open to discussions with Auckland Council regarding timing.

All physical works will be undertaken in alignment with the Health and Safety Act (2015). Aurecon will implement a Health and Safety Management Plan and Task Based Risk Assessment process to ensure best practice is followed. All personnel on site will wear appropriate PPE.

We will provide adequate buffer from any trees and existing utilities.

4.2 What other options have you considered for this site? Why is this the chosen option?

In order to keep our team safe and out of busy transport corridors, Aurecon request access to Basque Reserve to establish a safe working site that will minimise disruptions to members of the public.

4.3 Have you provided the relevant supporting documents?

- [x] Site plans
- [ ] Arborist report
- [ ] Iwi consultation
- [ ] Resource consent
- [ ] Asset owner approval
- [ ] Stormwater report
- [ ] Engineers report
- [ ] Planting and maintenance plan
- [ ] Building consent
- [ ] Other. Please specify:

4.4 How will the proposed works impact the park and the public?

Boreholes will be: a) 100 mm in diameter; b) A construction laydown/storage area measuring a max 10 m x 4 m working area; c) Borehole depths will be approximately 20-25 m. Drilling time is expected to be a maximum of 5 days per borehole. Access to drilling sites will be limited to Drilling contractors and Aurecon. The proposed drilling will not prevent public use of the park, the working area will be safely cordoned off. Visual impacts will be limited where possible. Groundwater monitoring may include installation of a standpipe with mounted monitoring device or an in-ground device, flush with the surface and covered with grass. Groundwater monitoring will continue for a 12-month period.

4.5 Proposed mitigation for the works

Drilling sites will be fenced to limit access to authorised personnel. Acoustic panels will be added to reduce noise. Geotextile mates will be laid across the site to minimise damage to grassed areas. The working areas will be re-instated to pre-investigation conditions (i.e. infilled and regressed) or per-instruction from Auckland Council. Drilling works will be coordinated to avoid conflicts with events or any planned maintenance/upgrade works Council may be undertaking in the park. Proposed timing of works allows for changes in program scheduling.

4.6 Timing of works

Proposed physical works start date: 01/05/2024

Proposed physical works end date: 6/05/2024

NB: Any physical works on parks must be carried out in accordance with the requirements of the Health and Safety at Work Act 2015. The applicant must ensure that any contractors undertaking works on council owned land comply with all necessary statutory and council Health and Safety standards.

FEES AND CHARGES

Visit the Landowner approvals page on the Auckland Council website for the schedule of fees and charges.

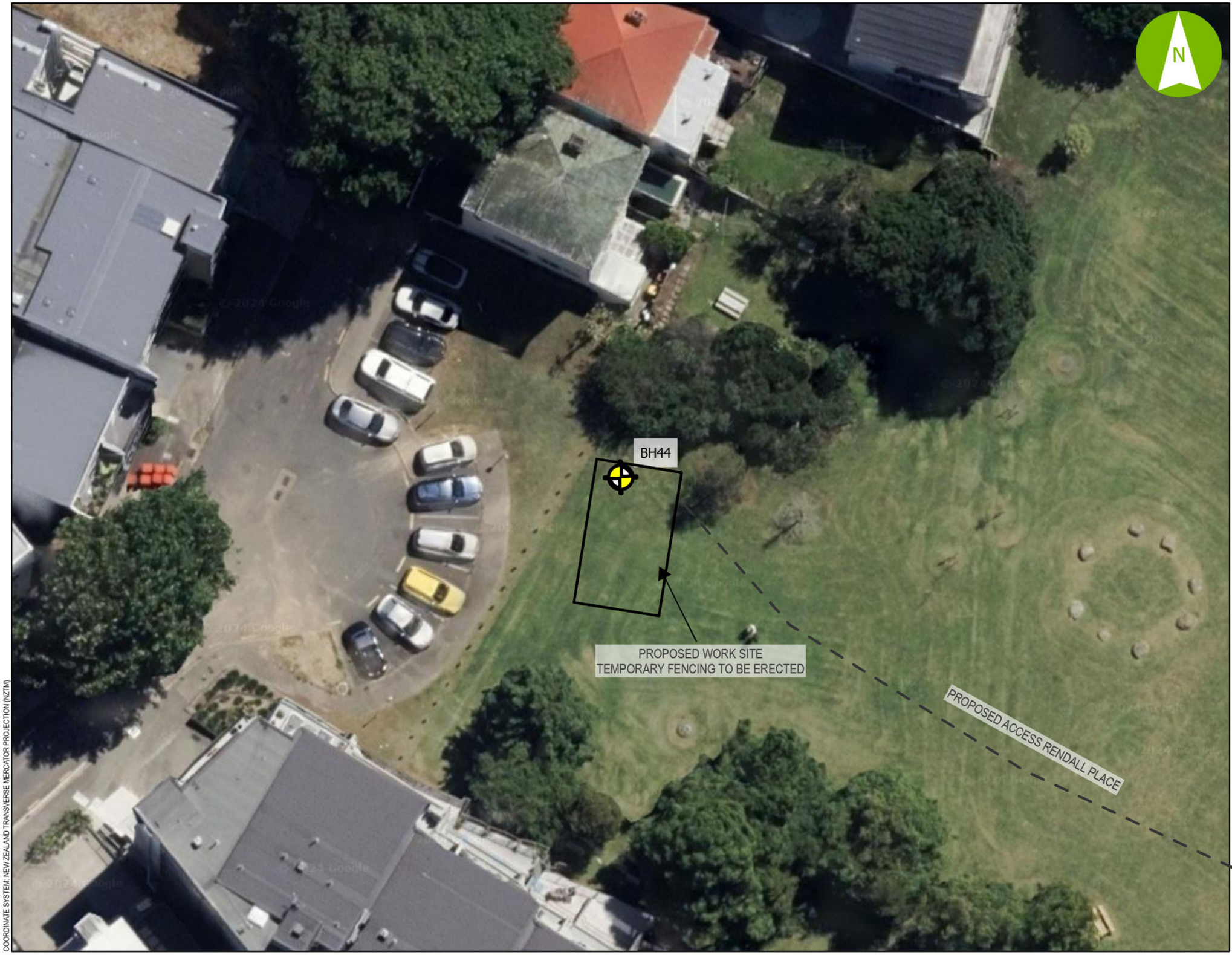
There is a 50 per cent reduction in all fees for:

- registered community groups
- incorporated societies
- charitable trusts.

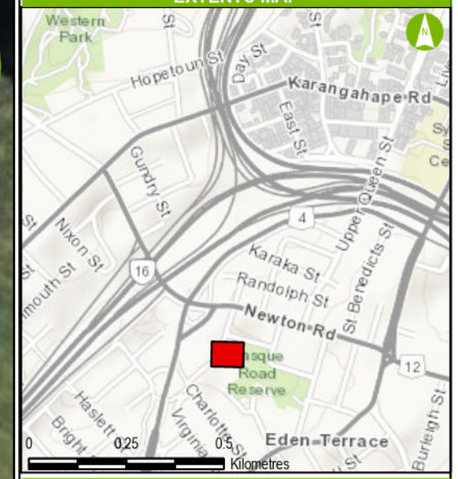
5. Applicant's signature	Date
Tracy Howe	3/4/2024

Please submit completed application form, along with relevant plans and your supporting documents, to:

landadvisors@aklc.govt.nz



EXTENTS MAP



LEGEND

PROPOSED GROUND INVESTIGATION LOCATIONS BY STAGE

- STAGE 1
- STAGE 2
- STAGE 3
- STAGE 4
- NOT STAGED

0 5 10 Metres

NOTES:
1) IMAGERY IS SOURCED FROM GOOGLE EARTH
2) GROUND INVESTIGATION LOCATIONS ARE APPROXIMATED ONLY AND MAY BE SUBJECT TO CHANGE

COORDINATE SYSTEM: NEW ZEALAND TRANSVERSE MERCATOR PROJECTION (NZTM)

aurecon

Watercare

REV	DATE	REVISION DETAILS	APPROVED
A	03.04.24	PROPOSED GROUND INVESTIGATION LOCATION	

SCALE	SIZE
1:250	A3

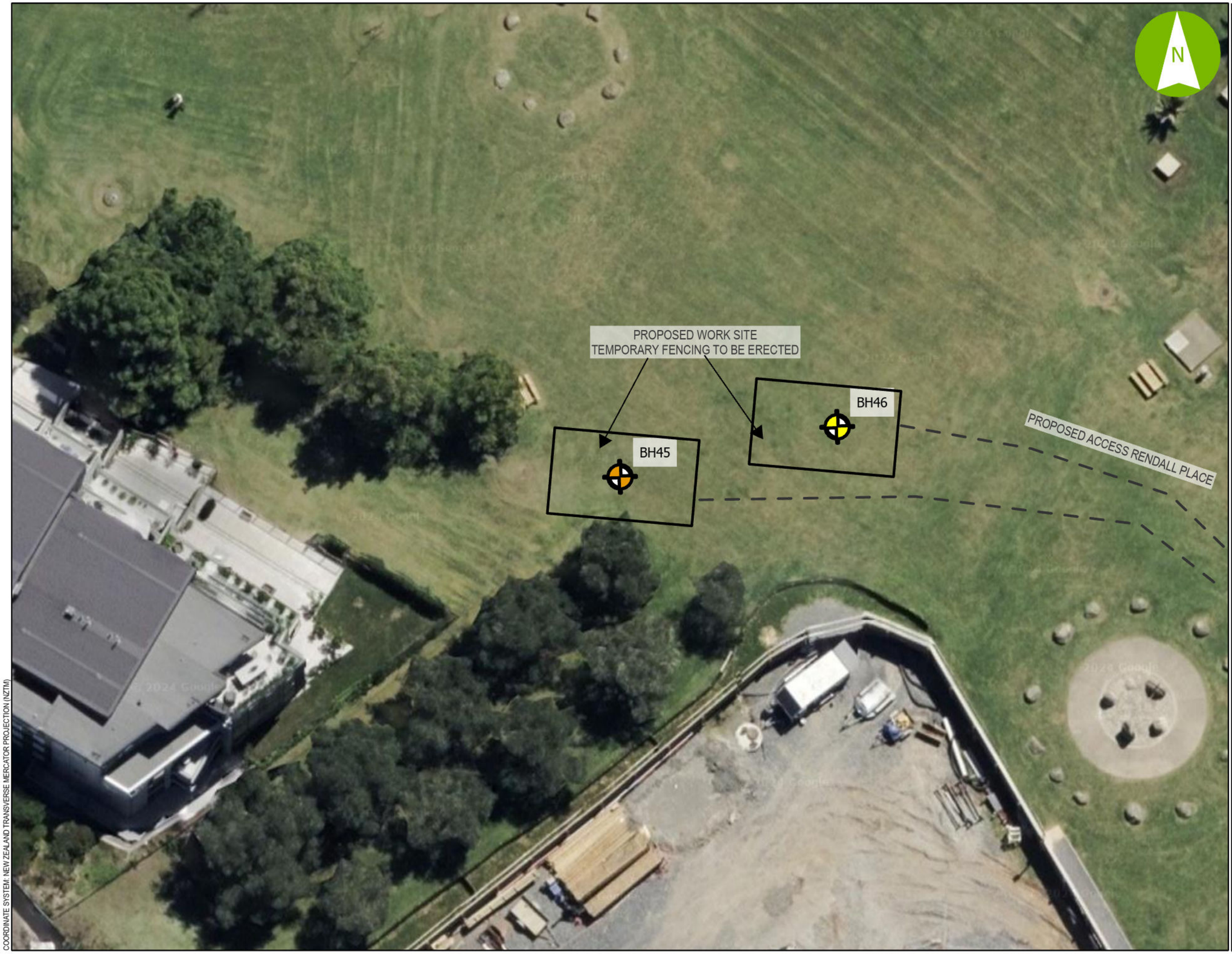
DRAWN: T. HOWE
REVIEWED: S. MACKAY
VERIFIED:

PRELIMINARY
NOT FOR CONSTRUCTION
APPROVED
DATE 03.04.24

PROJECT: WATERCARE
WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

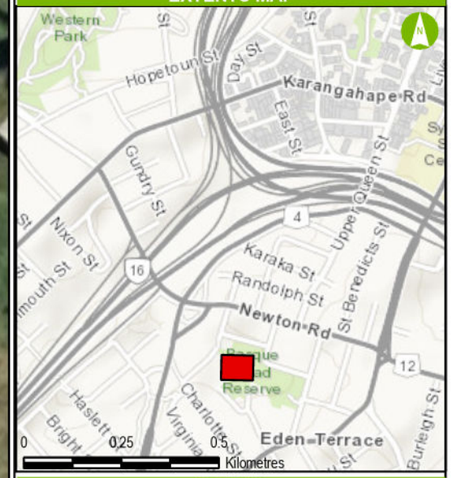
TITLE: PROPOSED GROUND INVESTIGATION PLAN
Basque Park

DRAWING No.	PROJECT No.	AREA	TYPE	DISC	NUMBER	REV
	521290	064	SKT	GG	0012	A



COORDINATE SYSTEM: NEW ZEALAND TRANSVERSE MERCATOR PROJECTION (NZTM)

EXTENTS MAP



LEGEND

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aurecon

CLIENT: Watercare

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SCALE: 1:250 | SIZE: A3
DRAWN: T. HOWE
REVIEWED: S. MACKAY
VERIFIED:

PRELIMINARY
NOT FOR CONSTRUCTION
APPROVED
DATE 03.04.24

PROJECT: WATERCARE WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

TITLE: PROPOSED GROUND INVESTIGATION PLAN
Basque Park

DRAWING No. 521290 - 064 - SKT - GG - 0013 - A
(PROJECT No. - AREA - TYPE - DISC - NUMBER - REV)

Attachment C - Borelogs for shaft

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PO Box 9762, Newmarket
Auckland, New Zealand
Tel: +64 9 520 6019
www.aurecongroup.com

Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Suffolk Reserve**
Project Reference: **521290-064**

BH06

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756390.70m
Northing: 5918882.84m
Ground level: 43.71m (NZVD2016)

Date started: 4/09/2024
Date completed: 6/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HA	43	1		Fc	**0m:** SILT with minor clay, trace gravel and organics; dark brown. Firm, moist, low plasticity. Gravel is fine sub-angular basalt. Organics consist of rootlets. [FILL] **0.18m to 0.32m:**...With some clay and gravel; brown with mottled black, dark brown and red brown. **0.55m to 0.9m:**...With some clay and minor sand; brown with mottled grey and yellow brown. **0.75m to 0.9m:**...Light brown and mottled light grey and orange. **0.9m to 1.35m:**...With minor clay and trace sand; orange with mottled light grey. Very soft. **1m:**...Wet. **1.35m to 1.6m:**...With some clay; light grey with mottled orange.	ML	0.5m: ISHSV=145/50kPa 1m: ISHSV=62/22kPa	100				**0m: FILL** **0.05m to 0.2m:** ES BH06_0.05-0.2 **0.4m to 0.5m:** ES BH06_0.4-0.5 **1m to 1.1m:** ES BH06_1-1.1 **1.4m to 1.5m:** ES BH06_1.4-1.5	
SPT	42	2		ERc	**1.6m:** CLAY; grey. Stiff, moist, high plasticity. [RESIDUAL SOILS ECBF]	CH	1.5m: ISHSV=151/48kPa 1.5m: SPT 1,1// 1,1,2,2 N = 6	100				**1.6m: EAST COAST BAYS FORMATION**	
HQ3				ERx	**1.95m:** CORE LOSS.			0				**1.95m:** ES BH06_1.95	
U54				EWx	**2m:** PUSH TUBE			100				**2m:** Flushed out hole so push tube would be undisturbed material.	
HQ3	41	3		ERz	**2.5m:** SILT; grey. Stiff, moist, high plasticity. **2.73m to 2.88m:**...Silty fine to medium SAND. Black carbonaceous material disseminated throughout, <3mm.	MH		100				2.88m: BP 15°	
SPT					**3.06m to 3.25m:**...Silty fine to medium SAND.		3m: IBHSV=UTP 3m: SPT 0,1// 1,2,2,2 N = 7	100					
HQ3	40	4			**3.25m to 3.47m:**...SILT with some sand. Sand is fine to medium. **3.47m to 3.7m:**...Silty fine to medium SAND. **3.95m to 4m:**...Sandy SILT.			95					
SPT	39	5		EWs EWz	**4.28m:** Highly weathered, grey, silty fine to medium SANDSTONE; Extremely weak. Poorly cemented. (Silty SAND). **4.29m:**...Black carbonaceous material band <3mm, 20°. **4.68m:** Highly weathered, grey, SILTSTONE; Extremely weak. (SILT). **4.73m to 4.77m:**...Silty fine to medium SANDSTONE. (Silty SAND).	HW HW	4.5m: SPT 2,3// 5,4,4,7 N = 20	89				**4.45m:** 50mm core loss.	
								100	100	76			

Box 1
Box 2

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 3cm and vertical accuracy of 2cm.
2) Geophysical profiling undertaken downhole on 05/09/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
29/08/24 00:00 | 1.00m | 1.00 m bgl
04/09/24 15:50 | 25.00m | 2.00 m bgl
05/09/24 07:30 | 25.00m | 3.35 m bgl
06/09/24 08:00 | 36.00m | 2.20 m bgl
06/09/24 14:00 | 36.00m | 2.00 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Suffolk Reserve**
Project Reference: **521290-064**

BH06

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Ground level: 43.71m (NZVD2016)

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Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	38	6		EWz	**4.68m:** Highly weathered, grey, SILTSTONE; Extremely weak. (SILT).	HW							
					5.15m: Moderately weathered, grey, SILTSTONE; extremely weak. **5.26m to 5.5m:**...Moderately weathered, grey, silty fine to medium SANDSTONE; Very weak. Moderately cemented.	MW		100	100	76		5.15m: BP 50° 5.23m: JI 30° 5.50m: BP 15° 5.68m: JT 15° Pl, Ro, Cl	
SPT				EWs	**5.91m:** Moderately weathered, grey, silty fine to medium SANDSTONE; extremely weak. Moderately cemented. Black carbonaceous material dissemenated throughout.	MW	6m: SPT 2,5// 8,12,18,12 for 50mm N = 50+	100				5.91m: BP 60°	
HQ3	37	7		EWz	**6.52m:** Moderately weathered, grey, SILTSTONE; very weak. **6.66m:**...10mm band of SANDSTONE, inclined 10°. **6.84m to 7m:**...Sandy SILTSTONE; extremely weak. Poorly cemented. Sand is fine to medium. (Sandy SILT).	MW		100	95	95		6.60m: BP 50°	
				EWs	**7.19m:** Moderately weathered, grey, SANDSTONE; very weak. Moderately cemented.	MW						7.19m: BP 45°	
SPTC	36						7.5m: SPTC 7,12// 17,20,13 for 50mm N = 50+	N/A	N/A	N/A		7.45m: JT 35° Pl, Sm, Cl 7.46m: JT 40° Pl, Sm, Cl **7.5m:** Changed to SPTc due to competent rock.	
HQ3		8		EUz	**7.85m:** Slightly weathered, grey, laminated SILTSTONE; very weak. **7.86m to 7.92m:**...Seam of pink SILTSTONE, inlcined 50°.	SW							
	35			EUs2	**8.25m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **8.36m:**...Black carbonaceous material bands, inclined 50°. **8.45m:**...Black carbonaceous material bands, inclined 50°. **8.48m to 8.6m:**...SILTSTONE; very weak.	SW		100	100	100		8.20m: BP 50° 8.56m: JI 50° Calcite with brown staining.	
SPTC		9		EUz2	**8.63m:** Slightly weathered, grey, laminated SILTSTONE; very weak.	SW	9m: SPTC 7,14// 32,18 for 25mm N = 50+	N/A	N/A	N/A			
HQ3	34	10		EUs2	**9.25m:** Slightly weathered, grey, fine to medium SANDSTONE; extremely weak. Moderately cemented.	SW							
				EUz2	**9.4m:** Slightly weathered, grey, SILTSTONE; extremely weak. Inclined 20°. **9.7m to 9.85m:**...Fine to medium SANDSTONE.	SW		100	100	100		9.45m: JT 30° Pl, Ro, Cl 9.65m: JT 40° Pl, Sm, Cl 9.70m: BP 20° 9.85m: JT 25° Pl, Ro, Cl	

REMARKS:
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Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

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Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 3 HQ3				EUz2	**9.4m:** Slightly weathered, grey, SILTSTONE; extremely weak. Inclined 20°.	SW		100	100	100		10.30m: BP 10° **10.35m:** Drilling induced breaks.	
HQ3	33	11		EUs2	**10.67m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW		100	100	100		10.67m: BP 30° Calcite vein	
Box 4 HQ3	32				**11.4m to 11.52m:**...SILTSTONE.							11.40m: BP 30°	
		12		EUz2	**11.87m:** Slightly weathered, grey, SILTSTONE; very weak.	SW						11.87m: BP 20°	
HQ3	31			EUs2	**12.2m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Well cemented.	SW		100	100	94		12.24m: JT 10° Pl, Sm, Cl 12.51m: JT 10° Pl, Sm, Cl 12.60m: JT 25° Pl, Ro, Cl	
		13			**12.8m to 12.91m:**...SILTSTONE.								
				EUz2	**13.2m:** Slightly weathered, grey, SILTSTONE; very weak. **13.21m to 13.5m:**...Interbedded SILTSTONE (50%) and sandy SILTSTONE (50%). Incipient fracturing.	SW						**13.5m to 17.4m:** Sealed microfractures. No discolouration along fractures. Possible faulting?	
Box 5 HQ3	30	14						100	100	100		13.96m: JT 70° Pl, Sm, Cl **14m to 17.5m:** Water pressure permeability test (BH06_PPT01) 14.20m: BP 10°	
	29											14.55m: BP 15° Pl, Ro, Cl Clay infill (2mm) 14.66m: BP 15° Pl, Ro, Cl	
		15											

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HQ3	28	16		EUz2	**13.2m:** Slightly weathered, grey, SILTSTONE; very weak. **15.57m to 15.63m:**...Fine to medium SANDSTONE; very weak. **16.2m to 16.3m:**...Fine to medium SANDSTONE, inclined 50°.	SW		100	100	90		**15m:** Loss of 10% of water return. 15.57m: BP 20° 15.63m to 15.70m: JT 80° Pl, Sm, Cl 15.90m: BP 10° Pl, Ro, Cl 16.14m to 16.20m: JT 70° Pl, Sm, Cl 16.20m: BP 50° 16.32m: JT 20° Pl, Ro, Cl	
HQ3	27	17			**16.54m to 16.74m:**...Fine to medium SANDSTONE; very weak.			100	100	100		**16.5m to 17.22m:** Incipient fracturing. 16.95m: BP 8° Pl, Sm, Cl	
HQ3	26	18											
HQ3	25	19			**18.85m to 18.98m:**...SILTSTONE; extremely weak. Inclined 30°. (SILT).			100	93	93		18.60m to 18.70m: JT 50° Pl, Sm, Cl 18.85m: BP 30°	
HQ3	24	20						100	100	100			

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HQ3	23	21		EUz2	**13.2m:** Slightly weathered, grey, SILTSTONE; very weak. **20.9m to 21m:**...Fine to medium SANDSTONE. **21m to 21.08m:**...Silty fine SANDSTONE. **21.08m to 21.29m:**...Silty fine to medium SANDSTONE.	SW		100	100	100		20.55m: BP 10°	
HQ3	22	22		EUz2	**21.65m to 22m:**...Sandy SILTSTONE. Sand is fine. **22.15m to 22.25m:**...Sandy SILTSTONE. Sand is fine. **22.5m to 22.57m:**...Fine to medium SANDSTONE.	SW		100	100	100		21.95m: BP 50° 22.35m: JT 20° Pl, Sm, Cl 22.57m: BP 20°	
HQ3	21	23		EUs2	**22.79m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Well cemented. Black carbonaceous material dissementated throughout, <3mm. Minor calcite veins.	SW		100	100	100		22.79m: BP 30°	
HQ3	20	24		EUz2	**23.88m:**...Black carbonaceous material inclusion 10mm. **23.92m:** Slightly weathered, grey, SILTSTONE; very weak. **24.64m to 24.68m:**...Fine to medium SANDSTONE.	SW		100	100	95		23.92m: BP 30° **24m to 28m:** Water pressure permeability test (BH06_PPT02) 24.25m: BPJT 50° St, Sm, Cl 24.43m: BPJT 40° Pl, Sm, Cl 24.50m: BP 40° 24.82m: BPJT 20° Pl, Sm, Cl	
	19	25											

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 3cm and vertical accuracy of 2cm.
2) Geophysical profiling undertaken downhole on 05/09/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
29/08/24 00:00 | 1.00m | 1.00 m bgl
04/09/24 15:50 | 25.00m | 2.00 m bgl
05/09/24 07:30 | 25.00m | 3.35 m bgl
06/09/24 08:00 | 36.00m | 2.20 m bgl
06/09/24 14:00 | 36.00m | 2.00 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Suffolk Reserve**
Project Reference: **521290-064**

BH06

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756390.70m
Northing: 5918882.84m
Ground level: 43.71m (NZVD2016)

Date started: 4/09/2024
Date completed: 6/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3					**23.92m:** Slightly weathered, grey, SILTSTONE; very weak. **25.1m to 25.14m:**...Fine to medium SANDSTONE, inclined 40°.			100	100	95		25.10m: BP 40°	
HQ3	18	26			**26.15m to 26.28m:**...Fine to medium SANDSTONE. Inclined 10°. Black carbonaceous material disseminated throughout. **26.38m to 26.76m:**...Fine to medium SANDSTONE.			100	97	97		25.50m: BPJT 40° Pl, Sm, Cl 25.84m: JT 20° Pl, Sm, Cl 25.99m: BP 20° 26.15m: BP 20° 26.29m to 26.38m: JT 45° Pl, Sm, Cl	
HQ3	17	27		EUz2		SW						27.05m to 27.15m: JI 60° 27.35m: JT 40° Pl, Sm, Cl 27.50m: BP 20°	
HQ3	16	28			**27.58m to 27.6m:**...Fine to medium SANDSTONE band, inclined 20°. **27.65m to 27.68m:**...Fine to medium SANDSTONE band, inclined 20°. **27.85m to 27.87m:**...Fine to medium SANDSTONE band, inclined 20°.			100	97	97		27.90m: BP 10° Pl, Sm, Cl 27.95m: JT 40° Pl, Sm, Cl	
HQ3	15	29			**29m to 29.1m:**...Fine SANDSTONE, inclined 60°.			100	100	100		28.72m: BP 20°	
HQ3	14	30			**29.6m to 29.65m:**...Fine SANDSTONE, inclined 60°.								

Box 9 | Box 10 | Box 11

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 3cm and vertical accuracy of 2cm.
2) Geophysical profiling undertaken downhole on 05/09/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
29/08/24 00:00 | 1.00m | 1.00 m bgl
04/09/24 15:50 | 25.00m | 2.00 m bgl
05/09/24 07:30 | 25.00m | 3.35 m bgl
06/09/24 08:00 | 36.00m | 2.20 m bgl
06/09/24 14:00 | 36.00m | 2.00 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Suffolk Reserve**
Project Reference: **521290-064**

BH06

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756390.70m
Northing: 5918882.84m
Ground level: 43.71m (NZVD2016)

Date started: 4/09/2024
Date completed: 6/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	13	31		EUz2	**23.92m:** Slightly weathered, grey, SILTSTONE; very weak. **30.11m to 30.24m:**...Fine to medium SANDSTONE. Black carbonaceous material disseminated througout. **30.3m to 30.5m:**...Fine to medium SANDSTONE.	SW						30.60m: BP 45°	
				EUs2	**30.74m:** Slightly weathered, grey, fine to medium SANDSTONE; extremely weak. Moderately cemented.	SW		100	100	100		30.75m: BP 40°	
				EUz2	**31.12m:** Slightly weathered, grey, SILTSTONE; extremely weak.	SW						31.22m: BP 35°	
HQ3	12	32		EUs2	**31.8m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **32.4m to 32.43m:**...Black carbonaceous material layer fibrous <5mm. **32.6m:**...Extremely weak.	SW		100	100	100		32.40m: BP 40°	
HQ3	11	33		EUs2	**33.35m to 33.41m:**...SILTSTONE. **33.5m to 33.55m:**...SILTSTONE. **33.69m to 33.8m:**...SILTSTONE.	SW		100	100	100		33.27m: JT 40° Pl, Sm, Cl 33.40m: JT 42° Pl, Sm, Cl	
HQ3	10	34		EUz2	**33.9m:** Slightly weathered, grey, laminated SILTSTONE; very weak. Inclined 5°.	SW						33.90m: BP 5°	
HQ3	9	35		EUs2	**34.53m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW		100	100	100		**34.5m to 34.6m:** Core damaged during removal from splits. 34.55m to 34.60m: JT 70° Pl, Sm, Cl 34.66m: BP 5° Pl, Sm, Cl 34.89m: BP 5°	

Box 11 | Box 12 | Box 13

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 3cm and vertical accuracy of 2cm.
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3) ES refers to Environmental Sample.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
29/08/24 00:00 | 1.00m | 1.00 m bgl
04/09/24 15:50 | 25.00m | 2.00 m bgl
05/09/24 07:30 | 25.00m | 3.35 m bgl
06/09/24 08:00 | 36.00m | 2.20 m bgl
06/09/24 14:00 | 36.00m | 2.00 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Suffolk Reserve**
Project Reference: **521290-064**

BH06

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1756390.70m	Date started:	4/09/2024	Logged by:	AP
Equipment:	Hydrapower Trekker 2100	Northing:	5918882.84m	Date completed:	6/09/2024	Input by:	AP
Contractor:	Drill Force NZ Ltd	Ground level:	43.71m (NZVD2016)	Inclination:	-90°	Checked by:	PK
				Azimuth:	N/A	Reviewed by:	SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUz2	**34.89m:** Slightly weathered, grey, laminated SILTSTONE; very weak.	SW		100	100	100			
	8			EUs2	**35.7m:** Slightly weathered, grey, fine to medium SANDSTONE; extremely weak. Moderately cemented.	SW							
		36			End of borehole at 36m (Termination Depth Achieved)								

Box 13

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 3cm and vertical accuracy of 2cm.
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3) ES refers to Environmental Sample.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
29/08/24 00:00 | 1.00m | 1.00 m bgl
04/09/24 15:50 | 25.00m | 2.00 m bgl
05/09/24 07:30 | 25.00m | 3.35 m bgl
06/09/24 08:00 | 36.00m | 2.20 m bgl
06/09/24 14:00 | 36.00m | 2.00 m bgl

Database File: CC2 MOTIONS MASTER (02).GPJ **Library file:** LIBRARY_20240925_V13 (1).GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 MOTIONS CATCHMENT IMPROVEMENTS.LOG **Date Generated:** 18/02/2025

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **27 Mostyn Street**
Project Reference: **521290-064**

BH10

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1755959.16m
Northing: 5918491.96m
Ground level: 26.24m (NZVD2016)

Date started: 4/07/2024
Date completed: 9/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HA	26			Fg	**0m:** Silty fine to coarse GRAVEL with minor rootlets, cobbles and trace anthropogenic material; brown. Tightly packed, moist, well graded. Gravel is subangular, basalt and concrete. Cobbles are road debris, up to 70 mm length. Anthropogenic material includes glass and plastic fragments. [FILL]	GW-GM						**0m: FILL** **0.05m to 0.2m:** ES BH10_0.05-0.2	
					0.5m:...Scoriaceous basalt cobbles 100mm and 240mm							**0.4m to 0.5m:** ES BH10_0.4-0.5	
					0.6m: SILT with some sand and gravel; dark brown. Firm, saturated, low plasticity. Gravel is subangular ballast. Sand is fine to coarse. **0.65m to 0.85m:**...Tree roots, up to 20mm diameter.	ML	0.6m: ISHSV=UTP	100					
		1											
	25			Fc	**1m:** SILT with some sand and minor gravel; light brown. Firm, saturated, low plasticity. Gravel is fine to coarse, subangular ballast. Sand is fine to coarse.	ML	1.2m: ISHSV=49/10kPa				**1m to 1.1m:** ES BH10_1.0-1.1	
												1.4m to 1.5m: ES BH10_1.4-1.5	
SPT					**1.5m:**...Glass fragment up to 70mm length **1.6m to 1.7m:**...Decomposing rootlets and wood fragments.		1.5m: ISHSV=32/16kPa 1.5m: SPT 0,0// 0,1,0,1 N = 2						
				TAz	**1.7m:** Sandy SILT with some clay; greenish grey. Firm, moist, low plasticity. Sand is fine to medium. [UNDIFFERENTIATED ALLUVIUM]	MI-SP		67				**1.7m: TAURANGA GROUP ALLUVIUM**	
				TAx	**1.8m:** CORE LOSS							**1.8m to 1.9m:** ES BH10_1.8-1.9	
		2											
HQ3	24			TAz	**1.95m:** Sandy SILT with some clay; greenish grey. Soft, moist, low plasticity. Sand is fine to medium.	MI-SP							
					2.36m to 2.38m:...Silty fine to coarse SAND; dark brown.								
				TAc	**2.38m:** Silty CLAY with trace sand; greenish grey. Soft, moist, high plasticity. Sand is fine.	CH		100					
					2.84m: Clayey SILT with minor sand; greenish grey. Soft, moist, high plasticity. Sand is fine.								
		3											
SPT	23			TAz		MH	3m: IBHSV=23/10kPa 3m: SPT 0,0// 0,0,0,0 N = 0	71					
				TAx	**3.32m:** CORE LOSS							**3.3m to 3.4m:** ES BH10_3.3-3.4 **3.32m to 3.45m:** Driller changed to use finger catcher.	
HQ3				TAz	**3.45m:** Clayey SILT with minor sand; greenish grey. Soft, moist, high plasticity. Sand is fine.	MH							
				TAs	**3.6m:** Silty SAND with minor organics; grey. Very loose, moist, poorly graded. Organics are decomposing wood fragments up to 35mm length. Sand is fine to medium.	SM							
		4			**3.91m:** SILT with some clay and minor sand; grey. Stiff, moist, low plasticity. Sand is fine.			100					
	22					ML							
				TAz			4.5m: IBHSV=52/13kPa						
HQ3					**4.57m:** Sandy SILT with trace clay; grey. Stiff, moist, low plasticity. Sand is fine to medium.	MI-SP		100					
		5											

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 09/07/2024, comprising an Optical and Acoustic Televiewer.
3) ES refers to environmental sample

Water Level Readings:
Date Time | Hole Depth | Water Level
04/07/24 11:45 | 1.50m | 0.90 m bgl
05/07/24 07:30 | 1.50m | 0.75 m bgl
05/07/24 15:10 | 16.40m | 2.20 m bgl
08/07/24 10:00 | 16.40m | 0.82 m bgl
08/07/24 16:40 | 19.00m | 1.45 m bgl
09/07/24 08:00 | 19.00m | 0.56 m bgl
09/07/24 14:30 | 25.00m | 0.72 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **27 Mostyn Street**
Project Reference: **521290-064**

BH10

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1755959.16m
Northing: 5918491.96m
Ground level: 26.24m (NZVD2016)

Date started: 4/07/2024
Date completed: 9/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
U54	21			TAx	**5m:** PUSHTUBE			100				5.20m to 5.60m: Drilling induced breaks	
HQ3				TAz	**5.5m:** Clayey SILT with minor organics and trace sand. Soft, moist, high plasticity. Organics are decomposing wood fragments up to 17mm length. Sand is fine.	MH		80					
	6			TAx	**5.9m:** CORE LOSS							**5.9m to 6m:** Material dropped out of barrel and re-drilled, recovered core was highly disturbed. ES BH10_5.9-6.0 **6m:** IBHSV not possible due to shortened runs to allow for pushtube.	
HQ3	20			TAz	**6m:** Clayey SILT with minor organics and trace sand. Soft, moist, high plasticity. Organics are decomposing wood fragments up to 34mm length. Sand is fine. **6.02m to 6.2m:**...Decomposing wood (tree branch) **6.26m to 6.39m:**...Decomposing wood (tree branch)	MH		100					
	7												
U54	19				**7m:** PUSHTUBE			100				**7m: EAST COAST BAYS FORMATION**	
HQ3				ERz	**7.5m:** Clayey SILT with trace fine sand and minor black carbonaceous material. Soft, moist, high plasticity. Black carbonaceous material up to 34mm length. [RESIDUAL SOIL ECBF]	MH							
	8			EWs	**7.86m:** Highly weathered, greenish grey, fine SANDSTONE; extremely weak. Poorly cemented. (Silty SAND).	HW							
HQ3	18			EWz	**8.17m:** Moderately weathered, grey, SILTSTONE; very weak.	MW	9m: IBHSV=UTP 9m: SPT 2,3// 9,11,16,14 for 50mm N = 50+	100	55	55			
	9												
SPT	17							100				**9.4m to 9.5m:** ES BH10_9.4-9.5	
HQ3					**9.43m to 9.62m:**...minor, very thin beds of fine SANDSTONE. **9.62m to 9.8m:**...silty SAND. **9.8m to 10.95m:**...minor, very thin beds of fine SANDSTONE.			100	88	73		9.62m: JT 25° Pl, Ro, Cl 9.74m: JT 45° Pl, Sm, Cl 9.82m: BP 5°	
	10												

REMARKS:
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Water Level Readings:
Date Time | Hole Depth | Water Level
04/07/24 11:45 | 1.50m | 0.90 m bgl
05/07/24 07:30 | 1.50m | 0.75 m bgl
05/07/24 15:10 | 16.40m | 2.20 m bgl
08/07/24 10:00 | 16.40m | 0.82 m bgl
08/07/24 16:40 | 19.00m | 1.45 m bgl
09/07/24 08:00 | 19.00m | 0.56 m bgl
09/07/24 14:30 | 25.00m | 0.72 m bgl

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BH10

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1755959.16m
Northing: 5918491.96m
Ground level: 26.24m (NZVD2016)

Date started: 4/07/2024
Date completed: 9/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	16			EWz	**8.17m:** Moderately weathered, grey, SILTSTONE; very weak.	MW		100	88	73		10.07m: BP 2° 10.17m: JT 5° Pl, Sm, Cl 10.25m: BP 2° 10.40m: BP 10°	
SPTC				EUx	**10.5m:** NO RECOVERY		10.5m: SPTC 5,33// 50 for 40mm N = 50+	N/A	N/A	N/A			
HQ3	15	11		EUz2	**10.69m:** Slightly weathered, grey SILTSTONE; very weak.	SW		100	100	100		**10.69m to 11.24m:** Contains minor beds of disseminated black carbonaceous material <2mm.	
		12		EUs2	**11.24m:** Slightly weathered, grey, fine SANDSTONE; very weak. Moderately cemented.	SW						11.50m: BP 2° 11.73m: BP 2°	
SPTC				EUx	**12m:** NO RECOVERY		12m: SPTC 21,29 for 135mm// N = 50+	N/A	N/A	N/A			
HQ3	14			EUz2	**12.14m:** Slightly weathered, grey SILTSTONE; very weak.	SW		100	100	100		12.47m: JT 10° Pl, Sm, Cl	
	13	13		EUs2	**12.25m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW						13.65m: JT 25° Pl, Sm, Cl	
HQ3	12	14		EUz2	**13.89m:** Slightly weathered, grey SILTSTONE; very weak.	SW		100	100	100		**13.97m to 14.02m:** Bed of disseminated black carbonaceous material <2mm.	
				EUs2	**14.18m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW							
		15		EUz2	**14.54m:** Slightly weathered, grey SILTSTONE; very weak.	SW						**14.57m to 14.61m:** Minor beds of disseminated black carbonaceous material <2mm. 14.79m: JT 25° Pl, Sm, Cl **14.89m to 14.92m:** Minor beds of disseminated black carbonaceous material	

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
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Water Level Readings:
Date Time | Hole Depth | Water Level
04/07/24 11:45 | 1.50m | 0.90 m bgl
05/07/24 07:30 | 1.50m | 0.75 m bgl
05/07/24 15:10 | 16.40m | 2.20 m bgl
08/07/24 10:00 | 16.40m | 0.82 m bgl
08/07/24 16:40 | 19.00m | 1.45 m bgl
09/07/24 08:00 | 19.00m | 0.56 m bgl
09/07/24 14:30 | 25.00m | 0.72 m bgl

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Location: **27 Mostyn Street**
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BH10

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1755959.16m
Northing: 5918491.96m
Ground level: 26.24m (NZVD2016)

Date started: 4/07/2024
Date completed: 9/07/2024
Inclination: -90°
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Logged by: THH
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Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	11	16		EUs2	**14.95m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW		100	100	100		<2mm. 15.06m: BP 2°	
HQ3	10	17		EUz2	**16.45m to 16.5m:**...SILTSTONE. **17m:** Slightly weathered, grey SILTSTONE; very weak.	SW		98	73	73		16.57m to 16.68m: JT 80° Un, Ro, Cl highly fractured zone 16.68m: JT 2° Pl, Ro, Cl 16.70m to 16.93m: JI 85° Un, Sm, Cl 16.73m to 16.85m: JI 55° Un, Sm, Cl 16.82m to 16.88m: JI 55° Un, Sm, Cl 17.00m: JT 45° Un, Ro, Cl	
HQ3	9	18		EUs2	**17.25m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **17.7m to 17.79m:**...SILTSTONE.	SW						17.20m: BP 2° 17.55m: BP 2° 17.62m: JT 35° Pl, Sm, Cl 17.70m: BP 5°	
HQ3	8	19		EUz2	**17.82m:** Slightly weathered, grey SILTSTONE; very weak.	SW							
HQ3	7	20		EUs2	**18.16m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **18.51m to 18.66m:**...Slightly weathered, grey SILTSTONE; very weak. **19m to 19.07m:**...SILTSTONE. **19.24m to 19.32m:**...SILTSTONE.	SW SW		100	100	100		18.51m: BP 55°	
HQ3					**19.32m:** Slightly weathered, grey, fine SANDSTONE; very weak. Moderately cemented. Contains minor layers of disseminated black carbonaceous material <2mm.	SW		100	97	87			
HQ3					**19.67m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW							

16m to 19m: Water pressure permeability test BH10_PPT01
16.03m to 16.12m: Minor beds of disseminated black carbonaceous material <2mm.

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 09/07/2024, comprising an Optical and Acoustic Televiewer.
3) ES refers to environmental sample

Water Level Readings:
Date Time | Hole Depth | Water Level
04/07/24 11:45 | 1.50m | 0.90 m bgl
05/07/24 07:30 | 1.50m | 0.75 m bgl
05/07/24 15:10 | 16.40m | 2.20 m bgl
08/07/24 10:00 | 16.40m | 0.82 m bgl
08/07/24 16:40 | 19.00m | 1.45 m bgl
09/07/24 08:00 | 19.00m | 0.56 m bgl
09/07/24 14:30 | 25.00m | 0.72 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **27 Mostyn Street**
Project Reference: **521290-064**

BH10

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1755959.16m
Northing: 5918491.96m
Ground level: 26.24m (NZVD2016)

Date started: 4/07/2024
Date completed: 9/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	6	21		EUs2	**19.67m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **20.09m to 20.17m:**...SILTSTONE.	SW						20.03m: JT 50° Pl, Sm, Cl 20.07m: BP 15° Pl, Ro, Cl 20.16m: JT 45° Pl, Sm, Cl	
				EUz2	**20.3m:** Slightly weathered, grey SILTSTONE; very weak. Contains minor, very thin 30-40mm beds of subhorizontal fine sandstone (6). **20.49m to 20.58m:**...SANDSTONE	SW		100	97	87		20.57m: JT 10° Un, Ro, Cl 20.64m: JT 10° Pl, Sm, Cl **20.65m to 20.71m:** Minor beds of disseminated black carbonaceous material <2mm. 20.80m: JT 25° Pl, Sm, Cl	
HQ3	5	22		EUs2	**21.57m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW		100	100	100		21.04m: BP 2° 21.50m: JI 5°	
	4	23		EUz2	**22.21m:** Slightly weathered, grey SILTSTONE; very weak. **22.91m to 22.97m:**...SANDSTONE	SW						22.34m: BP 10° **22.35m to 22.37m:** Bed of disseminated black carbonaceous material, <2mm. 22.70m: JT 30° Pl, Sm, Cl 22.76m: BP 5° Pl, Ro, Cl 22.79m: BP 5° Pl, Ro, Cl	
HQ3	3	24		EUs2	**23.22m:** Slightly weathered, grey, fine SANDSTONE; very weak. Moderately cemented. **23.35m to 23.51m:**...SANDSTONE; extremely weak. Poorly cemented. (SAND with some silt)	SW		100	88	63		23.22m: BP 2° 23.38m: BP 2° Pl, Ro, Cl 23.45m: BP 2° Pl, Ro, Cl 23.50m: BP 2° Pl, Ro, Cl	
HQ3	2	25		EUz2	**24.04m:** Slightly weathered, grey SILTSTONE; very weak.	SW						24.09m: JT 50° Pl, Ro, Cl	
				EUs2	**24.27m:** Slightly weathered, grey, fine SANDSTONE; very weak. Moderately cemented. Contains disseminated black carbonaceous material, <2mm.	SW		97	92	92			
				EUz2	**24.69m:** Slightly weathered, grey SILTSTONE; very weak.	SW						24.69m: BP 45°	

REMARKS: End of borehole at 25m (Termination Depth Achieved)
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 09/07/2024, comprising an Optical and Acoustic Televiewer.
3) ES refers to environmental sample

Water Level Readings:
Date Time | Hole Depth | Water Level
04/07/24 11:45 | 1.50m | 0.90 m bgl
05/07/24 07:30 | 1.50m | 0.75 m bgl
05/07/24 15:10 | 16.40m | 2.20 m bgl
08/07/24 10:00 | 16.40m | 0.82 m bgl
08/07/24 16:40 | 19.00m | 1.45 m bgl
09/07/24 08:00 | 19.00m | 0.56 m bgl
09/07/24 14:30 | 25.00m | 0.72 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **New Bond Street**
Project Reference: **521290-064**

BH13

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3 Rig
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1755685.52m
Northing: 5918252.96m
Ground level: 28.98m (NZVD2016)

Date started: 10/07/2024
Date completed: 12/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: FG
Input by: FG
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX				T	**0m:** SILT with minor clay, trace sand; brown. Stiff, moist, low plasticity. Sand is fine to coarse. [TOPSOIL]	OL						**0m: FILL** **0.05m to 0.2m:** ES BH13_0.05-0.2.	
				Fg	**0.3m:** Silty GRAVEL, dark brown. Tightly packed, dry. Gravel is slightly weathered to unweathered, grey sandstone and greywacke. [FILL]	GM						**0.4m to 0.5m:** ES BH13_0.4-0.5.	
					0.4m: Silty CLAY with minor gravel; yellowish brown. Very stiff, moist, high plasticity. Gravel is slightly weathered to unweathered, grey sandstone and greywacke.		0.5m: ISHSV=UTP						
	28	1					1m: ISHSV=158/17kPa					**1m to 1.1m:** ES BH13_1.0-1.1.	
					1.3m to 1.9m:...Yellow.								
					1.5m:...Stiff.	CH	1.5m: ISHSV=60/34kPa					**1.4m to 1.5m:** ES BH13_1.4-1.5.	
	27	2		Fc	**1.9m to 2.5m:**...Brownish grey.		2m: ISHSV=64/25kPa						
					2.5m: Silty CLAY with some gravel; brown, speckled orange brown. Stiff, moist, high plasticity. Gravel is completely weathered, grey sandstone and greywacke.	CH	2.5m: ISHSV=54/20kPa						
	26	3			**3m to 3.15m:**...Yellowish grey.		3m: ISHSV=84/30kPa						
SPT				Fx	**3.15m:** CORE LOSS		3m: SPT 0,0// 0,0,0,0 N = 0	33				**3.2m:** Cased to 3.2m.	
HQ3	25	4		Fc	**3.45m:** Silty CLAY; yellow, speckled grey. Very soft, moist, high plasticity.	CH		100					
U54	24	5		Fx	**4.5m:** PUSH TUBE.		4.5m: IBHSV=8/3kPa	100					

Box 1

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) ES refers to environmental sample.

Hand Shear Vane Serial No: DR4940 Correction Factor: 1.678

Water Level Readings:
Date Time | Hole Depth | Water Level
11/07/24 08:00 | 15.00m | 3.33 m bgl
12/07/24 08:00 | 15.00m | 4.50 m bgl
12/07/24 13:00 | 25.00m | 4.10 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **New Bond Street**
Project Reference: **521290-064**

BH13

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3 Rig
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1755685.52m
Northing: 5918252.96m
Ground level: 28.98m (NZVD2016)

Date started: 10/07/2024
Date completed: 12/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: FG
Input by: FG
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3 Box 1				Fc	**5m:** Silty CLAY; yellowish orange, speckled grey. Firm, moist, high plasticity.			100					
					5.7m to 6.45m:...Soft.								
	23	6				CH	6m: IBHSV=22/4kPa 6m: SPT 0,0// 0,0,0,0 N = 0					**6m:** Vibrating wire transducer (S/N: 361129).	
SPT								100					
HQ3					**6.45m to 6.65m:**...Grey, speckled yellow.								
	22	7		Fg	**6.9m:** Clayey SAND with some silt; greenish grey. Firm, moist, low plasticity. **7.02m to 7.15m:**...Grey.	SC		86					
				Fx	**7.15m:** CORE LOSS.								
				ERs	**7.3m:** Silty SAND with trace clay; grey. Very dense, moist, non-plastic. [RESIDUAL SOIL ECBF]	RS						**7.3m: EAST COAST BAYS FORMATION**	
SPT				EWz	**7.5m:** Moderately weathered, grey SILTSTONE; Very weak.	MW	7.5m: SPT 4,8// 50 N = 50+	100					
HQ3 Box 2				EWs	**7.73m:** Moderately weathered, grey, fine to medium SANDSTONE; Very weak, moderately cemented.								
	21	8										7.92m: JT 15° Un, Ro, Cl	
					8.15m to 8.53m:...Fine SANDSTONE.							8.14m: BP 20° 8.21m: JT 10° Un, Ro, Cl	
						MW		100	95	84		8.31m: JT 30° Un, Ro, Cl	
												8.46m: JT 20° Un, Ro, Cl	
					8.53m to 8.78m:...SILTSTONE.							8.61m: BP 2°	
					8.68m:...20mm of black carbonaceous material.							8.69m: BP 2°	
	20	9			**8.94m to 8.97m:**...Extremely weak, poorly cemented.							8.94m: BPJT 10° Un, Ro, Cl	
SPTC				EUx	**9m:** NO RECOVERY.		9m: SPTC 12,38// N = 50+	N/A	N/A	N/A			
HQ3				EUz2	**9.15m:** Slightly weathered, grey SILTSTONE; extremely weak.	SW							
					9.31m:...10mm of black carbonaceous material.								
				EUs2	**9.32m:** Slightly weathered, grey, fine to medium SANDSTONE; extremely weak, moderately cemented.	SW		100	99	78		9.43m: BP 5° Pl, Ro, Cl	
Box 3				EUz2	**9.78m:** Slightly weathered, grey SILTSTONE; extremely weak.	SW							
	19	10											

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) ES refers to environmental sample.

Hand Shear Vane Serial No: DR4940 Correction Factor: 1.678

Water Level Readings:
Date Time | Hole Depth | Water Level
11/07/24 08:00 | 15.00m | 3.33 m bgl
12/07/24 08:00 | 15.00m | 4.50 m bgl
12/07/24 13:00 | 25.00m | 4.10 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **New Bond Street**
Project Reference: **521290-064**

BH13

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3 Rig
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1755685.52m
Northing: 5918252.96m
Ground level: 28.98m (NZVD2016)

Date started: 10/07/2024
Date completed: 12/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: FG
Input by: FG
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUz2	**9.78m:** Slightly weathered, grey SILTSTONE; extremely weak. **10.1m to 10.3m:**...Fine to medium SANDSTONE; extremely weak.	SW		100	99	78		10.14m: BP 3° 10.26m: BP 2° 10.30m: BPJT 5° Un, Ro, Cl	
SPTC				EUx	**10.5m:** NO RECOVERY.		10.5m: SPTC 3,17// 40,10 for 20mm N = 50+	N/A	N/A	N/A			
HQ3	18	11		EUz2	**10.75m:** Slightly weathered, grey SILTSTONE; extremely weak. **10.88m to 10.97m:**...Zone of black carbonaneous material.	SW						10.93m: BP 10°	
HQ3				EUs2	**11m:** Slightly weathered, grey, fine to medium SANDSTONE; Very weak, moderately cemented. **11.43m to 11.45m:**...Extremely weak, poorly cemented.	SW		100	96	88		11.00m: BP 10° 11.20m: BP 20° 11.45m: BP 5° 11.75m: JT 30° Un, Ro, Cl	
HQ3	17	12		EUz2	**11.9m:** Slightly weathered, grey SILTSTONE; Very weak. **12.03m to 12.21m:**...Fine to medium SANDSTONE. **12.5m:**...3mm of black carbonaceous material.	SW						11.88m: JT 15° Pl, Ro, Cl 11.95m: JT 10° Pl, Ro, Cl 12.22m: BP 2° 12.26m: JT 15° Pl, Ro, Cl 12.39m: BP 5° 12.50m to 12.53m: BPJT 2° Un, Ro, Co, (Infill: black carbonaceous material 2mm)	
HQ3	16	13		EUs2	**12.67m:** Slightly weathered, grey, fine to medium SANDSTONE; extremely weak, poorly cemented. **12.69m:**...5mm of black carbonaceous material. **13.3m to 13.31m:**...SILTSTONE. **13.6m to 13.8m:**...Extremely weak, poorly cemented.	SW		100	100	92		12.70m: Black carbonaceous material, inclined at 15°. 12.80m: JT 15° Pl, Ro, Cl 12.87m: JT 20° Pl, Ro, Cl 13.20m: JT 10° Pl, Ro, Cl 13.40m: BP 2° 13.70m: BP 5° Pl, Ro, Cl	
HQ3	15	14		EUz2	**13.8m:** Slightly weathered, grey SILTSTONE; Very weak.	SW							
HQ3				EUi2	**14m:** Slightly weathered, Interbedded grey, fine SANDSTONE and SILTSTONE; Very weak. SANDSTONE is very thin in beds 10mm thick. SILTSTONE is very thin in beds 20mm thick. **14.4m to 14.45m:**...Extremely weak, poorly cemented. **14.44m to 15m:**...SILTSTONE.	SW		100	72	72		14.01m: JT 15° Un, Ro, Cl 14.40m to 14.43m: JT 30° Un, Ro, Cl 14.45m: BP 5° Un, Ro, Cl	
	14	15		EUs2	**14.5m:** Slightly weathered, grey, fine to medium SANDSTONE; Very weak, moderately cemented. **14.51m to 14.56m:**...SILTSTONE.	SW							

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) ES refers to environmental sample.

Water Level Readings:
Date Time | Hole Depth | Water Level
11/07/24 08:00 | 15.00m | 3.33 m bgl
12/07/24 08:00 | 15.00m | 4.50 m bgl
12/07/24 13:00 | 25.00m | 4.10 m bgl

Hand Shear Vane Serial No: DR4940 Correction Factor: 1.678

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **New Bond Street**
Project Reference: **521290-064**

BH13

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3 Rig
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1755685.52m
Northing: 5918252.96m
Ground level: 28.98m (NZVD2016)

Date started: 10/07/2024
Date completed: 12/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: FG
Input by: FG
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	13	16		EUs2	**14.5m:** Slightly weathered, grey, fine to medium SANDSTONE; Very weak, moderately cemented.	SW		100	90	86		**15.2m:** Vibrating wire transducer (S/N: 365171). 15.20m to 15.33m: JT 75° Un, Ro, Cl 15.21m: BPJT 2° Un, Ro, Co, (Infill: black carbonaceous material 2mm) 15.36m: BP 5° Un, Ro, Cl 15.40m: BP 5° Un, Ro, Cl 15.55m: BP 5° Un, Ro, Cl 15.58m: BP 5° Un, Ro, Cl 15.68m: BP 5° Un, Ro, Cl	
				EUz2	**16m:** Slightly weathered, grey SILTSTONE; Very weak.	SW						16.05m: BP 5° Un, Ro, Cl 16.13m: BP 5° Un, Ro, Cl 16.44m: JT 30° Pl, Ro, Cl	
HQ3	12	17		EUs2	**16.58m:** Slightly weathered, grey, fine SANDSTONE; Very weak, moderately cemented. **16.78m to 16.92m:**...Fine to medium SANDSTONE.	SW							
				EUz2	**16.92m:** Slightly weathered, grey SILTSTONE; Very weak. **16.98m to 17.04m:**...Extremely weak. **17.06m:**...20mm of black carbonaceous material. **17.17m:**...30mm of black carbonaceous material.	SW		100	97	97		16.95m to 16.96m: JT 45° Un, Ro, Cl 17.13m: JT 45° Un, Ro, Cl	
				EUs2	**17.35m:** Slightly weathered, grey, fine SANDSTONE; Very weak, moderately cemented.	SW						17.49m: JT 20° Un, Ro, Cl 17.54m: JT 20° Un, Ro, Cl	
HQ3	11	18			**17.65m:** Slightly weathered, grey, fine to medium SANDSTONE; Very weak. Interbedded with some (17%) siltstone, 40-50mm thick.	SW						17.75m: JT 10° Un, Ro, Cl 17.92m: JT 25° Un, Ro, Cl 18.06m: BP 5° Un, Ro, Cl	
					18.38m to 18.46m:...SILTSTONE.								
HQ3	10	19		EUs2	**18.4m:** Slightly weathered, grey, fine to medium SANDSTONE; Very weak, moderately cemented. **18.46m:**...3mm of black carbonaceous material. **18.48m to 18.5m:**...Extremely weak, poorly cemented. **18.55m to 18.75m:**...SILTSTONE. **18.67m to 18.75m:**...Extremely weak. **18.95m to 18.96m:**...SILTSTONE. **19m to 19.1m:**...SILTSTONE. **19.14m:**...4mm of black carbonaceous material.	SW		100	96	86		18.47m: Black carbonaceous material, inclined at 25°. 18.61m: BP 5° Pl, Ro, Cl Fractured 18.70m: BP 5° Pl, Ro, Cl 18.80m: SST 2mm thick, drilling induced. 19.05m: BP 10° 19.14m: Black carbonaceous material, inclined at 25°.	
					19.45m to 19.5m:...Extremely weak, poorly cemented.								
HQ3	9	20		EUz2	**19.5m:** Slightly weathered, grey SILTSTONE; Very weak. Interbedded with minor (8%) fine sandstone, 10-50mm thick.	SW		100	98	98			

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) ES refers to environmental sample.

Water Level Readings:
Date Time | Hole Depth | Water Level
11/07/24 08:00 | 15.00m | 3.33 m bgl
12/07/24 08:00 | 15.00m | 4.50 m bgl
12/07/24 13:00 | 25.00m | 4.10 m bgl

Hand Shear Vane Serial No: DR4940 Correction Factor: 1.678

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **New Bond Street**
Project Reference: **521290-064**

BH13

Sheet **5** of **5**

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1755685.52m	Date started:	10/07/2024	Logged by:	FG
Equipment:	Massenza MM3 Rig	Northing:	5918252.96m	Date completed:	12/07/2024	Input by:	FG
Contractor:	McMillan Drilling Ltd	Ground level:	28.98m (NZVD2016)	Inclination:	-90°	Checked by:	BGW
				Azimuth:	N/A	Reviewed by:	SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3 Box 6	8	21		EUz2	**19.5m:** Slightly weathered, grey SILTSTONE; Very weak. Interbedded with minor (8%) fine sandstone, 10-50mm thick. **20.04m to 20.06m:**...Extremely weak, poorly cemented. **20.66m to 20.67m:**...Extremely weak, poorly cemented. **20.7m to 20.85m:**...Fine to coarse SANDSTONE.	SW		100	98	98		20.55m: BP 5° St, Ro, Cl 20.75m: BP 5° St, Ro, Cl 20.85m: BP 5° Pl, Ro, Cl	
HQ3	7	22		EUs2	**21.57m:** Slightly weathered, grey, fine to medium SANDSTONE; Very weak, moderately cemented. **22m to 22.2m:**...SILTSTONE.	SW		100	100	100		21.53m: BP 5° 21.73m: BP 5° 22.00m to 24.00m: Drilling induced breaks (discing)	
HQ3 Box 7	6	23		EUs2	**22.91m to 22.95m:**...SILTSTONE.			87	78	78		22.62m to 22.75m: JT 70° Un, Ro, Cl	
				EUz2	**23.45m:** Slightly weathered, grey SILTSTONE; Very weak.	SW						23.50m: BP 5° 23.54m to 23.55m: JT 5° Un, Ro, Cl	
	5	24		EUx	**23.8m:** CORE LOSS.								
HQ3 Box 8	4	25		EUs2	**24m:** Slightly weathered, grey, fine to medium SANDSTONE; Very weak, moderately cemented. **24.42m to 24.7m:**...SILTSTONE. **24.76m:**...Black carbonaceous material laminae.	SW		100	100	100			

REMARKS: End of borehole at 25m (Termination Depth Achieved)
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) ES refers to environmental sample.

Hand Shear Vane Serial No: DR4940 Correction Factor: 1.678

Water Level Readings:
Date Time | Hole Depth | Water Level
11/07/24 08:00 | 15.00m | 3.33 m bgl
12/07/24 08:00 | 15.00m | 4.50 m bgl
12/07/24 13:00 | 25.00m | 4.10 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Nixon Park Carpark**
Project Reference: **521290-064**

BH14

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower 015
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1755471.53m
Northing: 5918203.21m
Ground level: 21.78m (NZVD2016)

Date started: 16/09/2024
Date completed: 18/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: KL
Input by: KL
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	21	1		P	**0m:** ASPHALT							**0m: FILL**	
				FEk	**0.04m:** Medium to coarse GRAVEL with some cobbles; grey and brown. Tightly packed, dry. [FILL]	GP							
				Fc	**0.6m:** Silty CLAY with trace sand; yellowish brown. Stiff, moist, high plasticity. Sand is fine.	CH	0.9m: ISHSV=53/16kPa						
				FEk	**1m:** Medium to coarse GRAVEL with minor boulders/cobbles and trace sand; grey and brown. Tightly packed, dry.	GP						**1m:** SPT unable to be undertaken due to prescence of boulder	
HQ3	20	2		Fx	**1.5m:** CORE LOSS								
				FEk	**1.9m:** Silty CLAY with some gravel; brown. Soft, wet, high plasticity. Gravel is slightly weathered, fine to coarse basalt. **2.1m to 2.2m:**...Stiff, moist.	CH							
				TAc	**2.2m:** Clayed SILT with trace sand and organics; darkish grey. Firm, moist, low plasticity. Sand is fine. [UNDIFFERENTIATED ALLUVIUM]	MH		73				**2.2m: TAURANGA GROUP ALLUVIUM**	
	19	3			**2.6m:** Silty CLAY with trace sand and organics; brownish orange. Firm, moist, high plasticity. Sand is fine.	CH	3m: IBHSV=26/13kPa						
SPT					**3.1m:**...Stiff.		3m: SPT 0,0// 1,0,1,1 N = 3	100					
HQ3	18	4		TAz	**3.45m:** Clayey SILT with trace organics; yellowish brown mottled light grey. Stiff, moist, high plasticity. Fragmental ogranics within silt layers. **3.6m to 3.65m:**...Trace decomposed organics.	MH	3.1m: ISHSV=82/49kPa	100					
U54	17			TAx	**4.5m:** PUSH TUBE			100				**4.5m to 4.8m:** Push Tube discontinued due to hard ground	
HQ3		5		TAz	**4.8m:** Clayey SILT with minor sand; light grey, mottled orange brown. Very stiff, moist, high plasticity. Sand is fine to medium.			100					

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 5cm and vertical accuracy of 8cm.
2) A standpipe was installed in BH14 with a screened interval between 4-6m bgl.
3) Geophysical profiling undertaken downhole on 19/09/2024, comprising an Optical and Acoustic Televiewer.
4) Packer testing was undertaken between 24.5-30m on 20/09/2024. No water flow found.

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

Water Level Readings:
Date Time | Hole Depth | Water Level
16/09/24 15:40 | 4.50m | 1.54 m bgl
17/09/24 08:30 | 4.50m | 2.63 m bgl
17/09/24 15:30 | 21.00m | 5.90 m bgl
18/09/24 08:30 | 30.00m | 4.69 m bgl
19/09/24 09:00 | 30.00m | 1.69 m bgl

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BH14

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Date started: 16/09/2024
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Inclination: -90°
Azimuth: N/A

Logged by: KL
Input by: KL
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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy / Defect Description / Additional Notes	Installation
Box 1 HQ3				TAz	**4.8m:** Clayey SILT with minor sand; light grey, mottled orange brown. Very stiff, moist, high plasticity. Sand is fine to medium.	MH		100					
	16				**5.4m to 5.45m:**...Mottled orange brown with trace organics. Iron oxide staining on the organics. **5.5m:**...Thin layers of organic material.								
SPT		6		ERz	**5.8m:** Clayey SILT with trace sand; greyish brown. Very stiff, moist, low plasticity. Sand is fine. [COMPLETELY WEATHERED ECBF]		6m: SPT 2,2// 3,3,3,5 N = 14	100				**5.8m: EAST COAST BAYS FORMATION**	
Box 2 HQ3	15				**6.45m to 7m:**...Grey.	CW							
		7		EWs	**7m:** Highly weathered, grey, fine to medium SANDSTONE; Extremely weak, poorly cemented. (Silty fine to medium SAND; Medium dense).	HW		100					
SPT	14			ERz	**7.4m:** Highly weathered, grey, sandy SILTSTONE; Extremely weak (Sandy SILT; Very stiff).	HW	7.5m: SPT 3,4// 5,6,8,11 N = 30	100					
		8										8.20m: BP 45°	
HQ3	13			ERs	**8.3m:** Moderately weathered, grey, medium SANDSTONE; Extremely weak, poorly cemented.	MW		100	97	0			
		9					9m: SPT 11,6// 19,21,10 for 40mm N = 50+						
SPT					**9.25m:**...Fine SANDSTONE.			100					
Box 3 HQ3												9.30m to 9.55m: CZ	
	12			ERz	**9.54m:** Moderately weathered, grey, SILTSTONE; Very weak, moderately cemented.	MW		100	75	75			
		10		ERs	**9.74m:** Moderately weathered, grey, medium SANDSTONE; Extremely weak, poorly cemented. **9.9m to 10.2m:**...poorly cemented, highly fractured.	MW							

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 5cm and vertical accuracy of 8cm.
2) A standpipe was installed in BH14 with a screened interval between 4-6m bgl.
3) Geophysical profiling undertaken downhole on 19/09/2024, comprising an Optical and Acoustic Televiewer.
4) Packer testing was undertaken between 24.5-30m on 20/09/2024. No water flow found.

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

Water Level Readings:
Date Time | Hole Depth | Water Level
16/09/24 15:40 | 4.50m | 1.54 m bgl
17/09/24 08:30 | 4.50m | 2.63 m bgl
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18/09/24 08:30 | 30.00m | 4.69 m bgl
19/09/24 09:00 | 30.00m | 1.69 m bgl

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BH14

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Equipment: Hydrapower 015
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Ground level: 21.78m (NZVD2016)

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Azimuth: N/A

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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				ERs	**9.74m:** Moderately weathered, grey, medium SANDSTONE; Extremely weak, poorly cemented.	MW		100	75	75			
SPTC							10.5m: SPTC 5,26// 50 for 50mm N = 50+	N/A	N/A	N/A			
HQ3	11	11		ERs	**10.7m to 12.15m:**... Very weak, moderately cemented.	MW		100	100	95			
	10				**11.75m to 11.8m:**...SILTSTONE							11.70m: JT 5° Pl, Ro, Cl 11.75m: JT 5° Pl, Ro, Cl	
SPTC		12					12m: SPTC 16,34// N = 50+	N/A	N/A	N/A			
HQ3	9	13		EUz2	**12.15m:** Slightly weathered, grey sandy SILTSTONE; Very weak, moderately cemented.	SW		100	100	74		**12.15m to 12.2m:** Black carbonaceous material at 12.15m, inclined 5°. **12.4m to 12.5m:** Bedding is sub horizontal at 5°. 12.40m: JT 5° Pl, Ro, Cl 12.45m: JT 5° Pl, Ro, Cl 12.55m: BP 5° 12.65m: JT 5°	
				EUs2	**12.3m:** Slightly weathered, grey silty fine SANDSTONE; Very weak, moderately cemented.	SW							
HQ3	8	14		EUs2		SW		100	100	100		14.50m: JT 5° Pl, Ro, Cl	
	7			EUs2	**14.65m to 14.7m:**...Coarse SANDSTONE	SW						14.65m: JT 5° Pl, Ro, Cl	
		15		EUz2	**14.8m:** Slightly weathered, grey SILTSTONE; Very weak.	SW							

Box 3 | Box 4 | Box 5

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 5cm and vertical accuracy of 8cm.
2) A standpipe was installed in BH14 with a screened interval between 4-6m bgl.
3) Geophysical profiling undertaken downhole on 19/09/2024, comprising an Optical and Acoustic Televiewer.
4) Packer testing was undertaken between 24.5-30m on 20/09/2024. No water flow found.

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

Water Level Readings:
Date Time | Hole Depth | Water Level
16/09/24 15:40 | 4.50m | 1.54 m bgl
17/09/24 08:30 | 4.50m | 2.63 m bgl
17/09/24 15:30 | 21.00m | 5.90 m bgl
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BH14

BOREHOLE INFORMATION
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Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
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Northing: 5918203.21m
Ground level: 21.78m (NZVD2016)

Date started: 16/09/2024
Date completed: 18/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: KL
Input by: KL
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	6	16		EUz2	**14.8m:** Slightly weathered, grey SILTSTONE; Very weak.	SW		100	100	100		15.10m: BP 10°	
				EUs2	**15.1m:** Slightly weathered, grey, silty SANDSTONE; Very weak, moderately cemented.	SW							
				EUz2	**15.4m:** Slightly weathered, grey, sandy SILTSTONE; Very weak.	SW						16.15m: BP 5°	
HQ3	5	17		EUs2	**16.3m:** Slightly weathered, grey, silty fine SANDSTONE; Very weak, moderately cemented.	SW		100	100	100		16.50m to 16.60m: JT 10° Pl, Ro, Cl	
					16.5m to 16.7m:...Silty medium SANDSTONE. Poorly cemented.								
					16.7m: Slightly weathered, grey, interbedded SILTSTONE/SANDSTONE; Very weak. Bedding is moderately thin and sub horizontal. Sandstone (50%) is fine, moderately cemented and Siltstone (50%).	SW						**17.25m to 17.3m:** Black carbonaceous material, 2-5mm thick. 17.30m: BP 5°	
	4	18			**17.5m to 18m:**...Silty fine to medium SANDSTONE.							17.50m: JT 10° Ro 17.72m: JT 5° Pl, Ro, Cl	
HQ3	3	19		EUs2	**18m:** Slightly weathered, grey, silty fine SANDSTONE with some (20-25%) interbeds of moderately thin SILTSTONE; Very weak, moderately cemented.	SW		100	100	100		**18.25m to 18.35m:** Rip-up clasts 18.25m to 18.35m: BP 5° 18.45m: BP 10°	
					18.7m to 18.9m:...Slightly weathered, grey, sandy SILTSTONE; Very weak.								
					19.1m to 19.4m:...Slightly weathered, grey, sandy SILTSTONE; Very weak.							19.05m to 19.10m: JT 10° Pl, Ro, Cl	
HQ3	2	20						100	97	97			

Box 5
Box 6

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 5cm and vertical accuracy of 8cm.
2) A standpipe was installed in BH14 with a screened interval between 4-6m bgl.
3) Geophysical profiling undertaken downhole on 19/09/2024, comprising an Optical and Acoustic Televiewer.
4) Packer testing was undertaken between 24.5-30m on 20/09/2024. No water flow found.

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

Water Level Readings:
Date Time | Hole Depth | Water Level
16/09/24 15:40 | 4.50m | 1.54 m bgl
17/09/24 08:30 | 4.50m | 2.63 m bgl
17/09/24 15:30 | 21.00m | 5.90 m bgl
18/09/24 08:30 | 30.00m | 4.69 m bgl
19/09/24 09:00 | 30.00m | 1.69 m bgl

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BH14

BOREHOLE INFORMATION
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Azimuth: N/A

Logged by: KL
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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	1	21		EUs2	**18m:** Slightly weathered, grey, silty fine SANDSTONE with some (20-25%) interbeds of moderately thin SILTSTONE; Very weak, moderately cemented. **20m to 20.2m:**...Slightly weathered, grey, sandy SILTSTONE; Very weak.	SW						**20.2m to 20.35m:** Black carbonaceous material bedding less than 5°.	
HQ3	1	21		EUz2	**20.43m:** Slightly weathered laminated SILTSTONE; Very weak. Bedding is moderately thin, gently inclined. **20.65m to 20.7m:**...poorly cemented. **20.8m to 20.95m:**...Fine SANDSTONE; Very weak, poorly cemented.	SW		100	97	97		20.40m: JT 45° Pl, Ro, Cl 20.70m: JT 10° Pl, Ro, Cl	
HQ3	0	22		EUs2	**20.95m:** Slightly weathered, grey medium SANDSTONE; Very weak, poorly cemented. **21.13m to 21.3m:**...Silty fine SANDSTONE	SW		87	87	87		21.50m: BP 25°	
				EUx	**22.1m:** CORE LOSS								
				EUs2	**22.3m:** Slightly weathered, grey, medium SANDSTONE; Very weak, moderately cemented.	SW							
HQ3	-1	23		EUz2	**22.41m:** Slightly weathered, grey, sandy SILTSTONE; Very weak.	SW						**22.65m to 22.7m:** Black carbonaceous material bedding less than 5°.	
HQ3	-2	24		EUs2	**23.2m:** Slightly weathered, grey, fine to medium SANDSTONE; Very weak, moderately cemented. **23.5m to 23.6m:**...SILTSTONE **24m to 24.1m:**...Coarse SANDSTONE. **24.1m to 24.15m:**...SILTSTONE.	SW		100	100	100		**23.5m to 23.6m:** Black carbonaceous materials bedding is inclined at 2-3°. 23.50m to 23.60m: BP 3°	
HQ3	-3	25		EUs2	**24.45m to 25.5m:**...Silty fine SANDSTONE.	SW		100	93	93			

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 5cm and vertical accuracy of 8cm.
2) A standpipe was installed in BH14 with a screened interval between 4-6m bgl.
3) Geophysical profiling undertaken downhole on 19/09/2024, comprising an Optical and Acoustic Televiewer.
4) Packer testing was undertaken between 24.5-30m on 20/09/2024. No water flow found.

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

Water Level Readings:
Date Time | Hole Depth | Water Level
16/09/24 15:40 | 4.50m | 1.54 m bgl
17/09/24 08:30 | 4.50m | 2.63 m bgl
17/09/24 15:30 | 21.00m | 5.90 m bgl
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BH14

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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUs2	**23.2m:** Slightly weathered, grey, fine to medium SANDSTONE; Very weak, moderately cemented. **25.1m to 25.3m:**...SANDSTONE; Well cemented. **25.3m to 25.45m:**...Pinkish fine to coarse SANDSTONE with some gravel; Weak, well cemented.	SW		100	93	93		25.10m to 25.30m: JT 50° St, Ro, Cl **25.5m to 25.9m:** Rip-up clasts	
HQ3	-4	26		EUz2	**25.65m:** Slightly weathered, grey sandy SILTSTONE; Very weak. Sand is fine. **26.2m to 26.4m:**...Grey to black SANDSTONE; Very weak, well cemented. **26.6m to 26.8m:**...Sandy SILTSTONE. Bedding inclined around 5-10°.	SW		100	100	100		25.80m: BP 15° **25.85m to 25.9m:** Black carbonaceous material inclined at 10°. **26.2m to 26.4m:** Black carbonaceous material bedding at 45°. 26.20m to 26.40m: BP 45° 26.60m to 26.80m: BP 10° 26.85m: JT 30° Pl, Ro, Cl	
HQ3	-6	28		EUs2	**27.7m:** Slightly weathered, grey, silty fine SANDSTONE; Very weak, moderately cemented.	SW		100	93	93		27.70m: JT 25° Pl, Ro, Cl 28.00m: JT 15° Pl, Ro, Cl	
HQ3	-7	29		EUz2	**28.1m:** Slightly weathered, grey, SILTSTONE; Very weak. Bedding dips 30° at 28.15m **28.4m to 28.5m:**...poorly cemented.	SW						28.10m to 28.15m: BP 30° 28.61m: JT 30° Pl, Ro, Cl	
				EUs2	**28.8m:** Slightly weathered, grey, silty fine SANDSTONE; Very weak, moderately cemented.	SW		100	95	87		29.10m: JT 30° Pl, Ro, Cl	
HQ3	-8	30		EUz2	**29.3m:** Slightly Weathered, grey, SILTSTONE; Very weak. **29.9m:**...poorly cemented.	SW						29.40m: JT 30° Pl, Ro, Cl	

Box 8 | Box 9 | Box 10

REMARKS: End of borehole at 30m (Termination Depth Achieved)
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 5cm and vertical accuracy of 8cm.
2) A standpipe was installed in BH14 with a screened interval between 4-6m bgl.
3) Geophysical profiling undertaken downhole on 19/09/2024, comprising an Optical and Acoustic Televiewer.
4) Packer testing was undertaken between 24.5-30m on 20/09/2024. No water flow found.

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

Water Level Readings:
Date Time | Hole Depth | Water Level
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17/09/24 08:30 | 4.50m | 2.63 m bgl
17/09/24 15:30 | 21.00m | 5.90 m bgl
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19/09/24 09:00 | 30.00m | 1.69 m bgl

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Location: **52 Kingsland Avenue**
Project Reference: **521290-064**

BH17

Sheet **1** of **7**

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1755198.45m	Date started:	5/09/2024	Logged by:	GMR
Equipment:	Massenza MM3	Northing:	5918229.65m	Date completed:	10/09/2024	Input by:	GMR
Contractor:	McMillan Drilling (N I) Ltd	Ground level:	19.00m (NZVD2016)	Inclination:	-90°	Checked by:	PK
				Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	18	1		P	**0m:** ASPHALT.							**0m: FILL**	
				Fg	**0.07m:** Medium to coarse GRAVEL; dark grey. Tightly packed, dry. Gravel is subangular, slightly weathered, moderately strong basalt. [FILL]	GW						**0.05m:** ES BH17_0.05 **0.07m:** ES BH17_0.07	
					0.3m: Medium to coarse GRAVEL with minor cobbles and trace silt; dark grey. Tightly packed, moist. Gravel is subangular, slightly weathered, moderately strong basalt.	GW	0.5m: ISHSV=89/48kPa 1m: ISHSV=53/22kPa	0					
SPT	17	2		TAc	**1.5m:** Silty CLAY with trace sand; light orange mottled grey. Stiff, moist, high plasticity. Sand is fine. [UNDIFFERENTIATED ALLUVIUM]	CH	1.5m: IBHSV=70/31kPa 1.5m: SPT 0,0// 1,1,1,1 N = 4	100				**1.5m: TAURANGA GROUP ALLUVIUM** **1.5m to 1.95m:** ES BH17_1.5-1.95	
HQ3	16	3		TAz	**2.2m:** SILT with some clay and minor sand; greenish grey. Stiff, moist, high plasticity.	MH		100					
U54				TAx	**3m:** PUSH TUBE.			70				**3m:** ISHSV failed due to shear vane slipping downhole in disturbed material.	
SPT	15	4		TAo	**3.5m:** CLAY with some silt and trace organic material; brownish grey. Firm, moist, high plasticity. Organics are rootlets, 10-15mm.	OH	3.5m: SPT 0,0// 0,1,1,1 N = 3	100				**3.5m to 3.95m:** ES BH17_13.5-3.95	
HQ3					**4.2m:**...soft.			100				3.95m: Cased to 2m bgl at 3.95m.	
				TAc	**4.3m:** Silty CLAY with minor organics; light bluish grey. Soft, moist, high plasticity. Organics are rootlets, 5-15mm.	CH							
U54	14	5		TAx	**4.5m:** PUSH TUBE.		4.5m: IBHSV=22/8kPa	100					

Box 1

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) ES = Environmental Sample.
3) A standpipe was installed in BH17 with a screened interval between 6.8-8.2m bgl.
4) Geophysical profiling undertaken downhole on 10/09/2024, comprising an Optical and Acoustic Televiewer.
5) Packer testing was undertaken between 16-20.5m on 11/09/2024.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
05/09/24 16:00 | 7.50m | 2.95 m bgl
06/09/24 07:30 | 7.50m | 1.80 m bgl
06/09/24 14:00 | 24.00m | 2.55 m bgl
09/09/24 07:30 | 24.00m | 0.40 m bgl
09/09/24 10:00 | 30.00m | 0.45 m bgl
10/09/24 08:00 | 30.00m | 0.70 m bgl
11/09/24 00:00 | 30.00m | 0.40 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **52 Kingsland Avenue**
Project Reference: **521290-064**

BH17

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1755198.45m
Northing: 5918229.65m
Ground level: 19.00m (NZVD2016)

Date started: 5/09/2024
Date completed: 10/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 1													
SPT				TAc	**5m:** Silty CLAY with minor organics; light bluish grey. Soft, moist, high plasticity. Organics are rootlets, 5-15mm.	CH	5m: SPT 0,0// 0,1,1,1 N = 3	100				**5m to 5.45m:** ES BH17_5.0-5.45	
HQ3	13	6		TAz	**5.3m:** Sandy SILT with minor clay; greenish grey. Firm, moist, low plasticity. Sand is fine. **5.45m:**...mottled orange and dark grey.	ML							
				TAc	**5.7m:** Silty CLAY with trace sand; light grey mottled orange. Firm, moist, high plasticity. Sand is fine.	CH		100					
U54				TAx	**6m:** PUSH TUBE.			100				**6m:** ISHSV failed due to shear vane slipping downhole in disturbed material.	
SPT				TAc	**6.5m:** Silty CLAY with trace sand; dark grey. Firm, moist, high plasticity. Sand is fine.	CH	6.5m: SPT 0,1// 1,1,1,2 N = 5	100				**6.5m to 6.95m:** ES BH17_6.5-6.95	
HQ3	12	7		TAs	**6.85m:** Silty SAND with trace clay; greyish orange. Loose, moist. Quick, dilatant. **7.4m:**...orange.	SM		100					
Box 2													
SPT				ERz	**7.54m:** SILT with minor clay and trace sand; light grey. Very stiff, moist, low plasticity. [RESIDUAL SOIL ECBF] **7.55m to 7.68m:**...fine silty sand.	ML	7.5m: IBHSV=8/0kPa 7.5m: SPT 1,1// 2,3,6,9 N = 20	100				**7.5m:** Loose sand at bottom of run. Shear vane not stable. **7.51m to 7.95m:** ES BH17_7.5-7.95 **7.54m: EAST COAST BAYS FORMATION**	
HQ3	11	8		EWs	**7.95m:** Moderately weathered, light grey silty fine SANDSTONE; extremely weak. Moderately cemented. **8.55m:** poorly cemented.	MW		100	56	56		8.10m: JT 20° Pl, Ro, Cl 8.20m: JT 30° Pl, Sm, Cl 8.42m: JT 60° Pl, Sm, Cl 8.55m: JT 35° Pl, Sm, Cl 8.62m to 8.77m: JT 85° Pl, Sm, Cl	
				EWs	**8.7m:** Moderately weathered, light grey SILTSTONE; extremely weak.							**8.7m: EAST COAST BAYS FORMATION**	
SPT	10	9			**9.05m to 9.25m:**...silty fine sandstone.	MW	9m: SPT 8,15// 20,18,12 for 30mm N = 50+	100	100	0		8.85m: JT 25° Pl, Ro, Cl 8.90m: JT 30° Pl, Sm, Cl **8.95m to 9m:** Core loss 0.05m. **9m to 9.33m:** ES BH17_9.0-9.33	
Box 3													
HQ3	9	10		EUs	**9.33m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **9.5m to 9.76m:**...medium sandstone. **9.82m to 9.98m:**...siltstone.	SW		100	100	79		9.36m: BPJT 25° **9.42m:** black carbonaceous material, 5mm, inclined 35°. 9.42m: BP 35° **9.44m:** black carbonaceous material, 3mm, inclined 20°. **9.46m:** black carbonaceous material, 15mm, inclined 15°. 9.49m: JT 25° Pl, Ro, Cl 9.78m: JT 45° St, Ro, Cl 9.80m to 9.89m: JT 70° St, Ro, Cl	

REMARKS:
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5) Packer testing was undertaken between 16-20.5m on 11/09/2024.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

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06/09/24 14:00 | 24.00m | 2.55 m bgl
09/09/24 07:30 | 24.00m | 0.40 m bgl
09/09/24 10:00 | 30.00m | 0.45 m bgl
10/09/24 08:00 | 30.00m | 0.70 m bgl
11/09/24 00:00 | 30.00m | 0.40 m bgl

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Equipment: Massenza MM3
Contractor: McMillan Drilling (N I) Ltd

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Northing: 5918229.65m
Ground level: 19.00m (NZVD2016)

Date started: 5/09/2024
Date completed: 10/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUs	**9.33m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented.	SW		100	100	79		9.90m: JT 30° Pl, Sm, Cl 9.92m: BPJT 20° 10.08m: BPJT 10° 10.12m: JT 45° Pl, Ro, Cl 10.28m: JT 55° Pl, Ro, Cl 10.36m: JT 35° Pl, Ro, Cl	
SPTC				EUx	**10.5m:** NO RECOVERY.		10.5m: SPTC 5,6// 7,11,10,22 for 65mm N = 50+	N/A	N/A	N/A		10.46m: BP 35° 10.47m: JT 20° Pl, Ro, Cl **10.5m to 10.95m:** ES BH17_10.5-10.95	
HQ3	8	11		EUs	**10.94m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **11.15m to 11.58m:**...medium sandstone. **11.6m to 11.68m:**...siltstone inclusions, 5-10mm.	SW		100	92	92		10.94m: JT 25° Pl, Sm, Cl 11.02m: JT 10° Pl, Ro, Cl 11.56m: JT 20° St, Ro, Cl 11.71m: JT 20° Pl, Ro, Cl 11.85m to 11.95m: JI 75°	
SPTC	7	12		EUx	**12m:** NO RECOVERY.	SW	12m: SPTC 8,34// 50 for 65mm N = 50+	N/A	N/A	N/A		**12m to 12.22m:** ES BH17_12.0-12.22	
HQ3	6	13		EUs	**12.22m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **12.95m to 13.18m:**...medium to coarse sandstone, fining upwards. **13.18m to 13.25m:**...siltstone.	SW		100	95	92		**12.22m to 12.4m:** steep veins (70-80°), anastamosing. 12.62m to 12.65m: JI 30° 12.71m: JT 55° Pl, Ro, Cl 12.77m: JI 50° 13.02m: JT 25° Pl, Sm, Cl 13.18m: JT 20° Pl, Ro, Cl 13.24m: JT 10° Pl, Ro, Cl	
SPTC				EUx	**13.5m:** NO RECOVERY.	SW	13.5m: SPTC 16,34 for 140mm// N = 50+	N/A	N/A	N/A		13.38m: BP 15° **13.42m:** disseminated black carbonaceous material, 10mm, inclined 15°. 13.46m: JT 30° Pl, Sm, Cl **13.5m to 13.64m:** ES BH17_13.5-13.64	
HQ3	5	14		EUs	**13.64m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **13.65m to 13.77m:**...poorly cemented. **13.87m to 13.92m:**...siltstone. **14.05m to 14.16m:**...siltstone. **14.35m to 14.48m:**...poorly cemented.	SW		92	83	83		13.50m: JT 10° Pl, Sm, Cl 13.64m: Core loss due to poorly cemented sandstone. 13.77m: BP 35° **13.79m:** black carbonaceous material, 2mm, inclined 40°. 14.26m: BP 25° 14.37m: JT 50° Pl, Ro, Cl	
				EUx	**14.48m:** CORE LOSS.	SW							
	4	15		EUs	**14.59m:** Slightly weathered, light grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW						14.70m: JT 70° St, Sm, Cl 14.85m: JT 10° Pl, Sm, Cl	

Box 3
Box 4

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Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
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06/09/24 07:30 | 7.50m | 1.80 m bgl
06/09/24 14:00 | 24.00m | 2.55 m bgl
09/09/24 07:30 | 24.00m | 0.40 m bgl
09/09/24 10:00 | 30.00m | 0.45 m bgl
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BH17

BOREHOLE INFORMATION
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Equipment: Massenza MM3
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1755198.45m
Northing: 5918229.65m
Ground level: 19.00m (NZVD2016)

Date started: 5/09/2024
Date completed: 10/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3 Box 4	3	16		EUs	**14.59m:** Slightly weathered, light grey, fine to medium SANDSTONE; very weak. Moderately cemented. **15m to 15.19m:**...poorly cemented. **15.24m to 15.28m:**...siltstone. **15.55m to 15.59m:**...siltstone. **15.79m to 15.9m:**...siltstone.	SW		100	100	100		14.97m: JT 10° Pl, Sm, Cl 15.19m: BPJT 5° 15.64m: BP 30° 15.69m: JT 15° Pl, Ro, Cl 15.76m: BP 20° 15.80m: BP 25° 16.03m: JT 25° Pl, Sm, Cl	
HQ3 Box 5	2	17		EUs	**16.5m to 17.1m:**...poorly cemented.							16.47m: BPJT 25°	
			× × × × × × × ×	EUz	**17.1m:** Slightly weathered, light grey SILTSTONE; very weak.	SW		100	32	48			
	1	18		EUs	**17.3m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **17.6m to 17.7m:**...poorly cemented. **17.85m to 17.9m:**...siltstone.	SW						17.29m: JI 30° 17.31m: JI 25° 17.33m: JT 30° Pl, Sm, Cl 17.46m: JT 30° Pl, Sm, Cl 17.55m: JT 65° Pl, Sm, Cl 17.60m: JT 35° Pl, Sm, Cl 17.70m: JT 55° Pl, Sm, Cl 17.84m to 17.94m: JT 80° Pl, Ro, Cl	
HQ3 Box 6	0	19		EUs	**18.27m to 18.54m:**...poorly cemented.							**18.47m to 18.5m:** Core loss 0.03m.	
			× × × × × × × ×	EUz	**18.54m:** Slightly weathered, light grey SILTSTONE; very weak.	SW						18.54m: BPJT 15° 18.55m: BP 15°	
				EUs	**18.7m:** Slightly weathered, light grey, fine to medium SANDSTONE; very weak. Moderately cemented. **18.76m to 18.9m:**...poorly cemented. **18.96m to 19.02m:**...siltstone. **19.11m to 19.22m:**...poorly cemented.	SW		98	75	75		18.97m: BP 15° 19.00m to 19.10m: JI 70° 19.16m: JT 40° Pl, Ro, Cl 19.28m: BP 25° 19.40m: BP 15° 19.5m: Core loss due to poorly cemented sandstone.	
HQ3	-1	20			**19.6m to 19.8m:**...medium sandstone with shell fragments 1-2mm; poorly cemented.			47	38	38		19.70m: JT 50° Pl, Ro, Cl 19.80m: JT 40° Pl, Ro, Cl 19.84m: JT 20° Pl, Ro, Cl	

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Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
05/09/24 16:00 | 7.50m | 2.95 m bgl
06/09/24 07:30 | 7.50m | 1.80 m bgl
06/09/24 14:00 | 24.00m | 2.55 m bgl
09/09/24 07:30 | 24.00m | 0.40 m bgl
09/09/24 10:00 | 30.00m | 0.45 m bgl
10/09/24 08:00 | 30.00m | 0.70 m bgl
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BH17

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1755198.45m
Northing: 5918229.65m
Ground level: 19.00m (NZVD2016)

Date started: 5/09/2024
Date completed: 10/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-2	21		EUs	**18.7m:** Slightly weathered, light grey, fine to medium SANDSTONE; very weak. Moderately cemented. **20m to 20.15m:**...poorly cemented.	SW						
				EUx	**20.21m:** CORE LOSS.	SW		47	38	38		
HQ3	-3	22		EUs	**21m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **21.46m to 21.5m:**...siltstone. **21.61m to 21.68m:**...poorly cemented. **21.8m to 21.89m:**...siltstone. **22m to 22.13m:**...medium to coarse sandstone.	SW		75	73	73		21m: Core loss due to poorly cemented sandstone. 21.11m: BPJT 10° 21.15m to 21.25m: BP 25° 21.38m: JT 30° Pl, Sm, Cl 21.46m: JI 25° 21.55m: JT 45° Pl, Sm, Cl 21.59m: JI 40° 21.69m: BPJT 20° 21.96m: BPJT 20° **21.97m:** black carbonaceous material, 2mm, inclined 20°.	
				EUx	**22.13m:** CORE LOSS.	SW							
HQ3	-4	23		EUs	**22.5m:** Slightly weathered, light grey, fine to medium SANDSTONE; very weak. Moderately cemented. **22.73m to 22.8m:**...siltstone. **23.2m to 23.3m:**...siltstone inclusions. **23.31m to 24m:**...medium to coarse sandstone, shell fragments <1mm.	SW		100	99	95		22.62m: BP 25° 22.65m: BP 35° 23.20m: JT 20° Pl, Sm, Cl 23.32m: BP 15° 23.34m: BP 15° 23.40m: BP 30°	
HQ3	-5	24		EUs	**24m:** Slightly weathered, light grey, medium SANDSTONE with shell fragments (1-6mm); weak +. Well cemented. **24.42m:**...siltstone lithic, 40mm. **24.43m to 24.54m:**...coarse sandstone.	SW		84	83	83		23.83m: JT 30° Pl, Ro, Cl 23.90m: JT 15° Pl, Sm, Cl 24m: Switched drillbit, rock too hard. 24.27m: JT 10° Pl, Ro, Cl	
	-6	25			**24.54m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **24.68m to 24.79m:**...medium sandstone. **24.88m to 24.99m:**...siltstone.	SW						24.54m: JT 35° Pl, Ro, Cl **24.59m:** black carbonaceous material, 1mm, inclined 20°. 24.79m: BP 25° 24.86m: BP 35°	

Box 6
Box 7

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Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
05/09/24 16:00 | 7.50m | 2.95 m bgl
06/09/24 07:30 | 7.50m | 1.80 m bgl
06/09/24 14:00 | 24.00m | 2.55 m bgl
09/09/24 07:30 | 24.00m | 0.40 m bgl
09/09/24 10:00 | 30.00m | 0.45 m bgl
10/09/24 08:00 | 30.00m | 0.70 m bgl
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Northing: 5918229.65m
Ground level: 19.00m (NZVD2016)

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Box 7 HQ3				EUs	**24.54m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **25.18m to 25.22m:**...siltstone.	SW						**25.01m:** black carbonaceous material, 1mm, inclined 20°. 25.03m: BPJT 20° 25.05m: BP 25° 25.15m: BP 20°	
				EUx	**25.26m:** CORE LOSS.	SW		84	83	83			
HQ3	-7	26		EUs	**25.5m:** Slightly weathered, light grey, medium SANDSTONE; very weak. Moderately cemented. **25.66m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **25.88m to 25.97m:**...poorly cemented. **26m to 26.2m:**...siltstone laminations. **26.25m to 26.29m:**...medium to coarse sandstone and siltstone inclusions. **26.29m to 26.4m:**...siltstone.	SW		96	95	95		**25.9m:** disseminated black carbonaceous material, inclined 45°. 25.99m: BP 15° 26.13m: BP 25° 26.21m: BPJT 10° 26.38m: JT 25° Pl, Ro, Cl 26.52m: JT 25° Pl, Ro, Cl 26.68m: JT 20° Pl, Ro, Cl 26.83m: BP 25°	
	-8	27		EUz	**27.04m:** Slightly weathered, light grey SILTSTONE; very weak.	SW						**26.94m to 27m:** Core loss 0.06m. 27.04m: BP 35°	
Box 8 HQ3				EUs	**27.16m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **27.28m to 27.53m:**...medium sandstone. **27.8m to 27.9m:**...siltstone. **28m to 28.18m:**...siltstone. **28.38m to 28.95m:**...poorly cemented.	SW		95	84	89		27.46m: JT 20° Pl, Sm, Cl 27.53m: BP 20° 27.71m: JT 35° Pl, Ro, Cl 27.88m: JT 30° Pl, Ro, Cl, (Infill: clayey silt Firm 10mm) 27.96m: JT 25° Pl, Sm, Cl 28.00m: BP 30°	
	-9	28										**28.42m to 28.5m:** Core loss 0.08m.	
	-10	29		EUz	**29.08m:** Slightly weathered, light grey SILTSTONE; very weak.	SW						28.94m: JT 30° Pl, Ro, Cl 29.00m: BPJT 10° 29.03m: JT 10° Pl, Ro, Cl	
Box 9 HQ3				EUs	**29.2m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **29.28m to 29.35m:**...poorly cemented. **29.45m to 29.58m:**...poorly cemented. **29.78m to 29.88m:**...siltstone.	SW		100	86	86		29.20m: JT 25° Pl, Ro, Cl 29.29m: BPJT 15° 29.34m: BP 15° 29.38m: BP 15° 29.58m: BP 30° 29.64m: BP 30° 29.79m: BP 40°	
	-11	30										**29.92m:** black carbonaceous material,	

REMARKS: End of borehole at 30m (Termination Depth Achieved)
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) ES = Environmental Sample.
3) A standpipe was installed in BH17 with a screened interval between 6.8-8.2m bgl.
4) Geophysical profiling undertaken downhole on 10/09/2024, comprising an Optical and Acoustic Televiewer.
5) Packer testing was undertaken between 16-20.5m on 11/09/2024.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
05/09/24 16:00 | 7.50m | 2.95 m bgl
06/09/24 07:30 | 7.50m | 1.80 m bgl
06/09/24 14:00 | 24.00m | 2.55 m bgl
09/09/24 07:30 | 24.00m | 0.40 m bgl
09/09/24 10:00 | 30.00m | 0.45 m bgl
10/09/24 08:00 | 30.00m | 0.70 m bgl
11/09/24 00:00 | 30.00m | 0.40 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **52 Kingsland Avenue**
Project Reference: **521290-064**

BH17

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1755198.45m	Date started:	5/09/2024	Logged by:	GMR
Equipment:	Massenza MM3	Northing:	5918229.65m	Date completed:	10/09/2024	Input by:	GMR
Contractor:	McMillan Drilling (N I) Ltd	Ground level:	19.00m (NZVD2016)	Inclination:	-90°	Checked by:	PK
				Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
												1mm, inclined 15°. **29.94m:** black carbonaceous material, 1mm, inclined 15°.	

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) ES = Environmental Sample.
3) A standpipe was installed in BH17 with a screened interval between 6.8-8.2m bgl.
4) Geophysical profiling undertaken downhole on 10/09/2024, comprising an Optical and Acoustic Televiewer.
5) Packer testing was undertaken between 16-20.5m on 11/09/2024.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:

Date Time	Hole Depth	Water Level
05/09/24 16:00	7.50m	2.95 m bgl
06/09/24 07:30	7.50m	1.80 m bgl
06/09/24 14:00	24.00m	2.55 m bgl
09/09/24 07:30	24.00m	0.40 m bgl
09/09/24 10:00	30.00m	0.45 m bgl
10/09/24 08:00	30.00m	0.70 m bgl
11/09/24 00:00	30.00m	0.40 m bgl

Database File: CC2 MOTIONS MASTER (02).GPJ **Library file:** LIBRARY_20240925_V13 (1).GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 MOTIONS CATCHMENT IMPROVEMENTS.LOG **Date Generated:** 18/02/2025

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **67 Finch Street**
Project Reference: **521290-064**

BH21

Sheet **1** of **6**

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1754694.30m	Date started:	19/06/2024	Logged by:	GMR
Equipment:	Hanjin D&B-10D	Northing:	5918287.43m	Date completed:	20/06/2024	Input by:	GMR
Contractor:	McMillan Drilling (N I) Ltd	Ground level:	16.38m (NZVD2016)	Inclination:	-90°	Checked by:	PK
				Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	16	1		P	**0m:** ASPHALT.							**0m: FILL**	
					0.04m: Medium to coarse GRAVEL with some silt and trace sand; dark grey. Tightly packed, moist, bedded. Clast supported. Gravel is subangular to angular basalt and greywacke, slightly weathered. Bedding is sub-horizontal (<5°), 60-200mm. [FILL]							**0.5m:** Inferred uncontrolled fill. Attempted contamination sampling but unable to collect sample due to tightly packed ground.	
					0.4m to 4m:...some clay, brownish grey.								
	15	2		Fg	**0.5m:**...fragments of plastic, wood, concrete, and glass.			0				**2m to 2.5m:** Concrete on side wall, 200mm thick beams of concrete with 100mm gap inbetween.	
	14	3										**2.5m to 4m:** Difficult to observe material, inferred to be similar to overlying fill.	
HQ3	13	4		Fx	**4m:** CORE LOSS.			0				4m: Core loss due to wash out of gravel. Flushed hole for SPT @ 4.5m.	
SPT	12	5		Fg	**4.5m:** Medium to coarse GRAVEL with some silt and minor clay; light grey. Medium dense, moist. Gravel is subangular to angular greywacke.		4.5m: SPT 9,4// 5,4,5,4 N = 18	38					
								71					

Box 1

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum excavation completed to 4.0m bGL due to a 1200mm diameter stormwater pipe within 1.0m of the borehole location, at a depth of 3.5m bGL.
3) Geophysical profiling undertaken downhole on 20/06/2024, comprising an Optical and Acoustic Televiewer.
4) ES = Environmental Sample.
5) BH49 backfilled on completion of drilling.

Hand Shear Vane Serial No: DR4940 Correction Factor: 1.678

Water Level Readings:
Date Time | Hole Depth | Water Level
18/06/24 16:35 | 9.45m | 3.50 m bgl
19/06/24 07:35 | 9.45m | 3.50 m bgl
20/06/24 10:00 | 30.00m | 3.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **67 Finch Street**
Project Reference: **521290-064**

BH21

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hanjin D&B-10D
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1754694.30m
Northing: 5918287.43m
Ground level: 16.38m (NZVD2016)

Date started: 19/06/2024
Date completed: 20/06/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	11	6		Fg Fk ERs	**5.1m:** Medium to coarse GRAVEL; light grey. Medium dense, dry. Gravel is subangular to angular, slightly weathered greywacke. **5.2m:** CONCRETE; light grey. Clasts within concrete matrix are medium, subangular, slightly weathered, moderately vesicular basalt. **5.4m to 5.45m:**...silty fine sand with minor fine gravel; greenish grey. **5.45m:** Silty fine SAND; light greenish grey. Medium dense, moist. [COMPLETELY WEATHERED ECBF]	SP-SM		71				4.95m: 100% water loss during core run, cased to 5.5m. **5.4m to 5.5m:** ES BH21_5.40-5.50m **5.45m: EAST COAST BAY FORMATION**	
SPT	10			EWs	**6m:** Highly weathered, light greenish grey, silty fine SANDSTONE; extremely weak. Poorly cemented. (Silty fine SAND).	HW	6m: IBHSV=UTP 6m: SPT 1,4// 6,6,7,9 N = 28	89				**6.4m to 6.45m:** Core loss 0.05m. 6.45m: Core loss due to wash out. 100% water loss downhole. Driller slowed drilling for next run. **6.6m to 6.7m:** ES BH21_6.60-6.70m	
HQ3	9	7			**6.95m:** CORE LOSS.			48	16	0			
SPT	8	8		EWx	**7.5m:** Highly weathered, light grey, silty fine SANDSTONE; extremely weak. Weakly cemented. (Silty fine SAND)	HW	7.5m: SPT 2,6// 7,9,11,11 N = 38	80				**7.86m to 7.95m:** Core loss 0.09m. 7.95m: Cased to 7m at 7.95m bGL to try prevent water loss and wash out. Driller attached extended nozzle.	
HQ3	8	9			**8.35m:** CORE LOSS.			38	29	0			
SPT	7	7		EWs	**9m:** Highly weathered, light grey, silty fine SANDSTONE; extremely weak. Poorly cemented. (Fine SAND with minor silt)	HW	9m: SPT 3,7// 9,12,14,15 N = 50	89				**9.4m to 9.45m:** Core loss 0.05m. 9.45m: Cased to 8.5m at 12m bGL. Driller noted sand coming up around casing.	
HQ3		10			**9.75m to 9.85m:**...poorly cemented			100	62	0			

Box 1
Box 2

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum excavation completed to 4.0m bGL due to a 1200mm diameter stormwater pipe within 1.0m of the borehole location, at a depth of 3.5m bGL.
3) Geophysical profiling undertaken downhole on 20/06/2024, comprising an Optical and Acoustic Televiewer.
4) ES = Environmental Sample.
5) BH49 backfilled on completion of drilling.

Hand Shear Vane Serial No: DR4940 Correction Factor: 1.678

Water Level Readings:
Date Time | Hole Depth | Water Level
18/06/24 16:35 | 9.45m | 3.50 m bgl
19/06/24 07:35 | 9.45m | 3.50 m bgl
20/06/24 10:00 | 30.00m | 3.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **67 Finch Street**
Project Reference: **521290-064**

BH21

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hanjin D&B-10D
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1754694.30m
Northing: 5918287.43m
Ground level: 16.38m (NZVD2016)

Date started: 19/06/2024
Date completed: 20/06/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	6			EWs	**9.95m to 10m:**...siltstone. **9m:** Highly weathered, light grey, silty fine SANDSTONE; extremely weak. Poorly cemented. (Fine SAND with minor silt) **10.05m:** poorly cemented **10.07m to 10.14m:**...siltstone. **10.18m to 10.23m:**...sandy SILT.	HW		100	62	0		**9.97m to 10.04m:** disseminated black carbonaceous material. 10.05m: JT 60° Pl, Ro, Cl	
SPT					**10.3m:** Moderately weathered, light grey, fine to medium SANDSTONE; extremely weak. Moderately cemented. [MODERATELY WEATHERED ECBF]		10.5m: SPT 3,5// 8,11,17,14 for 60mm N = 50+	100				**10.3m: EAST COAST BAY FORMATION**	
HQ3	5	11			**10.94m to 11.24m:**...poorly cemented			100	62	20		10.94m: Switched from extended nozzle back to normal catcher at 10.95. **11m to 11.1m:** ES BH21_11.00-11.10m **11.15m:** black carbonaceous material, inclined 10°. **11.46m to 11.48m:** black carbonaceous material, thinly laminated, inclined 20°. **11.5m to 11.8m:** steep veins (70-80°), anastamosing.	
SPT	4	12			**11.7m to 11.75m:**...poorly cemented **11.75m to 11.83m:**...poorly cemented. **11.88m to 11.93m:**...siltstone.		12m: SPT 6,10// 13,16,17,4 for 10mm N = 50+	100				**11.83m to 11.85m:** black carbonaceous material, thinly laminated, inclined 10°. 11.90m: JT 20° Pl, Ro, Cl	
HQ3	3	13		EWs	**12.46m to 13.3m:**...poorly cemented.	MW		100	46	0		12.41m: JT 50° Pl, Ro, Cl **12.51m to 12.55m:** black carbonaceous material, thinly laminated, inclined 10°.	
HQ3	2	14			**13.65m to 13.75m:**...poorly cemented			100	93	0		14.25m: JT 60° Sm, Cl 14.25m to 14.37m: JT 55° Pl, Ro, Cl 14.25m: JT 60° Sm, Cl 14.25m to 14.37m: JT 55° Pl, Ro, Cl 14.25m: JT 60° Sm, Cl 14.50m: JI 80° fault?	
		15											

Box 2
Box 3

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum excavation completed to 4.0m bGL due to a 1200mm diameter stormwater pipe within 1.0m of the borehole location, at a depth of 3.5m bGL.
3) Geophysical profiling undertaken downhole on 20/06/2024, comprising an Optical and Acoustic Televiewer.
4) ES = Environmental Sample.
5) BH49 backfilled on completion of drilling.

Hand Shear Vane Serial No: DR4940 Correction Factor: 1.678

Water Level Readings:
Date Time | Hole Depth | Water Level
18/06/24 16:35 | 9.45m | 3.50 m bgl
19/06/24 07:35 | 9.45m | 3.50 m bgl
20/06/24 10:00 | 30.00m | 3.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **67 Finch Street**
Project Reference: **521290-064**

BH21

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hanjin D&B-10D
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1754694.30m
Northing: 5918287.43m
Ground level: 16.38m (NZVD2016)

Date started: 19/06/2024
Date completed: 20/06/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	1			EWs	**10.3m:** Moderately weathered, light grey, fine to medium SANDSTONE; extremely weak. Moderately cemented. [MODERATELY WEATHERED ECBF]							**14.97m to 15m:** disseminated black carbonaceous material. **15.1m:** black carbonaceous material, thinly laminated, inclined 5°.	
					15.5m to 15.7m:...poorly cemented.								
								100	100	0		**15.71m:** black carbonaceous material, thinly laminated, inclined 5°.	
		16			**15.89m to 15.93m:**...silty SAND.								
					16.05m to 16.15m:...poorly cemented.	MW							
	0											**16.4m to 16.5m:** ES BH21_16.40-16.50m	
HQ3					**16.63m to 16.65m:**...clayey SILT, infilling at joint.							16.63m: JT 30° infilled	
		17			**16.9m to 17.1m:**...poorly cemented								
					17.05m to 17.1m:...poorly cemented.								
	-1			EUs2	**17.23m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. [SLIGHTLY WEATHERED ECBF]	SW		93	73	73		**17.23m: East Coast Bays Formation**	
					17.7m to 17.8m:...poorly cemented.								
		18		EUx	**17.9m:** CORE LOSS.								
HQ3				EUs2	**18m:** Slightly weathered, light grey, fine to medium SANDSTONE; very weak. Moderately cemented.							18m: Cased to 10m at 19.5m bGL.	
					18.15m to 18.3m:...poorly cemented								
	-2				**18.33m to 18.43m:**...<1mm interbeds of clayey SILT.							**18.45m to 18.49m:** black carbonaceous material, thinly laminated, inclined 5°.	
								100	66	66			
					18.76m to 18.82m:...poorly cemented.							18.82m: BPJT 70° Un, Ro, Cl	
		19			**18.9m to 18.97m:**...clayey SILT with relict siltstone clasts.								
					18.98m to 19.02m:...sandy SILT. **19m to 19.15m:**...poorly cemented **19.05m to 19.55m:**...poorly cemented.	SW						19.00m: JT 25° Pl, Ro, Cl, (Infill: clayey SILT Very stiff 20mm)	
	-3												
					19.5m to 19.6m:...poorly cemented							19.5m: Cased to 13m at 21m bGL. 19.55m to 19.74m: JT 70° Pl, Ro, Cl	
HQ3					**19.7m to 19.8m:**...interbeds of laminated siltstone.			100	87	75		**19.67m to 19.68m:** disseminated black carbonaceous material.	
		20										19.82m: JI 60°	

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum excavation completed to 4.0m bGL due to a 1200mm diameter stormwater pipe within 1.0m of the borehole location, at a depth of 3.5m bGL.
3) Geophysical profiling undertaken downhole on 20/06/2024, comprising an Optical and Acoustic Televiewer.
4) ES = Environmental Sample.
5) BH49 backfilled on completion of drilling.

Hand Shear Vane Serial No: DR4940 Correction Factor: 1.678

Water Level Readings:
Date Time | Hole Depth | Water Level
18/06/24 16:35 | 9.45m | 3.50 m bgl
19/06/24 07:35 | 9.45m | 3.50 m bgl
20/06/24 10:00 | 30.00m | 3.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **67 Finch Street**
Project Reference: **521290-064**

BH21

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hanjin D&B-10D
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1754694.30m
Northing: 5918287.43m
Ground level: 16.38m (NZVD2016)

Date started: 19/06/2024
Date completed: 20/06/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-4	21		EUs2	**18m:** Slightly weathered, light grey, fine to medium SANDSTONE; very weak. Moderately cemented. **20.45m to 20.5m:**...poorly cemented. **21.23m to 21.25m:**...coarse sandstone.	SW		100	87	75		19.97m: JT 10° Un, Ro, Cl 20.10m: JT 20° Pl, Sm, Cl 20.12m: BP 20° **20.2m to 20.25m:** disseminated black carbonaceous material. **20.3m to 20.35m:** disseminated black carbonaceous material. 20.43m: JT 25° Pl, Ro, Cl 20.48m: JT 15° St, Ro, Cl **20.66m:** black carbonaceous material, thinly laminated, inclined 25°. 20.66m: BP 25° 20.67m: JT 25° Un, Ro, Cl 20.79m: JT 15° Pl, Ro, Cl 20.82m: JI 10°	
	-5			EUz2	**21.35m:** Slightly weathered, light grey SILTSTONE; very weak.	SW						**21.26m:** black carbonaceous material, thinly laminated, inclined 15°. 21.36m: JT 20° Pl, Ro, Cl 21.40m: JT 10° Pl, Ro, Cl	
HQ3	-6	22		EUs2	**21.53m:** Unweathered, light grey, fine SANDSTONE; very weak. Moderately cemented. Ocassional interbeds of medium sandstone, 20-70mm. [UNWEATHERED ECBF] **21.62m to 21.68m:**...poorly cemented.	UW		96	89	52		21.95m to 22.40m: JT 70° tight fault? 22.19m to 22.26m: JT 60° Pl, Ro, Cl **22.43m to 22.44m:** black carbonaceous material, thinly laminated, inclined 5°. **22.44m to 22.5m:** Core loss 0.06m. 22.5m: Cased to 16m @ 24m bGL.	
	-7	23		EUs2	**22.71m to 22.8m:**...concretion? **22.73m to 22.78m:**...siltstone.			81	78	68		**22.71m to 22.72m:** black carbonaceous material, thinly laminated, inclined 10°. 22.71m: JT 15° Pl, Ro, Cl 22.72m to 22.86m: JT 65° Un, Ro, Cl 22.81m to 22.86m: JI 65° 22.85m: JT 20° Pl, Ro, Cl 22.89m to 22.94m: JI 65° 23.26m: JT 10° Pl, Ro, Cl DI?	
		24		EUx	**23.65m to 23.7m:**...siltstone. **23.72m:** CORE LOSS.								
HQ3	-8	25		EUs2	**24m:** Unweathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **24.01m to 24.03m:**...siltstone. **24.18m to 24.65m:**...coarse sandstone. **24.2m to 24.3m:**...ocassional siltstone clasts, between 5-20mm. **24.54m to 24.57m:**...silty SAND. **24.65m to 25.18m:**...poorly cemented.	UW		79	44	35		24m: Core loss due to poorly cemented sand. 24.25m: JT 30° Un, Ro, Cl 24.27m: JT 30° Un, Ro, Cl 24.30m to 24.38m: JT 50° Pl, Ro, Cl **24.35m to 24.45m:** disseminated black carbonaceous material. **24.59m:** black carbonaceous material, thinly laminated, inclined 10°. **24.68m:** black carbonaceous material, thinly laminated, inclined 40°.	

Box 5
Box 6

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum excavation completed to 4.0m bGL due to a 1200mm diameter stormwater pipe within 1.0m of the borehole location, at a depth of 3.5m bGL.
3) Geophysical profiling undertaken downhole on 20/06/2024, comprising an Optical and Acoustic Televiewer.
4) ES = Environmental Sample.
5) BH49 backfilled on completion of drilling.

Hand Shear Vane Serial No: DR4940 Correction Factor: 1.678

Water Level Readings:
Date Time | Hole Depth | Water Level
18/06/24 16:35 | 9.45m | 3.50 m bgl
19/06/24 07:35 | 9.45m | 3.50 m bgl
20/06/24 10:00 | 30.00m | 3.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **67 Finch Street**
Project Reference: **521290-064**

BH21

Sheet **6** of **6**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hanjin D&B-10D
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1754694.30m
Northing: 5918287.43m
Ground level: 16.38m (NZVD2016)

Date started: 19/06/2024
Date completed: 20/06/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-9			EUs2	**24m:** Unweathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **25m:**...poorly cemented	UW						**25.02m to 25.03m:** black carbonaceous material, thinly laminated, inclined 5°.	
				EUx	**25.18m:** CORE LOSS.			79	44	35		25.23m: JT 40° Pl, Sm, Cl 25.35m: BP 75°	
HQ3	-10	26		EUs2	**25.5m:** Unweathered, grey, medium to coarse SANDSTONE; very weak. Moderately cemented. **25.68m to 25.75m:**...1-2mm interbeds of silty SAND. **25.75m to 25.85m:**...uncemented. **25.95m to 26.1m:**...poorly cemented.	UW		77	69	69		25.5m: Core loss due to poorly cemented sand. 25.59m: JT 25° Un, Ro, Cl **26.32m to 26.38m:** black carbonaceous material, thinly laminated, inclined 75°.	
		27		EUx	**26.65m:** CORE LOSS.								
HQ3	-11			EUs2	**27m:** Unweathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **27.25m to 27.27m:**...siltstone.							27m: Core loss due to poorly cemented sand. **27.27m to 27.29m:** black carbonaceous material, laminated, sub-horizontal.	
	-12	28			**27.85m to 28.5m:**...medium to coarse sandstone.	UW		95	95	95		27.47m: BP 35° 27.60m to 27.73m: BP 80° **28.43m to 28.5m:** Core loss 0.07m.	
HQ3	-13	29			**29m to 30m:**...coarse sandstone, becomes darker grey.			100	100	100		29.19m: BP 25° 29.63m: JT 20° Un, Ro, Cl 29.64m: BP 15° 29.77m: BP 35°	
		30											

REMARKS: End of borehole at 30m (Termination Depth Achieved)
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum excavation completed to 4.0m bGL due to a 1200mm diameter stormwater pipe within 1.0m of the borehole location, at a depth of 3.5m bGL.
3) Geophysical profiling undertaken downhole on 20/06/2024, comprising an Optical and Acoustic Televiewer.
4) ES = Environmental Sample.
5) BH49 backfilled on completion of drilling.

Hand Shear Vane Serial No: DR4940 Correction Factor: 1.678

Water Level Readings:
Date Time | Hole Depth | Water Level
18/06/24 16:35 | 9.45m | 3.50 m bgl
19/06/24 07:35 | 9.45m | 3.50 m bgl
20/06/24 10:00 | 30.00m | 3.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Finch Street - Berm outside 1 Levonia Street**
Project Reference: **521290-064**

BH22

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754685.77m
Northing: 5918270.02m
Ground level: 18.30m (NZVD2016)

Date started: 23/05/2024
Date completed: 24/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	18	1		Fc	**0m:** Sandy SILT with minor gravel; brown. Sand is fine to medium. Gravel is coarse sub-angular basalt, 20mm-80mm. Minor rootlets. [FILL]	MI-SP						**0m: FILL** **0.2m to 0.3m:** ES BH22_0.2-0.3	
					0.3m: CLAY; brown.	CH							
	17				**0.6m:** CLAY; light brown. Stiff, moist, high plasticity. Minor rootlets.	CH						**0.6m:** ES BH22_0.6	
	16	2			**1.9m:** Silty fine to medium SAND with minor gravel; brown. Moist.	SM		0					
	15	3		TAc	**2.8m:** Not observed. Thought to be silty CLAY. [UNDIFFERENTIATED ALLUVIUM]							**2.8m: TAURANGA GROUP ALLUVIUM** **2.8m:** Possible Tauranga Group??	
HQ3	14	4			**4m:** Silty CLAY with trace sand; light grey. Stiff, moist, high plasticity.	ML		100				4m: Picked up 0.5m, suspect due to swelling of Tauranga clay	
SPT		5			**4.5m:** Sandy CLAY with some silt minor black fibrous organics; light yellowish grey. Very stiff, moist, high plasticity. Disseminated black fibrous organics up to 30mm (wood fragments). Sand is fine to medium.		4.5m: IBHSV=110/44kPa 4.5m: SPT 1,1// 1,2,2,2 N = 7	100					
								100					

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum Excavated to 4m to due to potentail 1918 cast iron sewer pipe running through the site.
3) ES refers to environmental sample.
4) Vibrating wire piezometer (VWP) were installed at 18.5 m bgl (BH22_PZ01) and 22m bgl (BH22_PZ02). S/N: 366162 and 364111.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
23/05/24 15:52 | 18.38m | 3.00 m bgl
24/05/24 08:00 | 18.38m | 2.70 m bgl
24/05/24 12:18 | 30.00m | 2.13 m bgl

Box 1

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Finch Street - Berm outside 1 Levonia Street**
Project Reference: **521290-064**

BH22

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754685.77m
Northing: 5918270.02m
Ground level: 18.30m (NZVD2016)

Date started: 23/05/2024
Date completed: 24/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	13	6		TAc	**4.5m:** Sandy CLAY with some silt minor black fibrous organics; light yellowish grey. Very stiff, moist, high plasticity. Disseminated black fibrous organics up to 30mm (wood fragments). Sand is fine to medium.	CL		100					
U54	12			TAx	**6m:** PUSH TUBE. **6.01m to 6.5m:**...Sandy CLAY with minor black fibrous organics; light grey. Very stiff, slightly moist, moderately plastic. Sand is fine.		6m: IBHSV=73/23kPa	100					
SPT		7		TAs	**6.5m:** Silty fine to medium SAND; grey. Stiff, moist. Minor wood organics.	SW-SM	6.5m: SPT 2,2// 2,3,6,5 N = 16	100				**6.7m:** Residual ECBF soils? No relict siltstone or sandstone fabric	
HQ3	11							100					
SPT		8		ERs	**7.4m:** Fine to medium SAND with some silt; light grey. Medium dense, moist. [RESIDUAL SOILS ECBF] **7.5m:**...Trace disseminated black carbonaceous material 1mm.	SW.	7.5m: IBHSV=UTP 7.5m: SPT 3,3// 6,6,8,10 N = 30	93				**7.4m: EAST COAST BAY FORMATION**	
HQ3	10			EWs	**7.95m:** Highly weathered, grey, silty fine SANDSTONE; extremely weak. Poorly cemented. (Silty fine SAND). **8.55m to 8.65m:**...Sandy SILTSTONE.	HW		100	0	0			
SPT	9	9			**9.25m to 9.3m:**...Sandy SILTSTONE.		9m: SPT 4,5// 5,7,9,10 N = 31	100					
HQ3		10			**9.65m to 9.75m:**...Sandy SILTSTONE.			62	29	29			

Box 1
Box 2

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum Excavated to 4m to due to potentail 1918 cast iron sewer pipe running through the site.
3) ES refers to environmental sample.
4) Vibrating wire piezometer (VWP) were installed at 18.5 m bgl (BH22_PZ01) and 22m bgl (BH22_PZ02). S/N: 366162 and 364111.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
23/05/24 15:52 | 18.38m | 3.00 m bgl
24/05/24 08:00 | 18.38m | 2.70 m bgl
24/05/24 12:18 | 30.00m | 2.13 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Finch Street - Berm outside 1 Levonia Street**
Project Reference: **521290-064**

BH22

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754685.77m
Northing: 5918270.02m
Ground level: 18.30m (NZVD2016)

Date started: 23/05/2024
Date completed: 24/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	8			EWx	**10.1m:** CORE LOSS.	HW		62	29	29		**10.1m to 10.5m:** Core loss due to cohesiveness of sand	
SPT		11		EWs	**10.4m:** Highly weathered, grey, fine to medium SANDSTONE with some silt; extremely weak. Uncemented. (Fine to medium SAND with some silt). **10.5m to 10.6m:**...SILTSTONE.	HW	10.5m: SPT 4,6// 10,10,12,11 N = 43	78					
HQ3	7			EWx	**11.35m:** CORE LOSS.			38	0	0		**11.35m to 12m:** Core loss due to cohesiveness of sand	
SPT	6	12		EWs	**12m:** Highly weathered, grey, fine to medium SANDSTONE; extremely weak. Uncemented. (Fine to medium SAND with some silt).	HW	12m: SPT 5,7// 9,11,12,14 N = 46	89					
HQ3	5	13		EWx	**12.6m:**...Very thin layer of black carbonaceous material, 10mm. **12.77m to 12.8m:**...SILTSTONE. **12.8m to 13.05m:**...Very weak. **13.05m:** CORE LOSS.	HW		40	0	0		**13.05m to 13.5m:** Core loss due to cohesiveness of sand	
SPT		14		EWs	**13.5m:** Moderately weathered, grey, silty fine to medium SANDSTONE; extremely weak. Poorly cemented. (Silty fine to medium SAND). **13.7m:**...Trace black carbonaceous material disseminated throughout, 1mm.		13.5m: SPT 8,11// 11,14,16,9 for 30mm N = 50+	91					
HQ3	4					MW		92	64	64			
		15										**14.91m to 15m:** Drilling induced core loss	

Box 2
Box 3

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum Excavated to 4m to due to potentail 1918 cast iron sewer pipe running through the site.
3) ES refers to environmental sample.
4) Vibrating wire piezometer (VWP) were installed at 18.5 m bgl (BH22_PZ01) and 22m bgl (BH22_PZ02). S/N: 366162 and 364111.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
23/05/24 15:52 | 18.38m | 3.00 m bgl
24/05/24 08:00 | 18.38m | 2.70 m bgl
24/05/24 12:18 | 30.00m | 2.13 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Finch Street - Berm outside 1 Levonia Street**
Project Reference: **521290-064**

BH22

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754685.77m
Northing: 5918270.02m
Ground level: 18.30m (NZVD2016)

Date started: 23/05/2024
Date completed: 24/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPTC	3			EWs	**13.5m:** Moderately weathered, grey, silty fine to medium SANDSTONE; extremely weak. Poorly cemented. (Silty fine to medium SAND).	MW	15m: SPTC 7,11// 15,16,17,2 for 15mm N = 50+	N/A	N/A	N/A			
HQ3		16		EUz2	**15.9m:** Slightly weathered, grey, SILTSTONE; very weak. **16.05m:**...Horizontal bedding of SANDSTONE up to 5mm thick.	SW		95	63	56		15.87m: JT 45° Pl, Sm, Cl 15.99m: JT 50° Pl, Ro, Cl 16.03m: JT 45° Pl, Ro, Cl 16.09m: JT 40° Pl, Ro, Cl	
	2												
SPTC							16.5m: SPTC 6,15// 43,47,75 N = 50+	N/A	N/A	N/A			
HQ3		17		EUs2	**16.88m:** Slightly weathered, grey, fine SANDSTONE; very weak. Moderately cemented. **17.35m to 17.5m:**...SILTSTONE, moderately cemented.	SW		93	76	71		17.15m: JT 20° Pl, Sm, Cl 17.55m: JT 30° Pl, Sm, Cl 17.60m: JT 40° Pl, Sm, Cl 17.62m: JT 70° Sm, Cl	
	1												
		18		EUx	**17.84m:** CORE LOSS.		18m: SPTC 11,30// 30,20,55 N = 50+					**17.84m to 18m:** Core loss due to cohesiveness of sand 17.86m: JT 80° Pl, Ro, Cl	
SPTC	0							N/A	N/A	N/A			
HQ3		19		EUi2	**18.38m:** Interbedded SILTSTONE and SANDSTONE; very weak. SILTSTONE (50%) is unweathered, grey. Fine to medium SANDSTONE (50%) is slightly weathered, grey, moderately cemented. Moderately thin bedding, very close spacing, moderately inclined (20°) bedding. 1mm black carbonaceous bedding on boundary of siltstone and sandstone. **18.58m to 18.73m:**...poorly cemented.	UW		100	91	91		18.58m: JT 85° Pl, Sm, Cl 19.02m: JT 70° Pl, Sm, Cl	
	-1												
HQ3								93	91	76		19.57m: JT 60° Pl, Sm, Cl 19.74m: JT 40° Pl, Ro, Cl 19.90m: JT 90° Pl, Ro, Cl	
		20											

Box 3
Box 4

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum Excavated to 4m to due to potentail 1918 cast iron sewer pipe running through the site.
3) ES refers to environmental sample.
4) Vibrating wire piezometer (VWP) were installed at 18.5 m bgl (BH22_PZ01) and 22m bgl (BH22_PZ02). S/N: 366162 and 364111.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
23/05/24 15:52 | 18.38m | 3.00 m bgl
24/05/24 08:00 | 18.38m | 2.70 m bgl
24/05/24 12:18 | 30.00m | 2.13 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Finch Street - Berm outside 1 Levonia Street**
Project Reference: **521290-064**

BH22

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754685.77m
Northing: 5918270.02m
Ground level: 18.30m (NZVD2016)

Date started: 23/05/2024
Date completed: 24/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-2	21		EUi2	**18.38m:** Interbedded SILTSTONE and SANDSTONE; very weak. SILTSTONE (50%) is unweathered, grey. Fine to medium SANDSTONE (50%) is slightly weathered, grey, moderately cemented. Moderately thin bedding, very close spacing, moderately inclined (20°) bedding. 1mm black carbonaceous bedding on boundary of siltstone and sandstone.			93	91	76			
					20.7m to 20.85m:...Fine to medium SANDSTONE; weak. Moderately cemented.								
					20.95m to 21.22m:...SILTSTONE; weak.								
HQ3	-3	22		EUi2		UW		100	95	95		21.22m: JT 20° Pl, Ro, Cl 21.81m: JT 20° Pl, Sm, Cl 21.95m: JT 20° Pl, Sm, Cl	
	-4											22.20m: JT 20° Pl, Sm, Cl	
HQ3	-5	23		EUi2	**22.8m to 22.9m:**...poorly cemented.			87	83	23		22.74m: JT 40° Pl, Sm, Cl 22.92m: JT 40° Pl, Ro, Cl	
					23.07m to 23.4m:...poorly cemented.							**23m to 27m:** Core highly disturbed due to being extremely weak and removal from splits and handling 23.10m to 23.40m: JT	
				EUs1	**23.5m:** Unweathered, grey, fine to medium SANDSTONE; extremely weak. Poorly cemented. (Fine to medium SAND).	UW							
					23.7m to 23.75m:...Black carbonaceous decomposed wood fragments.								
		24		EUx	**23.8m:** CORE LOSS							**23.8m to 24m:** Core loss due to cohesiveness of sand?	
HQ3	-6			EUs1	**24m:** Unweathered, grey, fine to medium SANDSTONE; extremely weak. Poorly cemented.(Fine to medium SAND).	UW							
		25		EUx	**24.5m:** CORE LOSS			26	0	0		**24.5m to 25.5m:** Core loss due to cohesiveness of sand	

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum Excavated to 4m to due to potentail 1918 cast iron sewer pipe running through the site.
3) ES refers to environmental sample.
4) Vibrating wire piezometer (VWP) were installed at 18.5 m bgl (BH22_PZ01) and 22m bgl (BH22_PZ02). S/N: 366162 and 364111.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
23/05/24 15:52 | 18.38m | 3.00 m bgl
24/05/24 08:00 | 18.38m | 2.70 m bgl
24/05/24 12:18 | 30.00m | 2.13 m bgl

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Client: **Watercare Services Ltd**
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Location: **Finch Street - Berm outside 1 Levonia Street**
Project Reference: **521290-064**

BH22

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754685.77m
Northing: 5918270.02m
Ground level: 18.30m (NZVD2016)

Date started: 23/05/2024
Date completed: 24/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-7			EUx	**24.5m:** CORE LOSS			26	0	0			
HQ3	-8	26		EUs1	**25.5m:** Unweathered, grey, fine to medium SANDSTONE; extremely weak. Poorly cemented. (Fine to medium SAND). **25.56m to 25.72m:**...SILTSTONE. **25.69m to 25.88m:**...Trace black carbonaceous material disseminated throughout, 1mm width. **25.72m to 25.91m:**...Coarse SANDSTONE; very weak. Well cemented.	UW		26	0	0			
HQ3		27		EUx	**26.6m:** CORE LOSS								
HQ3	-9			EUs1	**27m:** Unweathered, grey, fine to medium SANDSTONE; extremely weak. Poorly cemented. (Fine to medium SAND).	UW							
HQ3	-10	28		EUx	**27.75m:** CORE LOSS			50	13	13		**27.75m to 28.5m:** Core loss due to cohesiveness of sand	
HQ3	-11	29		EUs2	**28.5m:** Unweathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **29.1m to 30m:**...Dissemenated 1mm clasts of silt and 1mm black carbonaceous material.	UW		100	53	53		28.74m: JT 30° Pl, Sm, Cl 29.19m: JT 85° Pl, Sm, Cl 29.25m: JT 50° Pl, Sm, Cl 29.46m to 29.54m: JT 80° Pl, Sm, Cl 29.74m: JT 60° Pl, Sm, Cl 29.80m: JT 60° Pl, Ro, Cl	
		30											

Box 6
Box 7

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum Excavated to 4m to due to potentail 1918 cast iron sewer pipe running through the site.
3) ES refers to environmental sample.
4) Vibrating wire piezometer (VWP) were installed at 18.5 m bgl (BH22_PZ01) and 22m bgl (BH22_PZ02). S/N: 366162 and 364111.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
23/05/24 15:52 | 18.38m | 3.00 m bgl
24/05/24 08:00 | 18.38m | 2.70 m bgl
24/05/24 12:18 | 30.00m | 2.13 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Finch Street - Berm outside 1 Levonia Street**
Project Reference: **521290-064**

BH22

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1754685.77m	Date started:	23/05/2024	Logged by:	AP
Equipment:	Massenza MM3	Northing:	5918270.02m	Date completed:	24/05/2024	Input by:	AP
Contractor:	McMillan Drilling NI Ltd	Ground level:	18.30m (NZVD2016)	Inclination:	-90°	Checked by:	PK
				Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS, WS, MWS, CS, VCS, ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPTC				EUs2	**28.5m:** Unweathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	UW	30m: SPTC 14,30// 50 for 45mm N = 50+	N/A	N/A	N/A		**30m to 30.2m:** SPTc was done to confirm strength at this depth due to poorly cemented sand.	
					End of borehole at 30.2m (Termination Depth Achieved)								

Box 7

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Vacuum Excavated to 4m to due to potentail 1918 cast iron sewer pipe running through the site.
3) ES refers to environmental sample.
4) Vibrating wire piezometer (VWP) were installed at 18.5 m bgl (BH22_PZ01) and 22m bgl (BH22_PZ02). S/N: 366162 and 364111.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
23/05/24 15:52 | 18.38m | 3.00 m bgl
24/05/24 08:00 | 18.38m | 2.70 m bgl
24/05/24 12:18 | 30.00m | 2.13 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **19 Myrtle Street**
Project Reference: **521290-064**

BH25

Sheet **1** of **6**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillans (NI) LTD

CO-ORDINATES: NZTM2000
Easting: 1754337.00m
Northing: 5918306.62m
Ground level: 13.52m (NZVD2016)

Date started: 2/09/2024
Date completed: 3/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: SMG
Input by: SMG
Checked by:
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy / Defect Description / Additional Notes	Installation
VACEX	13	1		T	**0m:** SILT with some clay and some organics; dark brown. Firm, moist, low plasticity. Organics are fibrous rootlets. [TOPSOIL]	ML							**0m: FILL**	
					0.15m: Silty fine to coarse SAND with some gravel and minor cobbles; dark blackish brown. Loosely packed, dry. Gravel/cobbles are slightly weathered, medium to coarse basalt and asphalt road millings. [FILL]	SM GW-GM							
				Fg	**0.3m:** Silty fine to coarse GRAVEL with minor cobbles and trace clay; brown & yellow. Loosely packed, dry. Gravel/cobbles are slightly weathered basalt. **0.5m:** Silty CLAY with minor gravel & cobbles; brown and yellow. Very stiff, moist, high plasticity. Gravel/cobbles are asphalt road millings.	CH	0.6m: ISHSV=195/58kPa 1m: ISHSV=150/65kPa	100					
SPT	12	2		TAc	**1.35m:** Silty CLAY with trace organics; orangey brown. Very stiff, moist, high plasticity. Organics are woody fragments [UNDIFFERENTIATED ALLUVIUM]	CH	1.5m: ISHSV=133/36kPa 1.5m: SPT 0,0// 1,1,1,1 N = 4	100				**1.35m: TAURANGA GROUP ALLUVIUM**	
HQ3	11	3			**2m:**...Light grey.		3m: IBHSV=36/16kPa	100					
SPT				TAz TAc	**3.1m:** Sandy SILT with some clay, grey mottled orange. Firm, moist, high plasticity. **3.18m:** Sandy CLAY; light grey. Firm moist, high plasticity.	MH CH	3m: SPT 0,0// 0,0,1,1 N = 2 3.1m: IBHSV=36/29kPa	100					
HQ3	10	4		ERs	**3.35m:** Silty medium to coarse SAND with minor clay; grey. Loose, moist, low plasticity. [RESIDUAL SOIL ECBF] **3.75m to 3.85m:**...Iron oxide staining.	SM		87				**3.35m: EAST COAST BAYS FORMATION**	
					3.98m: Fine to medium SAND; grey. Medium dense, moist.	SP							
	9			ERx	**4.35m:** CORE LOSS.								
SPT		5		ERs	**4.5m:** Silty medium to coarse SAND; grey. Medium dense, moist. **4.75m:**...Yellowish brown.		4.5m: SPT 1,1// 2,3,2,3 N = 10	100 73					

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 1.12cm and vertical accuracy of 1.4cm.
2) A Standpipe was installed (BH25_SP01) with a screening interval from 4 mbgl to 6 mbgl
3) ISHSV = In-situ Hand Shear Vane
4) IBHSV = In-barrel Hand Shear Vane

Hand Shear Vane Serial No: 2006 Correction Factor: 1.622

Water Level Readings:
Date Time | Hole Depth | Water Level
29/08/24 07:30 | 1.50m | 1.50 m bgl
29/08/24 15:45 | 22.50m | 2.50 m bgl
02/09/24 07:30 | 22.50m | 1.40 m bgl

Box 1

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **19 Myrtle Street**
Project Reference: **521290-064**

BH25

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillans (NI) LTD

CO-ORDINATES: NZTM2000
Easting: 1754337.00m
Northing: 5918306.62m
Ground level: 13.52m (NZVD2016)

Date started: 2/09/2024
Date completed: 3/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: SMG
Input by: SMG
Checked by:
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 1 HQ3	8			ERs	**4.5m:** Silty medium to coarse SAND; grey. Medium dense, moist.	SP-SM		73					
				ERx	**5.6m:** CORE LOSS.								
	6												
SPT				ERs	**6m:** Fine to coarse SAND with minor silt; grey. Medium dense, moist. [COMPLETELY WEATHERED ECBF]		6m: SPT 1,2// 3,4,2,4 N = 13	100					
	7												
Box 2 HQ3		7				CW		100					
	6			EWs	**7.2m:** Highly weathered, grey, fine to medium SANDSTONE; Extremely weak, poorly cemented (fine to medium SAND. Medium dense).		7.5m: SPT 3,4// 5,7,9,12 N = 33	100				7.45m: JT 45° Pl, Ro, Cl	
SPT													
	8												
HQ3	5				**8.71m to 10.3m:**...Coarse SANDSTONE.	HW		100				8.72m: BPJT 5° Pl, Sm, Cl 8.95m: JT 3° Pl, Ro 9.05m: JT 5° Un, Ro	
	9						9m: SPTC 5,7// 10,10,11,16 N = 47	N/A	N/A	N/A			
Box 3 SPTC	4				**9.45m:** Highly weathered, grey, fine to medium SANDSTONE; Extremely weak, poorly cemented (fine to medium SAND. Dense)	HW		100					
HQ3		10										9.90m to 10.05m: JT 70° Pl, Ro	

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 1.12cm and vertical accuracy of 1.4cm.
2) A Standpipe was installed (BH25_SP01) with a screening interval from 4 mbgl to 6 mbgl
3) ISHSV = In-situ Hand Shear Vane
4) IBHSV = In-barrel Hand Shear Vane

Hand Shear Vane Serial No: 2006 Correction Factor: 1.622

Water Level Readings:
Date Time | Hole Depth | Water Level
29/08/24 07:30 | 1.50m | 1.50 m bgl
29/08/24 15:45 | 22.50m | 2.50 m bgl
02/09/24 07:30 | 22.50m | 1.40 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **19 Myrtle Street**
Project Reference: **521290-064**

BH25

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillans (NI) LTD

CO-ORDINATES: NZTM2000
Easting: 1754337.00m
Northing: 5918306.62m
Ground level: 13.52m (NZVD2016)

Date started: 2/09/2024
Date completed: 3/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: SMG
Input by: SMG
Checked by:
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	3	11		EWs	**9.45m:** Highly weathered, grey, fine to medium SANDSTONE; Extremely weak, poorly cemented (fine to medium SAND. Dense)	HW		100				10.25m: JT 60° Pl, Ro 10.35m: JT 55° Pl, Ro	
SPTC				EWz	**10.4m:** Highly weathered, grey SILTSTONE; Extremely weak.	HW	10.5m: SPTC 5,10// 12,12,12,13 N = 49	N/A	N/A	N/A			
HQ3	2			EWs	**11.15m:** Highly weathered, grey, fine to medium SANDSTONE; Extremely weak, poorly cemented. **11.55m:**...Extremely weak.	HW		86				11.2m: Core broken when retrieved from splits 11.55m: Core broken when retrieved from splits	
	12			EWx	**11.85m:** CORELOSS								
SPT					**12m:** Moderatley weathered, grey, fine to medium SANDSTONE; Extremely weak, poorly cemented.		12m: SPT 6,11// 23,10 for 30mm N = 50+	100	100	100			
HQ3	1	13		EWs		MW		100	100	89		12.32m: SPT stopped early - Incorrect reading 12.68m: JT 5° Pl, Sm, Cl 13.15m: BPJT 2° Pl, Ro, Cl 13.20m: BPJT 2° Pl, Sm, Cl 13.28m: BPJT 2° Pl, Sm, Cl	
SPT	0						13.5m: SPT 14,23// 50 for 74mm N = 50+	100	100			13.48m: BPJT 5° Pl, Ro, Cl	
HQ3	-1	14			**14.03m to 14.11m:**...SILTSTONE			100	100	100		14.10m: JT 8° Pl, Ro	
		15		EWz	**14.65m:** Moderatley weathered, grey, SILTSTONE; Extremely weak. Contains disseminated black carbonaceous material.	MW						14.65m: BPJT 15° Pl, Ro 14.78m: BPJT 2° Pl, Ro	

Box 3
Box 4

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 1.12cm and vertical accuracy of 1.4cm.
2) A Standpipe was installed (BH25_SP01) with a screening interval from 4 mbgl to 6 mbgl
3) ISHSV = In-situ Hand Shear Vane
4) IBHSV = In-barrel Hand Shear Vane

Hand Shear Vane Serial No: 2006 Correction Factor: 1.622

Water Level Readings:
Date Time | Hole Depth | Water Level
29/08/24 07:30 | 1.50m | 1.50 m bgl
29/08/24 15:45 | 22.50m | 2.50 m bgl
02/09/24 07:30 | 22.50m | 1.40 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **19 Myrtle Street**
Project Reference: **521290-064**

BH25

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillans (NI) LTD

CO-ORDINATES: NZTM2000
Easting: 1754337.00m
Northing: 5918306.62m
Ground level: 13.52m (NZVD2016)

Date started: 2/09/2024
Date completed: 3/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: SMG
Input by: SMG
Checked by:
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPTC				EWz		MW	15m: SPTC 19,31// for 65mm N = 50+	N/A	N/A	N/A			
HQ3 Box 4	-2	16		EWs	**15.14m:** Moderatley weathered, grey, fine SANDSTONE; Extremely weak. **15.39m to 15.49m:**...SILTSTONE **15.65m:**...Poorly cemented	MW							
HQ3 Box 4	-3	16		EWx	**15.74m:** CORELOSS			44	32	32			
HQ3 Box 5	-4	17		EWs	**16.5m:** Moderatley weathered, grey, fine SANDSTONE; Extremely weak. **16.75m to 17.15m:**...poorly cemented.	MW						16.70m: DB 60° Pl, Ro, Core disturbed when retrieved splits. 16.90m: DB 64° Pl, Ro, Core disturbed when retrieved splits.	
HQ3 Box 5	-5	18		EUs2	**17.2m:** Slightly weathered, grey, fine SANDSTONE; Very weak, moderately cemeemented. **17.4m to 17.8m:**...poorly cemented.	SW		100	47	47			
HQ3 Box 5	-6	19		EUs2	**19.2m to 19.5m:**...SILTSTONE	SW		100	96	96		18m: Minor disseminated black carbonaceous material **18m to 18.15m:** Minor disseminated black carbonaceous material **18m to 18.15m:** Minor disseminated black carbonaceous material 18.05m: BPJT 2° Pl, Ro, Cl 18.15m: BPJT 5° Pl, Sm, Cl 18.35m: BPJT 2° Pl, Sm, Cl 18.41m: BPJT 2° Pl, Sm, Cl 19.15m: BPJT 2° Pl, Sm, Cl 19.2m: Minor disseminated black carbonaceous material **19.2m to 19.4m:** Minor disseminated black carbonaceous material 19.45m: JT 10° Pl, Sm, Cl	
HQ3 Box 6		20		EUl2	**19.5m:** Slighlty weathered, grey, interbedded SANDSTONE/SILTSTONE; Very weak. Bedding is moderately thin (80 mm), sub-horizontal. Sandstone (55%) is fine to medium, poorly cemented and SILTSTONE (45%). **19.75m to 19.95m:**...poorly cemented.	SW		100	65	65			

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 1.12cm and vertical accuracy of 1.4cm.
2) A Standpipe was installed (BH25_SP01) with a screening interval from 4 mbgl to 6 mbgl
3) ISHSV = In-situ Hand Shear Vane
4) IBHSV = In-barrel Hand Shear Vane

Hand Shear Vane Serial No: 2006 Correction Factor: 1.622

Water Level Readings:
Date Time | Hole Depth | Water Level
29/08/24 07:30 | 1.50m | 1.50 m bgl
29/08/24 15:45 | 22.50m | 2.50 m bgl
02/09/24 07:30 | 22.50m | 1.40 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **19 Myrtle Street**
Project Reference: **521290-064**

BH25

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillans (NI) LTD

CO-ORDINATES: NZTM2000
Easting: 1754337.00m
Northing: 5918306.62m
Ground level: 13.52m (NZVD2016)

Date started: 2/09/2024
Date completed: 3/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: SMG
Input by: SMG
Checked by:
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-7	21		EUi2	**19.5m:** Slighlty weathered, grey, interbedded SANDSTONE/SILTSTONE; Very weak. Bedding is moderately thin (80 mm), sub-horizontal. Sandstone (55%) is fine to medium, poorly cemented and SILTSTONE (45%). **20.25m to 20.5m:**...poorly cemented.	SW		100	65	65		19.95m to 20.10m: JT 75° Pl, Ro 20.00m to 20.10m: JT 65° Pl, Ro, Core disturbed when retrieved splits. Suspect intersecting joints, dip angle approximate. 20.25m to 20.50m: Core disturbed when retrieved splits. Suspect intersecting joints, unkown orientation 20.75m: DI 2° Pl, Ro, Drilling induced defect	
HQ3	-8	22		EUi2				100	86	86		21.10m: DI 2° Pl, Ro, Drilling induced defect 21.15m: DI 2° Pl, Ro, Drilling induced defect 21.20m to 21.22m: BPJT 2° Pl, Ro 21.30m to 21.32m: BPJT 5° Un, Ro 21.45m: JI 4° Un, Ro 21.50m to 21.53m: JI 2° Pl, Ro 21.58m to 21.61m: BPJT 7° Pl, Ro 21.65m: DI 2° Pl, Ro, Drilling induced defect 21.72m: JI 2° Pl, Ro 21.75m: JI 2° Pl, Ro 21.85m: JT 3° Pl, Ro 21.90m: BP 3° Pl, Ro	
HQ3	-9	23		EUs2	**22.1m:** Slightly weathered, grey, fine SANDSTONE; Very weak, moderately cemented. **22.6m to 23.1m:**...Coarse SANDSTONE	SW		100	90	90		22.10m to 22.13m: DI 2° Pl, Ro, Drilling induced defect 22.40m: JT 5° Pl, Ro 22.70m: JT 1° Pl, Ro 23.13m: JI 2° Pl, Ro 23.16m: JI 2° Pl, Ro	
HQ3	-10	24		EUs2	**23.4m to 24.1m:**...Coarse SANDSTONE	SW						23.40m: JI 2° Pl, Ro, Drilling induced defect 23.43m: JT 4° Pl, Ro 23.55m: BPJT 4° Pl, Ro	
HQ3	-11	25		EUs2	**24.67m to 24.77m:**...SILTSTONE **24.92m to 24.97m:**...poorly cemented.	SW		100	95	95		**24.15m to 25.3m:** Minor disseminated black carbonaceous material 24.33m to 24.35m: BPJT 2° Pl, Sm, Cl 24.65m: BPJT 2° Pl, Sm, Cl	

Box 6
Box 7

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 1.12cm and vertical accuracy of 1.4cm.
2) A Standpipe was installed (BH25_SP01) with a screening interval from 4 mbgl to 6 mbgl
3) ISHSV = In-situ Hand Shear Vane
4) IBHSV = In-barrel Hand Shear Vane

Hand Shear Vane Serial No: 2006 Correction Factor: 1.622

Water Level Readings:
Date Time | Hole Depth | Water Level
29/08/24 07:30 | 1.50m | 1.50 m bgl
29/08/24 15:45 | 22.50m | 2.50 m bgl
02/09/24 07:30 | 22.50m | 1.40 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **19 Myrtle Street**
Project Reference: **521290-064**

BH25

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillans (NI) LTD

CO-ORDINATES: NZTM2000
Easting: 1754337.00m
Northing: 5918306.62m
Ground level: 13.52m (NZVD2016)

Date started: 2/09/2024
Date completed: 3/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: SMG
Input by: SMG
Checked by:
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-12	26		EUs2	**22.1m:** Slightly weathered, grey, fine SANDSTONE; Very weak, moderately cemented. **25.55m to 25.75m:**...SILTSTONE; Very weak.	SW		100	95	95		25.40m: BPJT 2° Pl, Sm, Cl 25.60m: BPJT 2° Pl, Sm, Cl 25.75m: BPJT 2° Pl, Sm, Cl 25.89m: BPJT 22° Pl, Sm, Cl	
HQ3	-13	27		EUx	**26.1m:** Slighty weathered, grey, fine to medium SANDSTONE; Very weak, well cemented. **26.4m:** CORELOSS	SW		60	59	59			
HQ3	-14	28		EUs2	**27m:** Slighty weathered, grey, fine to medium SANDSTONE; Very weak, well cemented. **27.08m to 27.2m:**...Laminated SILTSTONE. **27.32m to 27.4m:**...poorly cemented.	SW						27.05m: BPJT 8° Pl, Ro 27.25m: BPJT 5° Pl, Sm, Cl 27.32m to 27.40m: Core disturbed when retrieved splits. Suspect defects, orientation unknown	
				EUx	**27.4m:** CORE LOSS.			67	48	30			
	-15			EUs	**28.1m:** slightly weathered, grey, coarse, SANDSTONE; weak, well cemeneted. **28.2m to 28.25m:**...poorly cemented.	SW						28.40m: BPJT 2° Un, Ro, Cl	
					28.5m: Slightly weathered, grey, coarse SANDSTONE; Weak, well cemented.	SW							
		29		EUz2	**28.6m:** Slightly weathered, grey, SILTSTONE; Very weak.	SW						28.70m: BP 2° Pl, Ro 28.80m: BP 2° Pl, Sm, Cl 28.90m: BPJT 2° Pl, Sm, Cl	
HQ3	-16			EUs2	**28.95m:** Slightly weathered, grey, coarse SANDSTONE; Weak, well cemented.	SW		100	94	94		29.15m: JT 8° Pl, Ro, Cl 29.30m: DI 2° Pl, Ro, Drilling induced defect 29.50m: DI 2° Pl, Ro, Drilling induced defect	
		30										29.80m: BPJT 9° Pl, Ro	

REMARKS: End of borehole at 30m (Termination Depth Achieved)
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 1.12cm and vertical accuracy of 1.4cm.
2) A Standpipe was installed (BH25_SP01) with a screening interval from 4 mbgl to 6 mbgl
3) ISHSV = In-situ Hand Shear Vane
4) IBHSV = In-barrel Hand Shear Vane

Hand Shear Vane Serial No: 2006 Correction Factor: 1.622

Water Level Readings:
Date Time | Hole Depth | Water Level
29/08/24 07:30 | 1.50m | 1.50 m bgl
29/08/24 15:45 | 22.50m | 2.50 m bgl
02/09/24 07:30 | 22.50m | 1.40 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **88 Tuarangi Road**
Project Reference: **521290-064**

BH29

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754278.56m
Northing: 5918527.29m
Ground level: 13.49m (NZVD2016)

Date started: 5/06/2024
Date completed: 7/06/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	13	1		FEg	**0m:** Clayey GRAVEL with some cobbles; brown. Tightly packed (medium dense), moist. Gravel and cobbles are slightly weathered, subangular, basalt (up to 140mm). [FILL] **0.5m:**...Brick fragments.	GC	0.5m: ISHSV=44/9kPa	0				**0m: FILL** **0.05m to 0.2m:** ES BH29_0.05-0.2	
	12				**1m:** Silty CLAY; brown. Stiff, moist, high plasticity. Minor organics (rootlets).	CL	1m: ISHSV=77/14kPa					**1m: AUCKLAND VOLCANIC GROUP**	
SPT		2		Va	**1.4m:** SILT with minor clay; orange brown. Stiff, moist.	ML	1.4m: ISHSV=93/12kPa 1.5m: SPT 1,1// 1,1,2,1 N = 5	89				**1.4m:** Completely weathered volcanic soil - relict basalt fabric.	
HQ3	11	3		Va	**1.95m:** CORE LOSS **2.35m:** CLAY with trace sand; orange brown. Firm, moist, high plasticity. Sand is fine to medium. Minor rootlets.	CL		40	27	23		**1.95m to 2.35m:** Washed out.	
				VWb	**2.5m:** CLAY with trace sand; orange brown. Firm, moist, high plasticity. Sand is fine to medium. Subangular clasts of slightly weathered basalt.	CL							
HQ3	10	4		VUb	**2.64m:** Slightly weathered, dark grey, slightly vesicular BASALT; strong. Vesicles are 0.5mm to 10mm in diameter. **3.3m to 3.6m:**...Basalt clast with clay infill. Clay; light grey. High plasticity. Possible void infill?	SW		100	87	68		2.77m: JT 30° Pl, Ro, Vn, (Infill: clay) 3.20m to 3.33m: CZ 80° Un, Ro, Co, (Infill: clay 3) 3.33m to 3.45m: JT 50° Pl, Ro, Co, (Infill: clay) 3.38m to 3.47m: CZ 50° Pl, Ro, Co, (Infill: clay) 3.48m to 3.68m: JT 40° Pl, Ro, Co, (Infill: clay) 3.50m: JT 37° Pl, Ro, Co, (Infill: clay) 3.79m to 3.90m: CZ 70° Un, Ro, Co, (Infill: clay 10) 4.03m to 4.09m: JT 30° Pl, Ro, Vn, (Infill: clay) 4.10m: JT 5° Pl, Sm, Vn, (Infill: clay)	
HQ3	9	5						100	84	26		4.75m: JT 20° Pl, Ro, Vn, (Infill: clay) 4.80m: JT 10° Pl, Sm, Vn, (Infill: clay) 4.83m: JT 10° Pl, Sm, Cl 4.90m: JT 40° Pl, Sm, Cl	

Box 1
Box 2

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Ground Access Portal (GAP) service clearance to 1.5m.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 16.5 m bgl (BH29_PZ01) and 21.5m bgl (BH29_PZ02). S/N: 366179 and 366161.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
05/06/24 13:40 | 6.00m | 1.90 m bgl
06/06/24 09:00 | 6.00m | 3.91 m bgl
06/06/24 14:20 | 18.90m | 4.80 m bgl
07/06/24 09:30 | 18.90m | 4.90 m bgl
07/06/24 13:30 | 30.00m | 2.20 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **88 Tuarangi Road**
Project Reference: **521290-064**

BH29

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754278.56m
Northing: 5918527.29m
Ground level: 13.49m (NZVD2016)

Date started: 5/06/2024
Date completed: 7/06/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	8	6		VUb	**2.64m:** Slightly weathered, dark grey, slightly vesicular BASALT; strong. Vesicles are 0.5mm to 10mm in diameter.	SW		100	84	26		4.97m: JT 10° Pl, Sm, Vn, (Infill: clay) 5.03m: JT 10° Pl, Sm, Cl 5.12m: JT 30° Pl, Sm, Cl 5.20m: JT 40° Pl, Sm, Vn, (Infill: clay) 5.29m: JT 90° Pl, Ro, Vn, (Infill: clay) 5.33m: JT 50° Pl, Ro, Cl 5.50m: JT 50° Pl, Sm, Cl 5.58m: JT 10° Pl, Sm, Vn, (Infill: clay) 5.60m: JT 20° Pl, Sm, Cl 5.70m: JT 5° Pl, Ro, Vn, (Infill: clay) 5.72m: JT 20° Pl, Sm, Cl 5.77m: JT 90° Pl, Sm, Cl	
HQ3	7	7						100	75	60		6.09m to 6.14m: CZ 5° Pl, Sm, Cl 6.21m: JT 90° Pl, Ro, Cl 6.31m: JT 40° Pl, Sm, Cl 6.61m: JT 30° Pl, Sm, Vn, (Infill: clay) 6.64m: JI 90° Pl, Ro, Vn, (Infill: clay) 6.69m: JT 20° Pl, Sm, Cl 6.88m to 7.01m: JT 50° Pl, Sm, Vn, (Infill: clay)	
HQ3	6	8			**7.39m to 7.41m:**...Very thin flow banding of vesicles, moderately inclined. Vesicles are 2-3mm in diameter. **7.54m to 7.55m:**...Very thin flow banding of vesicles, moderately inclined. Vesicles are 2-5mm in diameter.			100	87	85		7.26m: JT 20° Pl, Sm, Vn, (Infill: clay) 7.67m: JT 30° Pl, Sm, Cl 7.91m: JT 30° Pl, Ro, Co, (Infill: clay) 7.99m to 8.04m: JT 30° Pl, Sm, Cl 8.29m: JT 10° Pl, Sm, Cl 8.33m: JT 40° Pl, Sm, Cl 8.55m: JT 40° Pl, Sm, Vn, (Infill: clay) 8.82m to 8.93m: JT 80° Pl, Sm, Vn, (Infill: clay)	
HQ3	5	9			**9m:** Unweathered, dark grey, trace vesicles, BASALT (solid); very strong. Vesicles are less than 2mm in diameter.	UW		100	84	22		9.04m to 9.31m: JT 80° Pl, Sm, Vn, (Infill: clay) 9.31m: JT 70° Pl, Sm, Vn, (Infill: clay) 9.41m to 9.54m: JT 80° Pl, Sm, Vn, (Infill: clay) 9.54m: JT 30° Pl, Sm, Cl 9.56m: JT 30° Pl, Sm, Cl 9.78m to 10.10m: JT 80° Un, Ro, Vn, (Infill: clay)	
HQ3	4	10											

Box 2 | Box 3 | Box 4

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Ground Access Portal (GAP) service clearance to 1.5m.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 16.5 m bgl (BH29_PZ01) and 21.5m bgl (BH29_PZ02). S/N: 366179 and 366161.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
05/06/24 13:40 | 6.00m | 1.90 m bgl
06/06/24 09:00 | 6.00m | 3.91 m bgl
06/06/24 14:20 | 18.90m | 4.80 m bgl
07/06/24 09:30 | 18.90m | 4.90 m bgl
07/06/24 13:30 | 30.00m | 2.20 m bgl

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Location: **88 Tuarangi Road**
Project Reference: **521290-064**

BH29

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754278.56m
Northing: 5918527.29m
Ground level: 13.49m (NZVD2016)

Date started: 5/06/2024
Date completed: 7/06/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS, WS, MWS, CS, VCS, ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	3	11		VUb	**9m:** Unweathered, dark grey, trace vesicles, BASALT (solid); very strong. Vesicles are less than 2mm in diameter.	UW		100	84	22		10.10m: JT 30° Pl, Sm, Cl 10.30m to 10.47m: JT 60° Pl, Sm, Cl	
HQ3	2	12						100	100	100		11.48m to 11.63m: JT 70° Pl, Sm, Vn, (Infill: clay) 11.78m: JT 10° Pl, Sm, Cl	
HQ3	1	13			**12.7m to 14m:**...Very thin sub-horizontal flow bands of 0.5mm vesicles, very closely spaced.			100	83	83		12.23m to 12.30m: JT 70° Pl, Sm, Cl 12.34m to 12.40m: JT 80° Pl, Sm, Vn, (Infill: clay) 12.41m: JT 20° Pl, Sm, Vn, (Infill: clay) 12.55m to 12.65m: JT 80° Pl, Sm, Vn, (Infill: clay) 12.77m: JT 5° Pl, Sm, Cl	
HQ3	0	14											
HQ3	-1	15						100	96	93		13.53m to 13.61m: JT 80° Pl, Sm, Cl	

Box 4
Box 5

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Ground Access Portal (GAP) service clearance to 1.5m.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 16.5 m bgl (BH29_PZ01) and 21.5m bgl (BH29_PZ02). S/N: 366179 and 366161.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
05/06/24 13:40 | 6.00m | 1.90 m bgl
06/06/24 09:00 | 6.00m | 3.91 m bgl
06/06/24 14:20 | 18.90m | 4.80 m bgl
07/06/24 09:30 | 18.90m | 4.90 m bgl
07/06/24 13:30 | 30.00m | 2.20 m bgl

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Project: **WIWQIP Motions Catchment Improvements**
Location: **88 Tuarangi Road**
Project Reference: **521290-064**

BH29

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754278.56m
Northing: 5918527.29m
Ground level: 13.49m (NZVD2016)

Date started: 5/06/2024
Date completed: 7/06/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-2	16		VUb	**9m:** Unweathered, dark grey, trace vesicles, BASALT (solid); very strong. Vesicles are less than 2mm in diameter. **15.48m to 17.3m:**...Slightly weathered, light grey, BASALT.	UW		100	73	69		15.48m: JT 30° Pl, Sm, Vn, (Infill: clay) 15.56m to 15.64m: JT 70° Pl, Sm, Vn, (Infill: clay) 15.60m: JT 20° Pl, Sm, Cl 15.64m: JT 20° Pl, Sm, Vn, (Infill: clay) 15.95m: JT 20° Pl, Sm, Vn, (Infill: clay) 16.25m to 16.35m: JT 50° Pl, Ro, Vn, (Infill: clay)	
HQ3	-3	17		VUb								16.57m: JT 5° Pl, Sm, Cl 16.65m: JT 5° Pl, Sm, Cl 16.73m to 16.82m: JT 50° Pl, Sm, Cl 16.76m: JT 20° Pl, Sm, Vn, (Infill: clay)	
HQ3	-4	18		TAo	**17.3m:** Silty ORGANIC CLAY with charcoal; black. Very stiff, moist, high plasticity. (Baked margin). [UNDIFFERENTIATED ALLUVIUM]	CL		100	40	0		17.04m: JT 10° Pl, Sm, Cl 17.12m: JT 10° Pl, Sm, Cl 17.17m: JT 10° Pl, Sm, Cl 17.21m: JT 40° Pl, Sm, Cl 17.22m: JT 40° Pl, Sm, Cl **17.3m: TAURANGA GROUP ALLUVIUM**	
				TAc	**17.5m:** Silty CLAY with minor black carbonaceous material; dark brown grey. Very stiff, moist, high plasticity. The black carbonaceous material comprised of decomposed rootlets.	CL							
				ERc	**17.8m:** Silty CLAY; grey mottled orange brown. Very stiff, moist, high plasticity. [COMPLETELY WEATHERED ECBF].	CL						**17.8m: EAST COAST BAY FORMATION** 17.80m: CZ	
U54	-5	19		ERx	**18m:** PUSH TUBE. **18.01m to 18.45m:**...Silty CLAY with some sand, grey mottled orange brown. Very stiff, slightly moist, moderately plastic. Sand is fine.		18m: IBHSV=UTP	100				**18m:** Unable to carry out IBHSV, core moved in barrel	
SPT				ERs	**18.45m:** Silty fine to medium SAND with some clay; grey with some mottled orange. Loose, moist.	SM	18.45m: SPT 5,13// 13,17,20 for 70mm N = 50+						
				EWs	**18.55m:** Highly weathered, oxidised greenish grey, silty fine to medium SANDSTONE; very weak. Moderately cemented.	HW		82	0	0			
HQ3	-6			EUs2	**19m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW		100	100	100			
SPTC							19.5m: SPTC 15,35 for 130mm// N = 50+	N/A	N/A	N/A			
HQ3		20			**19.63m:** Unweathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **19.85m to 19.91m:**...SILTSTONE.	UW		100	100	96		**19.63m:** Horiztonal bedding.	

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Ground Access Portal (GAP) service clearance to 1.5m.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 16.5 m bgl (BH29_PZ01) and 21.5m bgl (BH29_PZ02). S/N: 366179 and 366161.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
05/06/24 13:40 | 6.00m | 1.90 m bgl
06/06/24 09:00 | 6.00m | 3.91 m bgl
06/06/24 14:20 | 18.90m | 4.80 m bgl
07/06/24 09:30 | 18.90m | 4.90 m bgl
07/06/24 13:30 | 30.00m | 2.20 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **88 Tuarangi Road**
Project Reference: **521290-064**

BH29

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754278.56m
Northing: 5918527.29m
Ground level: 13.49m (NZVD2016)

Date started: 5/06/2024
Date completed: 7/06/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 7 HQ3	-7	21			**19.63m:** Unweathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **20m to 20.06m:**...SILTSTONE. 3mm black carbonaceous material bedding on boundary. **20.16m to 20.26m:**...SILTSTONE. **20.75m to 20.82m:**...SILTSTONE. Black carbonaceous material layer on boundary.	UW		100	100	96			
SPTC				EUs2			21m: SPTC 8,10// 50 for 55mm N = 50+	N/A	N/A	N/A			
HQ3	-8	22			**21.21m to 22.28m:**...Weak. Well cemented. **21.28m to 21.33m:**...SILTSTONE. **21.78m to 21.89m:**...SILTSTONE. Thinly laminated (<2mm) bands of black carbonaceous material inclined 5°.			100	100	79		21.60m: JT 15° Pl, Sm, Cl	
	-9	23		EUz2	**22.28m:** Unweathered, grey, SILTSTONE; weak. Thinly laminated, horizontal bedding of black carbonaceous material. **22.55m to 22.56m:**...Fine to medium SANDSTONE. **22.57m to 22.58m:**...Fine to medium SANDSTONE. **22.65m to 22.79m:**...Fine to medium SANDSTONE.	UW						22.68m: JT 5° Pl, Ro, Cl	
Box 8 HQ3	-10	24		EUs2	**23.08m:** Unweathered, grey, fine to medium SANDSTONE; weak. Well cemented. **23.09m to 23.38m:**...Thinly laminated (<2mm), subhorizontal bedding of black carbonaceous material. **23.38m to 23.51m:**...Medium to coarse SANDSTONE. **23.53m to 23.76m:**...Laminated SILTSTONE horizontal bedding. Disseminated black carbonaceous material (1mm) throughout. **23.95m to 24.1m:**...Medium to coarse SANDSTONE.			100	100	96		23.20m: JT 5° Pl, Sm, Cl	
Box 9 HQ3	-11	25			**24.24m to 24.36m:**...Very thin subhorizontal bands of SILTSTONE. **24.49m to 24.8m:**...~60mm bands of SILTSTONE.	UW		93	93	93			

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Ground Access Portal (GAP) service clearance to 1.5m.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 16.5 m bgl (BH29_PZ01) and 21.5m bgl (BH29_PZ02). S/N: 366179 and 366161.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
05/06/24 13:40 | 6.00m | 1.90 m bgl
06/06/24 09:00 | 6.00m | 3.91 m bgl
06/06/24 14:20 | 18.90m | 4.80 m bgl
07/06/24 09:30 | 18.90m | 4.90 m bgl
07/06/24 13:30 | 30.00m | 2.20 m bgl

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Location: **88 Tuarangi Road**
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BH29

Sheet **6** of **6**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754278.56m
Northing: 5918527.29m
Ground level: 13.49m (NZVD2016)

Date started: 5/06/2024
Date completed: 7/06/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
						UW							
HQ3	-12			EUz2	**25.1m:** Unweathered, grey, SILTSTONE; weak.	UW		93	93	93			
HQ3	-13	26			**25.7m:** Unweathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	UW							
					25.9m: Unweathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.			95	95	86		**26.2m to 26.27m:** Core loss middle of run due to wash out of uncemented material	
		27			**26.32m to 26.6m:**...SANDSTONE; weak.								
					26.6m to 26.75m:...Well cemented.								
					26.75m to 27m:...20-60mm bands of SILTSTONE. **26.76m to 26.85m:**...Disseminated black carbonaceous material, up to 30mm width.								
HQ3	-14			EUs2				100	83	83		28.00m: JT 45° Ro	
		28			**27.9m to 28m:**...poorly cemented.	UW							
	-15				**28.3m to 28.45m:**...poorly cemented.								
					28.55m to 28.63m:...Well cemented.								
HQ3	-16	29						100	100	95			
					29.67m to 29.9m:...20-60mm bands of SILTSTONE.							29.86m: JT 20° Pl, Sm, Cl 29.92m: JT 20° Pl, Sm, Cl	
		30											

Box 9
Box 10

REMARKS: End of borehole at 30m (Termination Depth Achieved)
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Ground Access Portal (GAP) service clearance to 1.5m.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 16.5 m bgl (BH29_PZ01) and 21.5m bgl (BH29_PZ02). S/N: 366179 and 366161.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
05/06/24 13:40 | 6.00m | 1.90 m bgl
06/06/24 09:00 | 6.00m | 3.91 m bgl
06/06/24 14:20 | 18.90m | 4.80 m bgl
07/06/24 09:30 | 18.90m | 4.90 m bgl
07/06/24 13:30 | 30.00m | 2.20 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Western Springs Park - Southernmost Section**
Project Reference: **521290-064**

BH30

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1754155.64m
Northing: 5918511.70m
Ground level: 13.16m (NZVD2016)

Date started: 13/05/2024
Date completed: 16/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: BGW
Input by: BGW
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	13	1		Fc	**0m:** Sandy SILT, some clay, minor fine to medium gravel; brown. Hard, moist, low plasticity. Gravel slightly weathered subangular basalt. Sand is fine to medium. [FILL]	MI-SP						**0m: FILL**	
					0.23m: CLAY, some silt, trace fine to medium gravel and sand; yellow brown. Hard, moist, high plasticity. Gravel is slightly weathered subangular to angular basalt. Minor brick fragments.		0.23m: ER						
							0.62m: ER						
	12	2				CH							
	11												
HQ3		3		VUb	**2.5m:** Slightly weathered, grey BASALT. Strong. Slightly vesicular.	SW		100	40	40		**2.5m: AUCKLAND VOLCANIC GROUP** **2.5m to 2.6m:** 100mm drilling induced core loss. 2.5m: 100mm core loss driller induced **2.5m to 2.6m:** 100mm drilling induced core loss. 2.60m: JT 45° Infill with clay	
HQ3	10	4						100	80	80		3.00m to 3.10m: JT 90° Pl, Ro, St 3.00m: JT 35° Pl, Ro, St 3.00m to 3.10m: JT 90° Pl, Ro, St 3.00m: JT 35° Pl, Ro, St 3.00m to 3.10m: JT 90° Pl, Ro, St 3.00m: JT 35° Pl, Ro, St 3.00m to 3.10m: JT 90° Pl, Ro, St 3.10m: JI 30° 3.80m: JT 10° Pl, Ro, Co	
	9												
HQ3		5			**4.7m:** Unweathered, grey BASALT. Strong. Slightly vesicular.	UW		100	85	71		4.35m: JT Pl, Ro, St 4.41m: JT 45° Pl, Ro, St 4.45m: JT 45° Pl, Ro, St 4.50m to 4.60m: JT 35° Pl, Ro, Co 4.66m: JT 45° Pl, Ro, Co 4.70m: JT 20° Pl, Ro, Co	

Box 1

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
13/05/24 09:45 | 2.50m | 2.50 m bgl
13/05/24 17:00 | 15.00m | 5.03 m bgl
14/05/24 19:30 | 15.00m | 5.13 m bgl
15/05/24 16:00 | 27.00m | 4.75 m bgl
16/05/24 07:30 | 27.00m | 5.05 m bgl
16/05/24 11:00 | 30.00m | 4.90 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Western Springs Park - Southernmost Section**
Project Reference: **521290-064**

BH30

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1754155.64m
Northing: 5918511.70m
Ground level: 13.16m (NZVD2016)

Date started: 13/05/2024
Date completed: 16/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: BGW
Input by: BGW
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 1													
HQ3	8	6		VUb	**4.7m:** Unweathered, grey BASALT. Strong. Slightly vesicular.	UW		100	85	71		5.00m: JT 80° Pl, Sm, St 5.09m: JT 70° Pl, Ro, Co 5.33m: JT 50° Pl, Ro, Co 5.35m: JT 70° Pl, Ro, Co 5.44m: JT 80° Pl, Ro, Co 5.85m: JT 10° Pl, Ro, Co	
Box 2													
HQ3	7	7						100	80	87		6.11m: JT 65° Pl, Ro, Co 6.22m: JT 70° Pl, Ro, Co 6.30m: JT 50° Pl, Ro, Co 6.44m: JT 50° Pl, Ro, Co 6.62m: JT 45° Pl, Ro, Co 6.76m: JT 10° Pl, Ro, Co 7.00m: JT 70° Pl, Ro, Co 7.32m: JT 10° Pl, Ro, Co	
	6												
Box 3													
HQ3	5	8						100	97	92		7.58m: JT 10° Pl, Ro, Co 7.99m: JT 45° Pl, Sm, Co 8.09m: JT 45° Pl, Sm, Co 8.37m: JT 45° Pl, Ro, Co 8.62m: JT 15° Pl, Ro, Co 8.75m: JT 15° Pl, Ro, Co 8.93m: JT 45° Pl, Ro, Co	
	4	9											
HQ3		10						100	65	65		9.05m to 9.29m: JT 70° Pl, Ro, Co 9.75m: JT 60° Pl, Ro, Co	

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
13/05/24 09:45 | 2.50m | 2.50 m bgl
13/05/24 17:00 | 15.00m | 5.03 m bgl
14/05/24 19:30 | 15.00m | 5.13 m bgl
15/05/24 16:00 | 27.00m | 4.75 m bgl
16/05/24 07:30 | 27.00m | 5.05 m bgl
16/05/24 11:00 | 30.00m | 4.90 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Western Springs Park - Southernmost Section**
Project Reference: **521290-064**

BH30

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1754155.64m
Northing: 5918511.70m
Ground level: 13.16m (NZVD2016)

Date started: 13/05/2024
Date completed: 16/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: BGW
Input by: BGW
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3 Box 3	3	11		VUb	**4.7m:** Unweathered, grey BASALT. Strong. Slightly vesicular.	UW		100	65	65		10.20m: JT 45° Pl, Ro, Co	
HQ3 Box 4	2	12						100	80	80		10.75m: JT 40° Pl, Ro, Co 10.97m: JT 40° Pl, Ro, Co 11.40m to 11.60m: JT 70° Pl, Ro, Co	
HQ3 Box 4	1	13						100	83	83		12.00m: JT 80° Pl, Ro, Cl 12.41m: JT 40° Pl, Ro, Co 12.61m: JT 60° Pl, Ro, Co 12.70m: JT 10° Pl, Ro, Co	
HQ3 Box 5	0	14						100	85	85		13.02m: JT 35° Pl, Ro, Co 13.40m: JT 45° Pl, Ro, Co 14.40m: JT 50° Pl, Ro, Co 14.80m to 14.96m: JT 90° Pl, Sm, Co	
	-1	15											

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
13/05/24 09:45 | 2.50m | 2.50 m bgl
13/05/24 17:00 | 15.00m | 5.03 m bgl
14/05/24 19:30 | 15.00m | 5.13 m bgl
15/05/24 16:00 | 27.00m | 4.75 m bgl
16/05/24 07:30 | 27.00m | 5.05 m bgl
16/05/24 11:00 | 30.00m | 4.90 m bgl

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Project: **WIWQIP Motions Catchment Improvements**
Location: **Western Springs Park - Southernmost Section**
Project Reference: **521290-064**

BH30

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1754155.64m
Northing: 5918511.70m
Ground level: 13.16m (NZVD2016)

Date started: 13/05/2024
Date completed: 16/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: BGW
Input by: BGW
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-2	16		VUb	**4.7m:** Unweathered, grey BASALT. Strong. Slightly vesicular.	UW		100	47	47		15.12m: JT 40° Pl, Ro, Co 15.20m: JT 40° Pl, Ro, Co 15.26m: JT 35° Pl, Ro, Co 15.33m: JT 40° Pl, Ro, Co 15.60m to 15.80m: JT 60° Pl, Ro, Co 15.86m: JT 25° Pl, Ro, Co 16.10m: JT 80° Pl, Ro, Co 16.5m: Changed to PQ3 due to install considerations.	
PQ3	-3	17		TAc	**16.9m:** Silty CLAY, minor completely weathered fine organics and trace fine sand; greyish brown. Stiff, moist, high plasticity. [UNDIFFERENTIATED ALLUVIUM]	CH		100				**16.9m: TAURANGA GROUP ALLUVIUM**	
	-4			TAz	**17.2m:** Sandy SILT, some clay, trace decomposed organic rootlets (BCM); brownish grey. Stiff, moist, high plasticity. Sand is fine. Organics up to 10mm length. [EAST COAST BAYS FORMATION]	MI-SP						
U54				ERs	**17.5m:** Silty SAND minor clay, trace decomposed fibrous organics; greenish grey streaked brown. Very stiff, moist, low plasticity. Sand is fine. Organics are low plasticity. [COMPLETELY WEATHERED ECBF]	CW SP-SM	17.5m: IBHSV=102/20kPa	100				**17.5m: EAST COAST BAY FORMATION** **17.5m:** 300mm expanded core.	
PQ3		18		EWs	**17.51m to 17.6m:**...Sandy SILT with some clay, brownish grey mottled orange. Very stiff, slightly moist, high plasticity. Sand is fine.	MW		80					
SPTC	-5				**17.6m to 17.7m:**...Moderately weathered, greenish grey, fine to medium SANDSTONE; very weak. Moderately cemented **17.7m:** Moderately weathered greenish grey fine to medium SANDSTONE. Very weak, moderately cemented. **17.8m:**...Horizontal bedding SILTSTONE 50mm. **18m:** No Recovery.		18m: SPTC 7,18// 12,11,27 N = 50+	N/A	N/A	N/A		
PQ3	-6	19		EWs	**18.38m:** Moderately weathered greenish grey fine to medium SANDSTONE. Very weak, moderately cemented. **18.39m:**...SILTSTONE 50mm.	MW		100	100	100		**18.74m:** Poorly cemented, drilling induced.	
SPTC					**19.5m:** No Recovery.		19.5m: SPTC 15,35// for 55mm N = 50+	N/A	N/A	N/A			
PQ3		20		EWs	**19.63m:** Moderately weathered greenish grey fine to medium SANDSTONE. Very weak, moderately cemented.	MW		94	94	94			

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
13/05/24 09:45 | 2.50m | 2.50 m bgl
13/05/24 17:00 | 15.00m | 5.03 m bgl
14/05/24 19:30 | 15.00m | 5.13 m bgl
15/05/24 16:00 | 27.00m | 4.75 m bgl
16/05/24 07:30 | 27.00m | 5.05 m bgl
16/05/24 11:00 | 30.00m | 4.90 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Western Springs Park - Southernmost Section**
Project Reference: **521290-064**

BH30

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1754155.64m
Northing: 5918511.70m
Ground level: 13.16m (NZVD2016)

Date started: 13/05/2024
Date completed: 16/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: BGW
Input by: BGW
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
						MW							
PQ3	-7			EUs3	**20.1m:** Slightly weathered, grey, fine SANDSTONE. Weak +, highly cemented. Trace fine gravels.	SW						20.27m to 20.40m: JT 45° Pl, Ro, Co	
PQ3		21		EUs2	**20.5m:** Slightly weathered, grey, fine to medium SANDSTONE. Very weak, moderately cemented. **20.7m:**...poorly cemented.	SW		94	94	94			
SPTC	-8				**21m:** No Recovery.		21m: SPTC 10,25// 50 for 65mm N = 50+						
PQ3		22		EUs2	**21.22m:** Slightly weathered, grey, fine to medium SANDSTONE. Very weak, moderately cemented. **21.73m:**...Poorly cemented, 50mm (base of defect).	SW		N/A 100	N/A 100	N/A 100		21.58m to 21.73m: JT 65° Pl, Ro, Co	
SPTC	-9				**22.5m:** No Recovery.		22.5m: SPTC 10,40// for 40mm N = 50+	N/A	N/A	N/A		**22.5m: East Coast Bays Formation**	
PQ3		23		EUs2	**22.65m:** Unweathered, grey, fine to medium SANDSTONE. Very weak, moderately cemented. **23.32m:**...Fine SANDSTONE. Weak +, well cemented. 160mm.	UW		97	89	89		22.80m to 22.92m: JT 45° Un, Ro, Co	
PQ3	-10	24			**23.94m:**...SILTSTONE 110mm.							24.00m to 25.50m: DI	
PQ3	-11				**24.4m:**...Fine SANDSTONE. Weak +, highly cemented. 70mm.			100	97	97		24.50m to 24.60m: JT 45° Pl, Ro, Co	
		25											

Box 7 Box 8 Box 9

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
13/05/24 09:45 | 2.50m | 2.50 m bgl
13/05/24 17:00 | 15.00m | 5.03 m bgl
14/05/24 19:30 | 15.00m | 5.13 m bgl
15/05/24 16:00 | 27.00m | 4.75 m bgl
16/05/24 07:30 | 27.00m | 5.05 m bgl
16/05/24 11:00 | 30.00m | 4.90 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Western Springs Park - Southernmost Section**
Project Reference: **521290-064**

BH30

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1754155.64m
Northing: 5918511.70m
Ground level: 13.16m (NZVD2016)

Date started: 13/05/2024
Date completed: 16/05/2024
Inclination: -90°
Azimuth: N/A

Logged by: BGW
Input by: BGW
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3 Box 9	-12			EUs2	**22.65m:** Unweathered, grey, fine to medium SANDSTONE. Very weak, moderately cemented.	UW		100	97	97			
					25.35m: Unweathered, grey SILTSTONE. Very weak.	UW							
		26			**25.82m:** Unweathered, grey, fine to medium SANDSTONE. Very weak, moderately cemented.	UW		100	76	76			
PQ3 Box 10	-13				**26.35m:**...Fine SANDSTONE. Weak +, highly cemented. 100mm.								
				EUi2	**26.58m:** Unweathered, grey Interbedded SILTSTONE and fine to medium SANDSTONE. Very weak to weak, moderately cemented. Bedding, thin to moderately thin, subhorizontal to horizontal sandstone. **26.85m to 26.95m:**...poorly cemented.	UW						27.00m to 28.50m: DI	
		27			**27.15m to 27.25m:**...poorly cemented.							27.48m to 27.58m: JT 40° Pl, Ro, Co	
	-14							99	89	89			
PQ3		28			**28m to 28.06m:**...poorly cemented.								
	-15			EUs3	**28.3m:** Unweathered, grey, fine to medium SANDSTONE. Weak +, highly cemented. **28.59m:**...BCM, 21mm thick. **28.67m:**...BCM, 10mm thick, subhorizontal.	UW						28.50m to 30.00m: DI	
Box 11		29		EUi3	**28.91m:** Unweathered, grey, Interbedded SILTSTONE and fine SANDSTONE. Weak +, highly cemented. Bedding, laminated to thin.	UW							
PQ3	-16			EUs2	**29.08m:** Unweathered, grey, fine to medium SANDSTONE. Very weak, moderately cemented.	UW		97	95	95			
		30											

REMARKS: End of borehole at 30m (Termination Depth Achieved)
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.

Hand Shear Vane Serial No: DR4938 Correction Factor: 1.452

Water Level Readings:
Date Time | Hole Depth | Water Level
13/05/24 09:45 | 2.50m | 2.50 m bgl
13/05/24 17:00 | 15.00m | 5.03 m bgl
14/05/24 19:30 | 15.00m | 5.13 m bgl
15/05/24 16:00 | 27.00m | 4.75 m bgl
16/05/24 07:30 | 27.00m | 5.05 m bgl
16/05/24 11:00 | 30.00m | 4.90 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Western Springs - Bullock Road**
Project Reference: **521290-064**

BH31

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754228.07m
Northing: 5918574.64m
Ground level: 13.08m (NZVD2016)

Date started: 30/09/2024
Date completed: 1/10/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	13			Fg	**0m:** Silty medium to coarse GRAVEL; brown. Tightly packed, moist. Gravel is slightly weathered sub-angular basalt. [FILL]	GP-GM						**0m: FILL**	
					0.35m: SILT with minor organics; light brown. Very stiff, moist, high plasticity. Organics are minor rootlets.		0.5m: ISHSV=145/33kPa					**0.35m to 1.5m:** Fill was compact producing high shear vane results. **0.5m:** ES BH31_0.5 Jar and Tub	
	12	1		Fc	**1m:**...With minor fine sand. Hard.	ML	1m: ISHSV=211/13kPa	0					
					1.5m: CLAY with some silt; light grey brown mottled with orange and pinky orange. Very stiff, moist, high plasticity. Relict ash layers.	CH	1.5m: ISHSV=139/16kPa					**1.5m: AUCKLAND VOLCANIC GROUP**	
	11	2		Vt	**2m:** Slightly weathered, dark grey, BASALT, slightly vesicular; strong. Vesicles are 1mm to 3mm.		2m: ISHSV=UTP					2.00m to 2.05m: JT 80° Pl, Ro, Co Red brown staining with clay infill. Crushed zone?	
HQ3 Box 1								100	60	43		2.40m: JT 20° Pl, Ro, Cl Joint along flow banding vesicles. 2.41m to 2.59m: JT 80° Pl, Ro, Vn 2.60m: JT 50° Pl, Ro, St Blue green and red brown staining 2.71m: JT 20° Pl, Ro, St 2.76m: JT 20° Pl, Ro, St Blue green and red brown staining	
					2.8m to 3m:...Iron oxide staining in flow banding vesicles, inclined 80°.								
	10	3										3.12m: JT 15° Pl, Ro, Vn 3.15m: JT 20° Pl, Ro, Vn	
HQ3				VUb		SW						3.34m: JT 40° Pl, Sm, Cl 3.36m: JT 10° Pl, Ro, Vn 3.45m: JT 45° Pl, Sm, Cl 3.55m: JT 10° Pl, Ro, Co	
								100	88	85		3.68m: JT 5° Pl, Sm, Vn	
					3.83m:...Flow banding vesicles, <5mm, inclined at 5°. **3.92m:**...Flow banding vesicles, <5mm, inclined at 5°.								
	9	4										4.01m: JT 5° Pl, Sm, Vn	
												4.20m: JT 10° Pl, Sm, Vn 4.25m: JT 40° Pl, Sm, Co	
												4.40m: JT 15° Pl, Ro, Cl	
HQ3 Box 2								100	92	86		4.53m: JT 5° Pl, Ro, Cl 4.56m: JT 40° Pl, Ro, Vn 4.70m: JT 30° Pl, Ro, Cl	
		5										4.81m: JT 40° St, Ro, Cl 4.82m: JT 40° Pl, Ro, Cl	

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 3cm and vertical accuracy of 3cm.

Water Level Readings:
Date Time | Hole Depth | Water Level
30/09/24 15:30 | 12.00m | 3.30 m bgl
01/10/24 07:30 | 12.00m | 3.65 m bgl

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Western Springs - Bullock Road**
Project Reference: **521290-064**

BH31

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754228.07m
Northing: 5918574.64m
Ground level: 13.08m (NZVD2016)

Date started: 30/09/2024
Date completed: 1/10/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	8	6		VUb	**2m:** Slightly weathered, dark grey, BASALT, slightly vesicular; strong. Vesicles are 1mm to 3mm. **5.06m:**...Flow banding vesicles, <5mm, inclined at 5°. **5.13m:**...Flow banding vesicles, <5mm, inclined at 5°. **5.23m:**...Flow banding vesicles, <5mm, inclined at 5°. **5.44m:**...Flow banding vesicles, <5mm, inclined at 5°.	SW		100	92	86		5.73m: JT 10° Pl, Sm, Cl 5.92m: JT 10° Pl, Ro, Vn 5.93m to 5.98m: JT 40° Pl, Ro, Co Clay infill.	
HQ3	7	7			**6m:** Unweathered, dark grey, BASALT slightly vesicular; strong.			100	93	77		6.15m: JT 30° Pl, Sm, Vn 6.30m: JT 30° Pl, Sm, Cl 6.35m to 6.40m: JT 80° Pl, Sm, Vn 6.65m: JT 10° Pl, Sm, Cl 6.70m: JT 30° Pl, Sm, Vn Joints along flow banding vesicles. 6.80m to 6.88m: JT 80° Pl, Sm, Co 7.30m: JT 30° Pl, Sm, Vn 7.38m: JT 5° Pl, Sm, Cl	
HQ3	6	7				UW		100	60	53		7.90m: JT 20° Pl, Sm, Vn 8.00m: JT 20° Pl, Sm, Vn 8.04m: JT 25° Pl, Sm, Vn 8.07m: JT 20° Pl, Sm, Vn 8.08m to 8.35m: JT 80° Un, Ro, Co Clay infill; light greyish green. 8.35m to 8.38m: JT 15° Pl, Sm, Vn 8.45m: JT 15° Pl, Sm, Vn	
HQ3	5	8										8.77m: JT 40° Pl, Sm, Vn 8.78m to 8.90m: JT 80° Pl, Sm, Vn	
HQ3	4	9						100	60	48		9.12m: JT 30° Pl, Sm, Vn 9.25m to 9.37m: JT 80° Pl, Sm, Vn 9.37m: JT 10° Pl, Sm, Vn 9.59m: JT 10° Pl, Sm, Vn 9.70m: JT 45° Pl, Sm, Vn 9.74m: JT 35° Pl, Sm, Co 9.81m: JT 10° Pl, Sm, Vn 9.89m: JT 10° Pl, Sm, Cl	

Box 2
Box 3

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 3cm and vertical accuracy of 3cm.

Water Level Readings:
Date Time | Hole Depth | Water Level
30/09/24 15:30 | 12.00m | 3.30 m bgl
01/10/24 07:30 | 12.00m | 3.65 m bgl

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

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Level 3, Te Tihi, 110 Carlton Gore Road
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Ground level: 13.08m (NZVD2016)

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Inclination: -90°
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Logged by: AP
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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	3			VUb	**6m:** Unweathered, dark grey, BASALT slightly vesicular; strong.	UW		100	60	48		10.18m: JT 5° Pl, Sm, Cl 10.23m: JT 30° Pl, Sm, Vn 10.40m to 10.50m: JT 55° Pl, Sm, Vn	
HQ3	2	11						100	57	57		10.59m to 10.63m: JT 40° Pl, Sm, Cl 10.65m: JT 80° Pl, Sm, Vn 10.70m to 10.79m: JT 80° Pl, Sm, Vn 10.78m: JT 10° Pl, Sm, Vn 10.95m: JT 5° Pl, Ro, Vn 10.96m to 11.12m: JT 50° Pl, Sm, Vn 11.14m: JT 40° Pl, Sm, Vn 11.20m: JT 50° Pl, Sm, Vn 11.43m: JT 5° Pl, Sm, Vn 11.48m to 11.57m: JT 50° Pl, Sm, Vn 11.68m to 11.76m: JT 50° Pl, Sm, Vn 11.75m: JT 5° Pl, Sm, Vn 11.79m: JT 10° Pl, Sm, Vn	
HQ3	1	12										11.96m: JT 10° St, Sm, Vn 11.97m: JT -8° Pl, Sm, Vn 12.00m to 12.07m: JT 40° Pl, Sm, Vn 12.32m: JT 10° Pl, Sm, Vn 12.33m: JT 10° Pl, Sm, St 12.44m to 12.52m: JT 80° Pl, Sm, Co Fine sand. 12.55m: JT 20° Pl, Sm, Co Fine sand.	
HQ3	0	13						100	62	51		12.67m: JT 5° Pl, Sm, Vn 12.90m: JT 20° Pl, Sm, Vn 12.91m to 13.09m: JT 60° Pl, Sm, Vn 13.15m: JT 40° Pl, Sm, Cl 13.17m: JT 40° Pl, Sm, Cl 13.23m: JT 5° Pl, Sm, Vn 13.40m to 13.78m: JT 80° Pl, Sm, Vn	
HQ3	-1	14						100	87	62		14.04m to 14.09m: JT 50° Pl, Sm, Vn 14.09m: JT 20° Pl, Sm, Vn 14.10m to 14.23m: JT 70° Pl, Ro, Vn 14.35m: JT 30° Pl, Sm, Cl 14.46m: JT 60° Pl, Sm, Vn 14.47m: JT 30° Pl, Sm, Cl 14.71m: JT 25° Pl, Sm, Cl	
		15											

Box 3 / Box 4 / Box 5

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 3cm and vertical accuracy of 3cm.

Water Level Readings:
Date Time | Hole Depth | Water Level
30/09/24 15:30 | 12.00m | 3.30 m bgl
01/10/24 07:30 | 12.00m | 3.65 m bgl

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Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1754228.07m
Northing: 5918574.64m
Ground level: 13.08m (NZVD2016)

Date started: 30/09/2024
Date completed: 1/10/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-2			VUb	**6m:** Unweathered, dark grey, BASALT slightly vesicular; strong.	UW						15.04m to 15.21m: JT 80° Pl, Ro, Vn	
HQ3				TAz	**15.21m:** SILT with minor clay; black. Stiff, moist, high plasticity, baked contact. [UNDIFFERENTIATED ALLUVIUM]	MH		100	47	0		**15.21m: TAURANGA GROUP ALLUVIUM**	
Box 5 U54		16		TAx	**15.45m:** PUSH TUBE. **15.46m to 15.5m:**...Fine to coarse SAND with trace organics; dark blackish grey speckled orange. Medium dense, slightly moist. **15.5m to 15.6m:**...SILT with trace organics; blackish grey. Very stiff to hard, slightly moist. **15.6m to 15.7m:**... CLAY, dark blackish grey with trace organics. Very stiff to hard, slightly moist, highly plastic. **15.7m to 15.9m:**...CLAY, blue grey with trace organics. Very stiff to hard, slightly moist, highly plastic.			100					
SPT	-3				**15.95m:** SILT with some clay; blue grey with mottled orange brown. Very stiff, moist, high plasticity. [RESIDUAL ECBF]		15.95m: SPT 1,2// 4,4,4,4 N = 16	100					
HQ3								100					
SPT				ERz	**16.6m:**...Minor fine sand. **16.8m:**...Trace black carbonaceous material, <1mm.	MH	16.5m: IBHSV=112/20kPa 16.5m: SPT 0,0// 1,2,2,2 N = 7	100					
HQ3	-4	17						69					
				ERx	**17.55m:** SILT with some sand; orange brown mottled with blue grey. Very stiff, moist, high plasticity. [COMPLETELY WEATHERED ECBF] **17.67m:** CORE LOSS.	MH						**17.55m: East Coast Bays Formation**	
Box 6 SPT	-5	18		ERz	**18m:** SILT; light grey. Very stiff, moist, high plasticity.	MH	18m: SPT 1,2// 2,2,6,6 N = 16						
				ERs	**18.2m:** Fine to medium SAND with some silt; grey with oxidised green. Stiff, moist, high plasticity. **18.45m to 18.52m:**...Iron oxide staining.	SP		100					
HQ3	-6	19		EWs	**18.52m:** Highly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **18.56m:**...Three bands of black carbonaceous material, 2mm thick. Inclined at 10°. **18.65m to 18.85m:**...Sandy SILTSTONE.	HW		100	93	93		18.55m: BP 10° 18.80m: BP 10°	
SPTC							19.5m: IBHSV=UTP 19.5m: SPTC 14,36 for 145mm// N = 50+	N/A	N/A	N/A			
HQ3		20			**19.69m:** Moderately weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	MW		100	93	93			

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 3cm and vertical accuracy of 3cm.

Water Level Readings:
Date Time | Hole Depth | Water Level
30/09/24 15:30 | 12.00m | 3.30 m bgl
01/10/24 07:30 | 12.00m | 3.65 m bgl

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Western Springs - Bullock Road**
Project Reference: **521290-064**

BH31

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1754228.07m	Date started:	30/09/2024	Logged by:	AP
Equipment:	Massenza MM3	Northing:	5918574.64m	Date completed:	1/10/2024	Input by:	AP
Contractor:	McMillan Drilling NI Ltd	Ground level:	13.08m (NZVD2016)	Inclination:	-90°	Checked by:	PK
				Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS, WS, MWS, CS, VCS, ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 7 HQ3	-7	21		EWs	**19.69m:** Moderately weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **20.03m to 20.12m:**...Interbedded SILTSTONE, inclined 10°. **20.33m to 20.41m:**...Sandy SILTSTONE, inclined 20°.	MW		100	93	93		20.03m: BP 10° 20.12m: BPJT 10° 20.40m: BP 20° 20.43m: BP 20°	
					End of borehole at 21m (Termination Depth Achieved)								

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 3cm and vertical accuracy of 3cm.

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

Water Level Readings:
Date Time | Hole Depth | Water Level
30/09/24 15:30 | 12.00m | 3.30 m bgl
01/10/24 07:30 | 12.00m | 3.65 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Ophir Street**
Project Reference: **521290-064**

BH35

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3 Rig
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1756480.25m
Northing: 5919219.13m
Ground level: 58.92m (NZVD2016)

Date started: 24/06/2024
Date completed: 26/06/2024
Inclination: 90°
Azimuth: N/A

Logged by: FG
Input by: FG
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	59			P	**0m:** ASPHALT.							**0m: FILL**	
					0.045m: Fine to course GRAVEL; grey. Tightly packed, dry. Gravel is slightly weathered to unweathered, grey sandstone and graywacke. [FILL]	GW							
				FEg	**0.5m:** Gravelly fine SAND with trace clay; yellow. Medium dense, moist. Gravel is slightly weathered to unweathered, grey sandstone and greywacke.	SP							
	60	1											
				Fc	**1.5m:** Sandy CLAY; yellow. Stiff, moist, high plasticity. Sand is fine.	CH							
	61	2											
	62	3										**3.2m:** Cased to 6.6m.	
HQ3					**3.4m:** Silty CLAY; yellow, spotted orange. Soft, moist, high plasity. **3.45m to 3.6m:**...Grey.	CH		100				**3.4m to 3.5m:** ES BH35_3.4-3.5.	
HQ3				ERz	**3.6m:** Clayey SILT; grey. Firm, moist, high plasticity. [RESIDUAL SOIL ECBF]	MH	3.6m: IBHSV=24/6kPa	100				**3.6m: EAST COAST BAYS FORMATION** **4m to 4.1m:** ES BH35_4.0-4.1.	
	63	4											
SPT				ERc	**4.5m:** Silty CLAY; grey. Firm, moist, high plasticity.	CH	4.5m: IBHSV=42/16kPa 4.5m: SPT 0,0// 0,1,1,1 N = 3	100					
		5						100					

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) ES refers to environmental sample.

Hand Shear Vane Serial No: 2006 Correction Factor: 1.622

Water Level Readings:
Date Time | Hole Depth | Water Level
25/06/24 08:00 | 12.45m | 1.80 m bgl
26/06/24 08:00 | 20.00m | 9.48 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Ophir Street**
Project Reference: **521290-064**

BH35

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3 Rig
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1756480.25m
Northing: 5919219.13m
Ground level: 58.92m (NZVD2016)

Date started: 24/06/2024
Date completed: 26/06/2024
Inclination: 90°
Azimuth: N/A

Logged by: FG
Input by: FG
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 1 HQ3	64	6		ERc	**4.95m:** Silty CLAY; grey. Very stiff, moist, high plasticity. **5.35m to 5.5m:**...Sandy SILT.	CH		100				**5.3m to 5.4m:** ES BH35_5.3-5.4. **5.5m:** Vibrating wire transducer (S/N: 361078).	
SPT	65			ERs	**6m:** Silty fine SAND with tracy clay, grey. Loose, moist, low plasticity.	SM	6m: SPT 0,1// 1,2,2,2 N = 7						
				ERc	**6.2m:** Silty CLAY; grey. Firm, moist, high plasticity.	CH		100					
HQ3		7		ERz	**6.45m:** Clayey SILT; grey. Very stiff, moist, high plasticity. [COMPLETELY WEATHERED ECBF] **7.15m to 7.17m:**...Fine SAND.	MH		76					
	66			ERx	**7.25m:** CORE LOSS.							**7.4m to 7.5m:** ES BH35_7.4-7.5.	
Box 2 SPT				ERz	**7.5m:** Clayey SILT; grey. Very stiff, moist, high plasticity.	MH	7.5m: SPT 1,2// 4,5,5,6 N = 20	100					
HQ3	67	8		ERz	**8.32m to 8.4m:**...Sandy SILT; Hard.	MH		90				8.60m to 8.70m: JT 45° Un, Ro, Cl	
				ERs	**8.5m:** Silty fine SAND with tracy clay; grey. Stiff, moist, low plasticity. **8.51m to 8.54m:**...Greenish grey.	SM							
		9		ERx	**8.9m:** CORE LOSS.								
SPT	68			ERz	**9m:** Clayey SILT; grey. Very stiff, moist, high plasticity.	MH	9m: SPT 1,2// 4,5,7,7 N = 23	100					
HQ3				ERz	**9.45m to 9.5m:**...Sandy SILT.	MH		43					
		10		ERx	**9.9m:** CORE LOSS.								

REMARKS:
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Water Level Readings:
Date Time | Hole Depth | Water Level
25/06/24 08:00 | 12.45m | 1.80 m bgl
26/06/24 08:00 | 20.00m | 9.48 m bgl

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BH35

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3 Rig
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1756480.25m
Northing: 5919219.13m
Ground level: 58.92m (NZVD2016)

Date started: 24/06/2024
Date completed: 26/06/2024
Inclination: 90°
Azimuth: N/A

Logged by: FG
Input by: FG
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 2 HQ3	69			ERx	**9.9m:** CORE LOSS.			43					
SPT		11		EWz	**10.5m:** Highly weathered, grey SILTSTONE; Extremely weak (Sandy SILT, some clay; grey. Very stiff, moist, high plasticity. Sand is fine).	HW	10.5m: SPT 1,3// 5,6,6,8 N = 25	100					
HQ3	70				**11.07m to 11.08m:**...Fine SAND.								
					11.33m to 11.38m:...Fine SAND.								
		12		ERx	**11.4m:** CORE LOSS.			43					
Box 3 SPT	71			EWz	**12m:** Highly weathered, grey SILTSTONE; Extremely weak (Sandy SILT, some clay; grey. Very stiff, moist, high plasticity. Sand is fine).	HW	12m: SPT 1,3// 5,6,8,8 N = 27	100					
HQ3				EUz2	**12.45m:** Slightly weathered, grey, indistinctly bedded SILTSTONE; Very weak.	SW		100	97	93		**12.45m:** Zone of laminated, bedding moderately inclined at 25°. 12.60m: BP 5° 12.80m: BP 15°	
	72	13			**12.95m:** Slightly weathered, grey SILTSTONE; Very weak. Interbedded with some (20%) thin to moderately thin (40-120mm) fine Sandstone.							12.94m: BP 5° 12.97m: BP 5° 13.05m: BP 15°	
SPT						SW	13.5m: SPT 3,7// 11,17,14,8 for 45mm N = 50+	100	100	100			
HQ3	73	14										14.00m: BP 2° 14.04m: BP 2° 14.07m: BP 2°	
Box 4				EUs2	**14.14m:** Slightly weathered, grey SILTSTONE; Very weak.	SW		100	93	93		14.44m: BP 15°	
		15			**14.85m to 14.9m:**...Greenish grey; Extremely weak, poorly cemented.							14.75m: BP 15°	

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Water Level Readings:
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25/06/24 08:00 | 12.45m | 1.80 m bgl
26/06/24 08:00 | 20.00m | 9.48 m bgl

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BH35

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3 Rig
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1756480.25m
Northing: 5919219.13m
Ground level: 58.92m (NZVD2016)

Date started: 24/06/2024
Date completed: 26/06/2024
Inclination: 90°
Azimuth: N/A

Logged by: FG
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Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPTC	74			EUx	**15m:** NO RECOVERY.	SW	15m: SPTC 4,19// 50 for 55mm N = 50+	N/A	N/A	N/A		14.95m: BP 10°	
HQ3		16		EUs2	**15.21m:** Slightly weathered, grey SANDSTONE; Very weak. Interbedded with some (15%) very thin to thin (6-60mm) Siltstone.	SW		100	86	86		15.25m to 15.27m: JT 10° Un, Ro, Cl 15.30m to 15.32m: JT 10° Un, Ro, Cl 15.42m: BP 5° Un, Ro, Cl 15.50m to 15.60m: JT 80° Un, Ro, Cl	
SPTC				EUx	**16.5m:** NO RECOVERY.	SW	16.5m: SPTC 13,37 for 130mm// N = 50+	N/A	N/A	N/A			
HQ3	75	17		EUz2	**16.63m:** Slightly weathered, grey SILTSTONE; Very weak. Interbedded with some (17%) fine sandstone, 20-130mm thick. **16.75m to 16.8m:**...50mm black carbonaceous material.	SW		100	86	82		16.67m: BP 10° 16.69m: BP 10° 16.73m: BP 10° 16.83m: BP 10° 17.05m: BP 15° 17.10m: BP 5° 17.17m: BP 10° 17.30m to 17.35m: JT 10° Un, Ro, Cl 17.85m to 17.87m: JT 25° Un, Ro, Cl 17.95m to 17.97m: JT 25° Un, Ro, Cl	
HQ3	76	18		EUz2	**18m:** Slightly weathered, grey SILTSTONE; Very weak. **18.05m to 18.2m:**...Fine SANDSTONE. **18.35m to 18.65m:**...Fine SANDSTONE. **18.45m to 18.5m:**...Extremely weak, poorly cemented.	SW		100	97	92		18.16m to 18.18m: JT 30° Un, Ro, Cl 18.53m to 18.56m: JT 30° Un, Ro, Cl 18.70m to 18.73m: JT 30° Un, Ro, Cl 18.77m: BP 5°	
HQ3	77	19		EUs2	**19.25m:** Slightly weathered, grey, fine to medium SANDSTONE; Very weak, moderately cemented.	SW						19.19m: BP 5° 19.31m: BP 5° 19.46m: BP 5°	
HQ3	78	20		EUz2	**19.5m:** Slightly weathered, grey SILTSTONE; Very weak. Interbedded with some (15%) fine sandstone, thin to moderately thin and 20-100mm thick.	SW		100	97	91		19.65m: BP 15° 19.69m: BP 15° 19.94m: BP 5°	

Box 4
Box 5

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) ES refers to environmental sample.

Water Level Readings:
Date Time | Hole Depth | Water Level
25/06/24 08:00 | 12.45m | 1.80 m bgl
26/06/24 08:00 | 20.00m | 9.48 m bgl

Hand Shear Vane Serial No: 2006 Correction Factor: 1.622

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Ophir Street**
Project Reference: **521290-064**

BH35

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3 Rig
Contractor: McMillan Drilling Ltd

CO-ORDINATES: NZTM2000
Easting: 1756480.25m
Northing: 5919219.13m
Ground level: 58.92m (NZVD2016)

Date started: 24/06/2024
Date completed: 26/06/2024
Inclination: 90°
Azimuth: N/A

Logged by: FG
Input by: FG
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 5													
HQ3	79			EUz2	**19.5m:** Slightly weathered, grey SILTSTONE; Very weak. Interbedded with some (15%) fine sandstone, thin to moderately thin and 20-100mm thick.	SW		100	97	91		19.96m: BP 5° **20m:** Vibrating wire transducer (S/N: 366160). 20.05m: BP 5° 20.19m: BP 2° 20.35m: BP 10° 20.46m: BP 5°	
		21			**20.88m to 21.05m:**...Zone of black carbonaceous material.								
	80				**21.05m:** Slightly weathered, grey SILTSTONE; Very weak. **21.12m:**...50mm of black carbonaceous material.							21.03m: BP 10° 21.10m: BP 10°	
Box 6													
HQ3		22				SW		100	93	93			
	81												
												22.56m: BP 5°	
					22.61m:...40mm of black carbonaceous material. **22.7m:**...10mm of black carbonaceous material.							22.67m: BP 15° 22.74m: BP 15° **22.8m to 23m:** Drilling induced discing of core.	
		23											
	82											22.98m: BP 15°	
HQ3				EUi2	**23.23m:** Interbedded grey fine SANDSTONE and SILTSTONE; Very weak. Fine SANDSTONE is slightly weathered, moderately thin and in beds 70-130mm thick. SILTSTONE is slightly weathered, moderately thin and in beds 100-120mm thick. **23.4m to 23.43m:**...Extremely weak, poorly cemented.	SW		87	80	78		23.25m: BP 10° 23.40m: BP 15°	
				EUx	**23.8m:** CORE LOSS.	SW							
		24											
Box 7													
HQ3	83			EUz2	**24m:** Slightly weathered, grey SILTSTONE; Very weak. **24.3m to 24.35m:**...Fine SANDSTONE; Extremely weak, poorly cemented. **24.35m to 25m:**...Fine SANDSTONE; Very weak, moderately cemented. **24.54m to 24.6m:**...Extremely weak, poorly cemented.	SW		100	100	100			
		25											

REMARKS: End of borehole at 25m (Termination Depth Achieved)
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) ES refers to environmental sample.

Water Level Readings:
Date Time | Hole Depth | Water Level
25/06/24 08:00 | 12.45m | 1.80 m bgl
26/06/24 08:00 | 20.00m | 9.48 m bgl

Hand Shear Vane Serial No: 2006 Correction Factor: 1.622

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Ophir Street Edinburgh Street**
Project Reference: **521290-064**

BH36

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1756480.85m
Northing: 5919223.39m
Ground level: 59.46m (NZVD2016)

Date started: 12/09/2024
Date completed: 16/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	59	1		P	**0m:** ASPHALT.							**0m: FILL** **0m:** Vacuum excavation observed and logged by onsite geologist.	
				Fg	**0.1m:** Coarse GRAVEL; grey. Tightly packed, moist. Slightly weathered, sub-angular basalt. [FILL]								
					0.6m:...Geotextile mat.								
				Fc	**0.65m:** Silty CLAY; light grey brown with orange mottling. Stiff, moist, high plasticity.	CH	0.7m: ISHSV=89/41kPa	0					
	58	2			**0.9m:**...Very stiff		0.9m: ISHSV=104/62kPa						
					1.5m:...Light grey with orange mottling. Stiff.		1.5m: ISHSV=77/35kPa						
							2m: ISHSV=74/30kPa						
HQ3	57	3					2.5m: ISHSV=74/38kPa	100					
U54	56	4		Fx	**3m:** PUSH TUBE. Sandy CLAY; light brown with dark orange iron staining. Soft to firm, moderate to highly plasticity, moist. **3.11m to 3.29m:**...CLAY; light grey. Stiff to very stiff, slightly moist, high plasticity. **3.29m to 3.4m:**...Sandy SILT; light grey. Firm, moderate plasticity, moist. Sand is fine. **3.4m to 3.5m:**...CLAY with some sand; light grey. Firm, moist, high plasticity. Sand is fine.		3m: IBHSV=59/24kPa	100					
SPT					**3.5m:** SILT with some sand; grey. Stiff, moist, high plasticity. Sand is fine. [RESIDUAL SOIL ECBF]		3.5m: SPT 0,0// 1,1,1,2 N = 5	100				**3.5m: EAST COAST BAYS FORMATION**	
HQ3	55			ERz	**3.75m to 3.95m:**...Very stiff. **4.45m to 4.5m:**...Sandy SILT.	MH	4m: IBHSV=UTP	100				**3.95m:** ES BH36_3.95	
U54		5		ERx	**4.5m:** PUSH TUBE. CLAY; grey. Very stiff to hard, slightly moist, high plasticity. **4.53m:**...Very thin bands of fine sandy clay.		4.5m: IBHSV=95/21kPa	100				**4.5m:** Casing at 4.5 mbgl.	

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 16/09/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
12/09/24 15:55 | 7.50m | 1.20 m bgl
13/09/24 07:30 | 7.50m | 2.90 m bgl
13/09/24 13:48 | 25.00m | 2.80 m bgl
16/09/24 09:00 | 25.00m | 14.27 m bgl
16/09/24 12:00 | 25.00m | 6.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Ophir Street Edinburgh Street**
Project Reference: **521290-064**

BH36

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1756480.85m
Northing: 5919223.39m
Ground level: 59.46m (NZVD2016)

Date started: 12/09/2024
Date completed: 16/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT	54				**5m:** SILT with some sand. Stiff, moist, high plasticity. [COMPLETELY WEATHERED ECBF]		5m: SPT 0,1// 1,2,2,2 N = 7	100					
HQ3		6		ERz	**5.75m to 5.98m:**...Very stiff.	MH		91				**5.45m:** ES BH36_5.45	
SPT	53				**6m:**...Moderately cemented relict bedding. **6.1m:**...Black carbonaceous material amorphous layer.		6m: SPT 1,2// 1,2,3,4 N = 10	100				**5.95m:** 5mm core loss. **6m:** Core moved in barrel during shear vane	
HQ3		7		ERs	**6.3m:** Silty fine SAND; grey. Firm, moist, moderate plasticity.	SM		95					
	52				**7m:** Highly weathered, grey, sandy SILTSTONE; extremely weak. Poorly cemented. Sand is fine. (Sandy SILT).		7.5m: SPT 2,4// 4,7,6,7 N = 24						
SPT		8			**7.64m to 7.66m:**...Silty fine to medium SANDSTONE; extremely weak. (Silty fine to medium SAND).			100				**7.95m:** ES BH36_7.95	
HQ3	51			EWz	**8.35m to 8.48m:**...Fine to medium SANDSTONE; extremely weak. (Fine to medium SAND). **8.48m to 8.59m:**...Very weak. Poorly cemented.	HW		100	11	11			
		9					9m: SPT 2,3// 4,4,6,7 N = 21						
SPT	50							100					
HQ3		10						100	0	0			

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 16/09/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
12/09/24 15:55 | 7.50m | 1.20 m bgl
13/09/24 07:30 | 7.50m | 2.90 m bgl
13/09/24 13:48 | 25.00m | 2.80 m bgl
16/09/24 09:00 | 25.00m | 14.27 m bgl
16/09/24 12:00 | 25.00m | 6.70 m bgl

Box 1
Box 2

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Ophir Street Edinburgh Street**
Project Reference: **521290-064**

BH36

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1756480.85m
Northing: 5919223.39m
Ground level: 59.46m (NZVD2016)

Date started: 12/09/2024
Date completed: 16/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	49			EWz	**7m:** Highly weathered, grey, sandy SILTSTONE; extremely weak. Poorly cemented. Sand is fine. (Sandy SILT).	HW		100	0	0			
SPT							10.5m: SPT 2,4// 4,5,6,6 N = 21	100					
HQ3	48	11			**11.4m:** Moderately weathered, grey, sandy SILTSTONE; very weak. Poorly cemented. **11.47m:**...Black carbonaceous material band, inclined 5°. **11.55m to 11.92m:**...Very weak. Poorly cemented.			100	100	100		**10.95m:** ES BH36_10.95 11.28m: BP 50°	
SPT	47	12			**11.92m to 11.96m:**...Silty fine to medium SANDSTONE; very weak.		12m: SPT 4,6// 6,15,11,10 N = 42	100					
HQ3	46	13			**12.83m to 12.95m:**...Fine to medium silty SANDSTONE. Black carbonaceous material layers inclined 20°. **13.12m:**...SANDSTONE, 10mm width, inclined 20°. **13.2m to 13.5m:**...Sandy SILTSTONE. Sand is fine to medium.	MW		100	95	95		12.95m: BP 20° 13.23m: BP 20°	
SPTC							13.5m: SPTC 5,10// 27,23 for 35mm N = 50+	N/A	N/A	N/A			
HQ3	45	14		EUz2	**13.76m:** Slightly weathered, grey, sandy SILTSTONE; very weak. Sand is fine to medium. **13.95m to 14.1m:**...SILTSTONE.	SW		91	91	85			
				EUs2	**14.1m to 14.15m:**...Silty SANDSTONE; extremely weak. Poorly cemented. **14.15m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW							
				EUz2	**14.52m:** Slightly weathered, grey, SILTSTONE; very weak.	SW							
				EUs2	**14.78m:** Slightly weathered, blueish grey, fine SANDSTONE; very weak. Poorly cemented.	SW						14.78m: BP 30°	
	15			EUx	**14.86m:** CORE LOSS.	SW							

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 16/09/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.

Water Level Readings:
Date Time | Hole Depth | Water Level
12/09/24 15:55 | 7.50m | 1.20 m bgl
13/09/24 07:30 | 7.50m | 2.90 m bgl
13/09/24 13:48 | 25.00m | 2.80 m bgl
16/09/24 09:00 | 25.00m | 14.27 m bgl
16/09/24 12:00 | 25.00m | 6.70 m bgl

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Ophir Street Edinburgh Street**
Project Reference: **521290-064**

BH36

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1756480.85m
Northing: 5919223.39m
Ground level: 59.46m (NZVD2016)

Date started: 12/09/2024
Date completed: 16/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS, WS, MWS, CS, VCS, ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPTC				EUx	**14.86m:** CORE LOSS.	SW	15m: SPTC 8,21// 50 N = 50+	N/A	N/A	N/A			
HQ3	44			EUz2	**15.23m:** Slightly weathered, grey, SILTSTONE; very weak.	SW						15.28m: BP 10°	
				EUs2	**15.4m:** Slightly weathered, grey, medium SANDSTONE; very weak. Moderately cemented.	SW						15.40m: BP 20° 15.48m to 15.60m: JT 70° Pl, Ro, Cl	
					15.65m: Slightly weathered, grey, SILTSTONE; very weak.			95	93	93			
	16				**16m to 16.04m:**...Fine to medium SANDSTONE layer with black carbonaceous material, inclined 20°. **16.04m to 16.15m:**...Sandy SILTSTONE. Sand is fine to medium. **16.15m to 16.25m:**...Fine to medium SANDSTONE. Well cemented.							16.00m: BP 20°	
	43												
SPTC							16.5m: SPTC 8,23// 50 for 45mm N = 50+	N/A	N/A	N/A			
HQ3					**16.84m:**...Two bands of black carbonaceous material band, 5mm width, inclined 30°. **16.9m to 16.92m:**...Amorphous black carbonaceous material band, up to 5mm thick, inclined 20°. **16.93m to 17.07m:**...Fine to medium SANDSTONE. Well cemented.							16.81m: BP 30° 17.07m: BP 40°	
	17												
	42				**17.31m to 17.48m:**...Sandy SILTSTONE.			100	100	100			
				EUz2	**17.7m to 17.74m:**...Fine to medium SANDSTONE. Moderately cemented.	SW						17.74m: BP 30°	
	18				**18.1m:**...Laminated SILTSTONE.							18.20m: BP 20°	
	41				**18.32m to 18.42m:**...Medium SANDSTONE. Well cemented. Black carbonaceous material disseminated. (Fault?)							18.37m: BP 25° 18.42m: BP 20°	
					18.59m to 18.75m:...Medium SANDSTONE. Well cemented. Black carbonaceous material disseminated. (Fault?)							18.57m: BP 20°	
					18.79m to 19.04m:...Medium SANDSTONE. Well cemented. Black carbonaceous material disseminated. (Fault?)			100	100	100		18.77m: BP 20°	
	19												
	40				**19.31m to 19.37m:**...Fine to medium SANDSTONE. Well cemented. Black carbonaceous material disseminated.							19.19m: BP 25°	
HQ3					**19.67m to 19.82m:**...Fine to medium SANDSTONE. Well cemented. Black carbonaceous material disseminated.			100	100	100		19.60m: BP 10°	
	20												

Box 4 | Box 5 | Box 6

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 16/09/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
12/09/24 15:55 | 7.50m | 1.20 m bgl
13/09/24 07:30 | 7.50m | 2.90 m bgl
13/09/24 13:48 | 25.00m | 2.80 m bgl
16/09/24 09:00 | 25.00m | 14.27 m bgl
16/09/24 12:00 | 25.00m | 6.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Ophir Street Edinburgh Street**
Project Reference: **521290-064**

BH36

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1756480.85m
Northing: 5919223.39m
Ground level: 59.46m (NZVD2016)

Date started: 12/09/2024
Date completed: 16/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	39	21		EUz2	**15.65m:** Slightly weathered, grey, SILTSTONE; very weak. **20.1m to 20.49m:**...Fibrous black carbonaceous material disseminated throughout. **20.53m to 20.9m:**...Sandy SILTSTONE. Sand is fine to medium. **20.7m to 20.92m:**...Fibrous brown carbonaceous material disseminated throughout. **21.12m to 21.2m:**...Fibrous brown carbonaceous material disseminated throughout.	SW		100	100	100			
HQ3	38	22		EUs2	**21.2m:** Slightly weathered, grey, silty fine SANDSTONE; very weak. Moderately cemented.	SW		100	100	100			
HQ3	37	23		EUz2	**22.34m:** Slightly weathered, grey, SILTSTONE; very weak. **22.5m to 22.62m:**...Silty SANDSTONE. Moderately cemented.	SW						**22.5m to 25m:** Water pressure permeability test (BH36_PPT01)	
				EUx	**22.51m to 22.57m:**...Fibrous black carbonaceous material layers.	SW							
					22.62m: CORE LOSS.								
HQ3	36	24		EUs2	**22.77m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Well cemented. **23.2m to 23.38m:**...Laminated SILTSTONE, inclined 5°. **23.38m to 23.41m:**...Laminated sandy SILTSTONE. Fibrous black carbonaceous material along boundary. **23.77m to 23.83m:**...Laminated SILTSTONE, inclined 5°.	SW		90	90	90			
HQ3	35	25		EUs1	**24.14m to 24.16m:**...SILTSTONE. **24.16m:** Slightly weathered, grey, fine silty SANDSTONE; extremely weak. Poorly cemented. (Silty fine SAND).	SW		100	100	100			
				EUz2	**24.6m:** Slightly weathered, grey, sandy SILTSTONE; very weak. Sand is fine.	SW							

Box 6
Box 7

REMARKS: End of borehole at 25m (Termination Depth Achieved)
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 16/09/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
12/09/24 15:55 | 7.50m | 1.20 m bgl
13/09/24 07:30 | 7.50m | 2.90 m bgl
13/09/24 13:48 | 25.00m | 2.80 m bgl
16/09/24 09:00 | 25.00m | 14.27 m bgl
16/09/24 12:00 | 25.00m | 6.70 m bgl

Database File: CC2 MOTIONS MASTER (02(JL).GPJ **Library file:** LIBRARY_20240925_V13 (1).GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 MOTIONS CATCHMENT IMPROVEMENTS.LOG **Date Generated:** 18/02/2025

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Gundry Street**
Project Reference: **521290-064**

BH38

Sheet **1** of **5**

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1756411.17m	Date started:	19/09/2024	Logged by:	AP
Equipment:	Massenza MM3	Northing:	5919146.11m	Date completed:	23/09/2024	Input by:	AP
Contractor:	McMillan Drilling NI Ltd	Ground level:	53.87m (NZVD2016)	Inclination:	90°	Checked by:	PK
				Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	54			P	**0m:** ASPHALT.							**0m: FILL**	
				Fg	**0.1m:** Medium to coarse GRAVEL. Tightly packed. Gravel is slightly weathered, sub-angular to angular basalt. [FILL]							**0.5m to 0.6m:** ES BH38_0.5-0.6	
				Fc	**0.6m:** CLAY; orange grey. Firm, moist, high plasticity.								
		1			**0.8m:** SILT; dark grey. Firm, moist, moderate plasticity. [RESIDUAL SOIL ECBF]							**0.8m: EAST COAST BAYS FORMATION**	
	55						1.1m: ISHSV=30/6kPa	0				**1.1m to 1.2m:** ES BH38_1.1-1.2	
					1.5m:...Minor fibrous rootlets.		1.5m: ISHSV=41/12kPa					**1.5m to 1.6m:** ES BH38_1.5-1.6	
		2		ERz		ML							
	56												
HQ3					**2.5m:** Clayey SILT; grey with mottled orange. Stiff, moist, high plasticity. [COMPLETELY WEATHERED ECBF] **2.55m to 2.7m:**...Black carbonaceous material disseminated throughout.	CL-ML	2.5m: ISHSV=53/37kPa	100					
		3											
U54	57			ERx	**3m:** PUSH TUBE. Clayey SILT; grey mottled orange. Very stiff, moist, moderate plasticity. **3.25m:**...Dark orangey brown vein infilled with small pyrite crystals. **3.3m:**...SILTSTONE; grey. extremely weak to very weak. Moderately cemented.			100					
SPT					**3.5m:** Highly weathered, grey, silty fine SANDSTONE; extremely weak. Moderately cemented. (Silty fine SAND).	HW	N = 50+	100				**3.8m:** Stopped SPT prematurely due to checking that we weren't encountering a service.	
		4										**4m:** Casing to 4m bgl.	
HQ3	58			EWs	**3.95m:** Moderately weathered, grey, fine SANDSTONE; very weak. Well cemented.			100	59	51		**4.05m to 4.15m:** Weakly cemented.	
												4.35m: JI 45° Pl, Ro, Cl	
					4.45m to 4.5m:...SILSTONE; very weak.	MW	4.5m: SPTC 4,8// 11,11,11,10 N = 43					**4.5m:** Moved to SPTc due to competent ground.	
SPTC								N/A	N/A	N/A			
		5				MW		100	100	100			

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 5cm and vertical accuracy of 7cm.
2) Geophysical profiling undertaken downhole on 24/09/2024, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 18m bgl (BH38_PZ01). S/N: 376323.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:

Date Time	Hole Depth	Water Level
19/09/24 15:20	12.00m	1.23 m bgl
20/09/24 07:45	12.00m	2.81 m bgl
20/09/24 11:34	16.50m	1.10 m bgl
23/09/24 08:00	16.50m	3.60 m bgl
23/09/24 09:10	20.00m	2.00 m bgl
25/09/24 07:30	20.00m	3.50 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Gundry Street**
Project Reference: **521290-064**

BH38

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1756411.17m
Northing: 5919146.11m
Ground level: 53.87m (NZVD2016)

Date started: 19/09/2024
Date completed: 23/09/2024
Inclination: 90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 1 HQ3	59			EWz	**4.95m:** Moderately weathered, grey, SILTSTONE. Extremely weak. (SILT). **5.07m to 5.23m:**...Laminated SILTSTONE; very weak. **5.23m to 5.37m:**...Sandy SILTSTONE. Sand is fine to medium.	MW						5.06m: BP 10° Pl, Ro, Cl	
				EWs	**5.37m:** Moderately weathered, grey, fine to medium SANDSTONE; very weak. Well cemented.	MW		100	100	100		5.36m: BP 10° Pl, Ro, Cl	
		6		EWz	**5.7m:** Moderately weathered, grey, SILTSTONE; extremely weak. (SILT). **5.82m to 5.87m:**...Very weak. **5.87m to 6m:**...Sandy SILTSTONE; very weak. Sand is fine to medium. Black carbonaceous material disseminated throughout, <2mm thick.	MW							
SPTC	60						6m: SPTC 8,42 for 145mm// N = 50+	N/A	N/A	N/A			
HQ3				EUs2	**6.15m:** Slightly weathered, grey, fine SANDSTONE; weak. Well cemented. **6.37m to 6.5m:**...Sandy SILTSTONE; very weak.	SW							
		7		EUz2	**6.5m:** Slightly weathered, grey, SILTSTONE; very weak. **6.87m to 6.98m:**...Sandy SILTSTONE. **6.98m to 7.07m:**...Oxidised greenish grey. extremely weak. (Silty fine SAND). Poorly cemented. **7.23m to 7.33m:**...SILTSTONE with some fine sand; extremely weak. (SILT with some sand).	SW		96	90	90		6.86m: JT 45° Pl, Sm, Cl	
	61											**7.45m:** 50mm of core loss.	
SPTC							7.5m: SPTC 5,18// 32,18 for 20mm N = 50+	N/A	N/A	N/A			
Box 2 HQ3		8		EUs2	**7.75m:** Slightly weathered, grey, silty fine SANDSTONE; very weak. Well cemented. **7.88m to 8.3m:**...Fine SANDSTONE; weak. Well cemented.	SW						8.00m: JT 80° Un, Ro, Cl	
	62				**8.3m to 8.35m:**...SILTSTONE; very weak. **8.35m to 8.6m:**...Silty fine to medium SANDSTONE. Moderately cemented. **8.4m to 8.6m:**...Black carbonaceous material disseminated throughout <3mm.			100	100	100		8.30m: BP 20°	
					8.6m: Slightly weathered, grey, SILTSTONE; very weak.								
		9					9m: SPTC 7,10// 12,13,18,7 for 30mm N = 50+						
SPTC	63			EUz2		SW		N/A	N/A	N/A			
Box 3 HQ3					**9.41m to 10.3m:**...Sandy SILTSTONE; weak.			100	100	100		9.65m: BP 30°	
		10											

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 5cm and vertical accuracy of 7cm.
2) Geophysical profiling undertaken downhole on 24/09/2024, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 18m bgl (BH38_PZ01). S/N: 376323.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
19/09/24 15:20 | 12.00m | 1.23 m bgl
20/09/24 07:45 | 12.00m | 2.81 m bgl
20/09/24 11:34 | 16.50m | 1.10 m bgl
23/09/24 08:00 | 16.50m | 3.60 m bgl
23/09/24 09:10 | 20.00m | 2.00 m bgl
25/09/24 07:30 | 20.00m | 3.50 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Gundry Street**
Project Reference: **521290-064**

BH38

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1756411.17m
Northing: 5919146.11m
Ground level: 53.87m (NZVD2016)

Date started: 19/09/2024
Date completed: 23/09/2024
Inclination: 90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	64	11		EUz2	**8.6m:** Slightly weathered, grey, SILTSTONE; very weak. **10m to 10.18m:**...Silty fine SANDSTONE; very weak. Moderately cemented. **10.18m to 10.3m:**...Fine to medium SANDSTONE; very weak. Well cemented. **10.3m to 11.16m:**...Weak.	SW SW		100	100	100		10.15m: JT 30° Pl, Sm, Cl 10.31m: BP 30°	
HQ3	65	12		EUs2	**11.16m:** Slightly weathered, grey, silty fine to medium SANDSTONE; extremely weak. Moderately cemented. Black carbonaceous material disseminated.(Silty fine to medium SAND). **11.5m to 11.64m:**...SILTSTONE; weak. **11.66m to 11.8m:**...SILTSTONE; weak. **11.86m to 11.91m:**...SILTSTONE; weak.	SW		100	100	100		11.65m: BP 20° 11.85m: BP 20°	
HQ3	66	13		EUz2 EUs2 EUz2	**12m:** Slightly weathered, grey, SILTSTONE; weak. **12.23m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Poorly cemented. **12.54m:** Slightly weathered, grey, SILTSTONE; weak. **13.23m to 13.34m:**...Fine to medium SANDSTONE. **13.24m:**...Black carbonaceous material layer, 3mm thick.	SW SW SW		100	100	92		12.12m: JT 10° Pl, Ro, Cl 12.18m: JT 40° Pl, Ro, Cl 12.31m to 12.39m: JT 45° Pl, Ro, Cl 12.59m: JT 5° Pl, Ro, Cl 12.83m: JT 5° Pl, Ro, Cl 13.05m: JT 5° Pl, Ro, Cl 13.34m: JT 5° Pl, Ro, Cl	
HQ3	67	14		EUs2 EUz2 EUs2	**13.7m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Poorly cemented. **14.22m:**...Black carbonaceous material sub-horizontal layer, 10mm thick. **14.38m:** Slightly weathered, grey, SILTSTONE; weak. **14.52m:** Slightly weathered, grey, fine to medium SANDSTONE; weak. Well cemented. **14.83m to 14.9m:**...SILTSTONE.	SW SW SW		100	100	100		13.66m: JT 10° Pl, Ro, Cl 13.74m: JT 5° Pl, Ro, Cl 14.39m: BP 5° Pl, Ro, Cl	
HQ3	68	15		EUx	**14.9m:** CORE LOSS.	SW							

Box 4

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 5cm and vertical accuracy of 7cm.
2) Geophysical profiling undertaken downhole on 24/09/2024, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 18m bgl (BH38_PZ01). S/N: 376323.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
19/09/24 15:20 | 12.00m | 1.23 m bgl
20/09/24 07:45 | 12.00m | 2.81 m bgl
20/09/24 11:34 | 16.50m | 1.10 m bgl
23/09/24 08:00 | 16.50m | 3.60 m bgl
23/09/24 09:10 | 20.00m | 2.00 m bgl
25/09/24 07:30 | 20.00m | 3.50 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Gundry Street**
Project Reference: **521290-064**

BH38

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling NI Ltd

CO-ORDINATES: NZTM2000
Easting: 1756411.17m
Northing: 5919146.11m
Ground level: 53.87m (NZVD2016)

Date started: 19/09/2024
Date completed: 23/09/2024
Inclination: 90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3 Box 4	69			EUs2	**15m:** Slightly weathered, grey, fine to medium SANDSTONE; weak. Well cemented.	SW							
				EUz2	**15.2m:** Slightly weathered, grey, SILTSTONE; weak. **15.25m to 15.3m:**...Poorly cemented. **15.64m to 15.68m:**...Fine to medium SANDSTONE. **15.77m to 15.9m:**...Fine to medium SANDSTONE.	SW		97	94	93		15.21m: JT 5° Pl, Ro, Cl 15.44m: JT 5° Pl, Ro, Cl 15.47m: BP 5° Pl, Ro, Cl	
	70	16			**16.16m to 16.33m:**...Laminations of black carbonaceous material within the SILTSTONE. 10-15mm thick.							**16.45m to 16.5m:** 50mm of core loss.	
HQ3 Box 5	71	17		EUs2	**16.75m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW		100	100	97		16.75m: BPJT 5° 16.85m: BPJT 5°	
	72	18			**18m to 18.1m:**...Extremely weak. (Fine to medium SAND). **18.17m to 18.2m:**...Black carbonaceous material laminations, 30mm thick. **18.2m to 18.5m:**...Extremely weak (Fine to medium SAND).							18.40m: CZ 18.45m: CZ 18.50m: CZ 18.59m: CZ	
HQ3 Box 6				EUz2	**18.5m:** Slightly weathered, grey, SILTSTONE; very weak. **18.6m:**...Black carbonaceous material laminations, 30mm thick. **19m:**...Black carbonaceous material laminations, 30mm thick.	SW		73	63	63		18.70m: JI 45° Pl, Ro, Cl	
	73	19		EUx	**19.1m:** CORE LOSS.	SW							
HQ3				EUz2	**19.5m:** Slightly weathered, grey, SILTSTONE; weak.	SW		100	94	94		19.77m: JI 10° Un, Ro, Cl	
		20		EUs2	**19.77m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **19.9m to 19.95m:**...Poorly cemented.	SW							

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 5cm and vertical accuracy of 7cm.
2) Geophysical profiling undertaken downhole on 24/09/2024, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 18m bgl (BH38_PZ01). S/N: 376323.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
19/09/24 15:20 | 12.00m | 1.23 m bgl
20/09/24 07:45 | 12.00m | 2.81 m bgl
20/09/24 11:34 | 16.50m | 1.10 m bgl
23/09/24 08:00 | 16.50m | 3.60 m bgl
23/09/24 09:10 | 20.00m | 2.00 m bgl
25/09/24 07:30 | 20.00m | 3.50 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Gundry Street**
Project Reference: **521290-064**

BH38

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1756411.17m	Date started:	19/09/2024	Logged by:	AP
Equipment:	Massenza MM3	Northing:	5919146.11m	Date completed:	23/09/2024	Input by:	AP
Contractor:	McMillan Drilling NI Ltd	Ground level:	53.87m (NZVD2016)	Inclination:	90°	Checked by:	PK
				Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
					19.95m to 20m:...Extremely weak. (SAND). End of borehole at 20m (Termination Depth Achieved)								

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 5cm and vertical accuracy of 7cm.
2) Geophysical profiling undertaken downhole on 24/09/2024, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 18m bgl (BH38_PZ01). S/N: 376323.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:

Date Time	Hole Depth	Water Level
19/09/24 15:20	12.00m	1.23 m bgl
20/09/24 07:45	12.00m	2.81 m bgl
20/09/24 11:34	16.50m	1.10 m bgl
23/09/24 08:00	16.50m	3.60 m bgl
23/09/24 09:10	20.00m	2.00 m bgl
25/09/24 07:30	20.00m	3.50 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **15 Burgoyne Street**
Project Reference: **521290-064**

BH39

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Techdrill 250 HD
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756274.10m
Northing: 5919024.79m
Ground level: 51.15m (NZVD2016)

Date started: 15/07/2024
Date completed: 19/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	51			P	**0m:** ASPHALT.							**0m: FILL**	
				FEg	**0.05m:** Clayey medium to coarse GRAVEL; yellow brown. Tightly packed, moist. Gravel is slightly weathered, sub-angular basalt. Brick fragments <200mm. [FILL]	GC						**0.2m to 0.3m:** ES BH39_0.2-0.3	
				FEc	**0.35m:** Silty CLAY; brown. Very stiff, moist, high plasticity.	CH	0.55m: ISHSV=65/3kPa					**0.5m to 0.6m:** ES BH39_0.5-0.6	
					0.75m to 1.3m:...Orange brown.								
	50	1					1m: ISHSV=133/59kPa	0				**1m to 1.1m:** ES BH39_1-1.1	
				ERc	**1.3m:** CLAY; light grey orange mottling. Very stiff, moist, high plasticity. Minor rootlets. [RESIDUAL ECBF].	CH	1.5m: ISHSV=130/41kPa					**1.3m: EAST COAST BAY FORMATION** **1.5m to 1.6m:** ES BH39_1.5-1.6	
HQ3	49	2					2m: ISHSV=157/24kPa					**1.9m to 2m:** ES BH39_1.9-2	
					2.28m: CLAY; light grey with mottling. Very stiff, moist, high plasticity. [COMPLETELY WEATHERED ECBF].			100				**2.4m:** Relict rock fabric	
SPT	48	3				CH	3m: IBHSV=67/18kPa 3m: SPT 1,1// 1,1,1,1 N = 4	100				**3m:** Relict rock fabric and lithorelicts. **3.01m to 3.45m:** ES BH39_3-3.45	
HQ3	47	4		EWz	**3.85m:** Highly weathered, grey, sandy SILTSTONE; extremely weak. (Sandy SILT).	HW		95				4.00m: BP 25°	
					4.2m to 4.26m:...Black carbonaceous laminae disseminated in bands (0-5°).								
SPT		5		EWs	**4.7m:** Highly weathered, grey, fine to medium SANDSTONE; extremely weak, moderately cemented. (Fine to medium SAND).	HW	4.5m: IBHSV=UTP 4.5m: SPT 1,2// 3,5,6,7 N = 21	100				**4.45m:** Core loss 50mm, core washed out bottom. **4.5m to 4.95m:** ES BH39_4.5-4.95	
								71					

Box 1

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 12cm and vertical accuracy of 14cm.
2) Geophysical profiling undertaken downhole on 19/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) was installed at 22 m bgl (BH39_PZ01). S/N: 361306.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
17/07/24 16:00 | 12.45m | 2.37 m bgl
18/07/24 08:00 | 12.45m | 2.53 m bgl
18/07/24 15:20 | 30.00m | 1.63 m bgl
19/07/24 08:00 | 30.00m | 3.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **15 Burgoyne Street**
Project Reference: **521290-064**

BH39

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Techdrill 250 HD
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756274.10m
Northing: 5919024.79m
Ground level: 51.15m (NZVD2016)

Date started: 15/07/2024
Date completed: 19/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 1 HQ3	46			EWs	**4.7m:** Highly weathered, grey, fine to medium SANDSTONE; extremely weak, moderately cemented. (Fine to medium SAND).	HW							
					5.35m:...Black carbonaceous material band 10mm width, 5 °.			71				5.52m: JI 10° Pl, Oxidised green	
		6		EWx	**5.7m:** CORE LOSS	HW							
SPT	45			EWz	**6m:** Highly weathered, grey, sandy SILTSTONE; very weak.	HW	6m: SPT 1,3// 4,5,7,8 N = 24	100				**6m to 6.45m:** ES BH39_6-6.45	
Box 2 HQ3		7		EWs	**6.55m:** Highly weathered, grey, fine to medium SANDSTONE; very weak, moderately cemented. Greenish grey veins. **6.7m to 6.95m:**...Greenish grey.	HW		100	90	76			
	44				**7.02m to 7.22m:**...Weak.							7.05m to 7.15m: JT 70° Pl, Sm, Cl	
				EWz	**7.19m:** Highly weathered, grey, SILTSTONE; very weak.							7.19m: BP 20° 7.20m: JT 65° Pl, Ro, Cl 7.30m: JT 70° Pl, Sm, Vn	
SPT					**7.55m to 7.85m:**...Fine SANDSTONE.	HW	7.5m: SPT 6,7// 7,13,17,13 for 60mm N = 50+	100				**7.5m to 7.95m:** ES BH39_7.5-7.95	
		8										**7.95m:** Crushed during removal from splits. 7.97m: JT 40° Pl, Ro, Cl	
HQ3	43				**8.11m to 8.18m:**...Fine to medium SANDSTONE; very weak. White veins inclined 80°, calcite?.							8.20m: BP 25°	
				EWs	**8.47m:** Highly weathered, greenish grey, fine to medium SANDSTONE; extremely weak, poorly cemented. (Fine to medium SAND)	HW		100	96	96		8.50m: BP 30°	
		9			**8.95m to 9m:**...Silty SANDSTONE.		9m: SPT 4,6// 4,7,10,13 N = 34					**9m to 9.45m:** ES BH39_9-9.45	
Box 3 SPT	42			EWz	**9m:** Highly weathered, grey, sandy SILTSTONE; very weak. Sand is fine to medium.	HW		100					
HQ3				EWs	**9.64m:** Highly weathered, grey, fine to medium SANDSTONE; very weak, moderately cemented.	HW		100	100	100			
		10											

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 12cm and vertical accuracy of 14cm.
2) Geophysical profiling undertaken downhole on 19/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) was installed at 22 m bgl (BH39_PZ01). S/N: 361306.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
17/07/24 16:00 | 12.45m | 2.37 m bgl
18/07/24 08:00 | 12.45m | 2.53 m bgl
18/07/24 15:20 | 30.00m | 1.63 m bgl
19/07/24 08:00 | 30.00m | 3.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **15 Burgoyne Street**
Project Reference: **521290-064**

BH39

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Techdrill 250 HD
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756274.10m
Northing: 5919024.79m
Ground level: 51.15m (NZVD2016)

Date started: 15/07/2024
Date completed: 19/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	41			EWs	**9.64m:** Highly weathered, grey, fine to medium SANDSTONE; very weak, moderately cemented. **10.27m:**...SILTSTONE, 5mm band. **10.29m:**...SILTSTONE, 5mm band. **10.33m:**...SILTSTONE, 5mm band. **10.37m:**...SILTSTONE, 5mm band.	HW		100	100	100			
SPT		11		EWz	**10.5m:** Highly weathered, grey, sandy SILTSTONE; extremely weak. Sand is fine to medium. (Sandy SILT)	HW	10.5m: SPT 8,7// 6,7,12,9 N = 34	100				**10.5m to 10.95m:** ES BH39_10.5-10.95	
HQ3	40			EWz	**11.13m:** Moderately weathered, grey, SILTSTONE; weak. **11.29m to 11.3m:**...Band of pink siltstone, inclined 5°. **11.31m:**...5mm band of pink siltstone, inclined 5°. **11.41m to 11.77m:**...Very weak.	MW		100	96	96		11.25m: BP 30° 11.40m: BP 20°	
SPT	39	12		EWs	**11.96m:** Moderately weathered, grey, fine to medium SANDSTONE; very weak, moderately cemented.	MW	12m: SPT 3,8// 12,17,21 for 15mm N = 50+	100				**12m to 12.45m:** ES BH39_12-12.45	
				EWz	**12.18m:** Slightly weathered, grey, SILTSTONE; very weak.	MW						**12.45m:** 20% driling fluid loss over 12.45m.	
HQ3	38	13		EUs2	**12.65m:** Slightly weathered, grey, fine to medium SANDSTONE; weak, well cemented. Black carbonaceous material bands <2mm, inclined 5°. **12.78m:** Slightly weathered, grey, SILTSTONE; very weak. **12.82m to 12.84m:**...Band of pink siltstone, 40°. **13.18m to 13.22m:**...Fine to medium SANDSTONE.	SW		100	100	100		**12.6m:** Core damaged on transferral to box. 12.77m: JT 40° Pl, Sm, Cl	
SPTC					**13.4m to 13.5m:**...Fine to medium SANDSTONE. Thinly laminated bedding 0-5°.		13.5m: SPTC 10,40 for 99mm// N = 50+	N/A	N/A	N/A		**13.5m:** Changed to SPTc due to competent rock.	
HQ3	37	14		EUz2	**13.62m to 15m:**...Weak **14.2m to 14.29m:**...Fine to medium SANDSTONE. **14.42m to 14.59m:**...Fine to medium SANDSTONE.	SW		94	94	94		14.49m: BP 30°	
		15										**14.92m:** Core loss 80mm, core washed out	

Box 3
Box 4

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 12cm and vertical accuracy of 14cm.
2) Geophysical profiling undertaken downhole on 19/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) was installed at 22 m bgl (BH39_PZ01). S/N: 361306.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
17/07/24 16:00 | 12.45m | 2.37 m bgl
18/07/24 08:00 | 12.45m | 2.53 m bgl
18/07/24 15:20 | 30.00m | 1.63 m bgl
19/07/24 08:00 | 30.00m | 3.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **15 Burgoyne Street**
Project Reference: **521290-064**

BH39

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Techdrill 250 HD
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756274.10m
Northing: 5919024.79m
Ground level: 51.15m (NZVD2016)

Date started: 15/07/2024
Date completed: 19/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPTC					**12.78m:** Slightly weathered, grey, SILTSTONE; very weak.	SW	15m: SPTC 26,24 for 105mm// N = 50+	N/A	N/A	N/A		bottom.	
HQ3	36			EUs	**15.11m:** Slightly weathered, fine to medium SANDSTONE; weak, well cemented.	SW		100	94	94		15.24m: JT 20° Un, Ro, Cl 15.39m to 15.48m: JT 50° Pl, Sm, Cl	
		16			**15.56m to 15.65m:**...SILTSTONE.							15.60m: BP 25°	
	35				**16.39m:** Slightly weathered, grey, SILTSTONE; weak.	SW		100	97	97		**16.5m to 18m:** Core damaged during removal from splits.	
HQ3		17			**16.8m to 16.93m:**...Fine to medium SANDSTONE.								
	34				**17.13m:** Slightly weathered, grey, fine to medium SANDSTONE; weak, well cemented. Inclined 5°.							17.35m: JT 15° Pl, Sm, Cl 17.65m: JT 25° Pl, Sm, Cl	
		18		EUs2									
	33				**18.5m to 18.57m:**...SILTSTONE.	SW		100	100	100			
HQ3		19			**19.14m to 19.35m:**...SILTSTONE.								
	32				**19.42m to 19.49m:**...SILTSTONE.								
					19.57m to 19.67m:...SILTSTONE.								
HQ3					**19.68m to 19.8m:**...Silty SANDSTONE; very weak, moderately cemented.			100	100	100			
		20		EUz2	**19.8m:** Slightly weathered, grey, SILTSTONE; very weak.	SW						19.90m: BP 10°	

Box 5
Box 6

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 12cm and vertical accuracy of 14cm.
2) Geophysical profiling undertaken downhole on 19/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) was installed at 22 m bgl (BH39_PZ01). S/N: 361306.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
17/07/24 16:00 | 12.45m | 2.37 m bgl
18/07/24 08:00 | 12.45m | 2.53 m bgl
18/07/24 15:20 | 30.00m | 1.63 m bgl
19/07/24 08:00 | 30.00m | 3.70 m bgl

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BH39

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Techdrill 250 HD
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756274.10m
Northing: 5919024.79m
Ground level: 51.15m (NZVD2016)

Date started: 15/07/2024
Date completed: 19/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	31	21		EUz2	**19.8m:** Slightly weathered, grey, SILTSTONE; very weak. **20.23m to 20.3m:**...Fine to medium SANDSTONE. **20.7m to 20.8m:**...Fine to medium SANDSTONE.	SW		100	100	100		**20.5m to 23.5m:** Water pressure permeability test (BH39_PPT01) 20.80m: BP 35°	
HQ3	30	22			**21.07m to 21.12m:**...Fine to medium SANDSTONE								
HQ3	29	23		EUs2	**21.4m:** Slightly weathered, grey, fine to medium SANDSTONE; weak, well cemented. Black carbonaceous material dissemenated throughout, <2mm. **21.7m to 21.98m:**...Calcite veins disseminated? **22.36m to 22.54m:**...SILTSTONE. **22.46m:**...Black carbonaceous material band 20mm width, 0-5°.	SW		100	92	92		22.00m to 22.12m: JT 60° Un, Sm, Cl	
HQ3	28	24			**23.65m to 24.1m:**...SILTSTONE. Black carbonaceous material on bottom boundary.			100	100	100		23.65m: BP 20°	
HQ3	27	25			**24.8m to 25.03m:**...SILTSTONE.			100	100	97			

Box 6 Box 7 Box 8

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 12cm and vertical accuracy of 14cm.
2) Geophysical profiling undertaken downhole on 19/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) was installed at 22 m bgl (BH39_PZ01). S/N: 361306.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
17/07/24 16:00 | 12.45m | 2.37 m bgl
18/07/24 08:00 | 12.45m | 2.53 m bgl
18/07/24 15:20 | 30.00m | 1.63 m bgl
19/07/24 08:00 | 30.00m | 3.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **15 Burgoyne Street**
Project Reference: **521290-064**

BH39

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Techdrill 250 HD
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756274.10m
Northing: 5919024.79m
Ground level: 51.15m (NZVD2016)

Date started: 15/07/2024
Date completed: 19/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	26				**21.4m:** Slightly weathered, grey, fine to medium SANDSTONE; weak, well cemented. Black carbonaceous material dissemenated throughout, <2mm.			100	100	97		25.03m: BP 45°	
HQ3	25	26			**25.95m to 26.2m:**...SILTSTONE.							25.95m: BP 60°	
					26.2m to 26.7m:...Very weak.			100	100	100			
		27			**26.7m to 27.02m:**...SILTSTONE. Black carbonaceous material disseminated along bottom boundary.							26.70m: BP 60°	
HQ3	24			EUs2	**27.1m to 27.67m:**...Sandy SILTSTONE; very weak. Fine sand.	SW							
	23	28			**27.67m to 28.35m:**...Very weak, poorly cemented.			100	100	100			
HQ3	22	29			**28.84m to 28.94m:**...SILTSTONE; weak. **28.94m to 29.09m:**...Very weak, moderately cemented. Black carbonaceous material dissemeninated throughout. **29.09m to 29.23m:**...SILTSTONE. **29.23m to 29.28m:**...Very weak, moderately cemented. Black carbonaceous material disseminated. **29.3m to 29.32m:**...SILTSTONE; weak.			100	100	100			
					29.4m: Slightly weathered, grey, SILTSTONE; weak.								
		30		EUz2		SW							

REMARKS: End of borehole at 30m (Termination Depth Achieved)
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 12cm and vertical accuracy of 14cm.
2) Geophysical profiling undertaken downhole on 19/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) was installed at 22 m bgl (BH39_PZ01). S/N: 361306.

Water Level Readings:
Date Time | Hole Depth | Water Level
17/07/24 16:00 | 12.45m | 2.37 m bgl
18/07/24 08:00 | 12.45m | 2.53 m bgl
18/07/24 15:20 | 30.00m | 1.63 m bgl
19/07/24 08:00 | 30.00m | 3.70 m bgl

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **17 Fleet Street**
Project Reference: **521290-064**

BH43

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Canter Rig 86
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756551.51m
Northing: 5918779.20m
Ground level: 42.58m (NZVD2016)

Date started: 24/09/2024
Date completed: 27/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: CSR
Input by: CSR
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX				F	**0m:** ASPHALT							**0m: FILL**	
					0.1m: Fine to medium GRAVEL with minor silt, dark grey. Tightly packed. Gravel is subangular, greywacke. [FILL]	GP						0.10m to 0.45m: [GAP 40]	
	42				**0.45m:** Silty CLAY with minor gravel and trace anthropogenic material; light brown. Very stiff, moist, high plasticity. Gravel is fine to coarse, subangular, dark grey, moderately strong, slightly weathered basalt and greywacke. Anthropogenic material is weathered brick.		0.5m: ISHSV=UTP						
		1					1m: ISHSV=171/16kPa						
						CH							
	41				**1.5m:**...stiff.		1.5m: ISHSV=69/26kPa						
		2											
					2m: SILT with some clay and trace gravel; light brown mottled reddish brown. Stiff, moist, low plasticity.								
							2.3m: ISHSV=89/20kPa						
	40					ML							
		3					3m: ISHSV=102/33kPa						
SPT							3m: SPT 0,0// 0,1,2,2 N = 5	44					
					3.2m: CLAY with some silt; light grey mottled light brown. Stiff, moist, high plasticity.	CH						**3.2m to 3.45m:** No recovery.	
HQ3	39				**3.45m:** CORE LOSS							3.45m: Core loss caused by cobble being dislodged during hydroexcavation.	
		4						10					
				TAc	**4.4m:** CLAY with some silt; light grey mottled light brown. Stiff, moist, high plasticity. [UNDIFFERENTIAL ALLUVIUM]	CH						**4.4m: TAURANGA GROUP ALLUVIUM**	
U54	38						4.5m: IBHSV=30kPa						
				TA	**4.5m:** PUSH TUBE. Sandy CLAY; light grey mottled light brown with occasional organics. Stiff, moist, high plasticity. Sand is fine to coarse			100					
		5			**4.7m:**...CLAY with some fine sand; light brown. **4.9m:**...Intermixed CLAY and SILT with siltstone gravel.								

Box 1

REMARKS:
(1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.

Water Level Readings:
Date Time | Hole Depth | Water Level
25/09/24 15:41 | 4.50m | 1.66 m bgl
26/09/24 10:00 | 4.50m | 2.70 m bgl
26/09/24 16:54 | 18.00m | 4.60 m bgl
27/09/24 10:30 | 18.00m | 1.60 m bgl

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **17 Fleet Street**
Project Reference: **521290-064**

BH43

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Canter Rig 86
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756551.51m
Northing: 5918779.20m
Ground level: 42.58m (NZVD2016)

Date started: 24/09/2024
Date completed: 27/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: CSR
Input by: CSR
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
				TAx	**5m:** CORE LOSS								
HQ3	37	6		TAz	**5.3m:** SILT with some clay; dark brown. Soft, moist, low plasticity.	ML							
				TAc	**5.45m:** Silty CLAY; bluish grey. Firm, moist, high plasticity.	CH		70					
SPT				EWc	**5.95m:**...some gravel. Gravel is fine to medium, subrounded, highly weathered sandstone. **6m:** Highly weathered, grey SILTSTONE; extremely weak. (Silty CLAY; stiff). [COMPLETELY WEATHERED ECBF]	HW	6m: SPT 1,1// 0,2,2,2 N = 6	89				**6m: EAST COAST BAYS FORMATION**	
Box 1 HQ3	36	7		EWz	**6.45m:** Highly weathered, brownish grey SILTSTONE; extremely weak. (Clayey SILT with trace sand)	HW		100	76	76		**6.4m to 6.45m:** No recovery.	
				EWs	**6.65m:** Moderately weathered, grey SILTSTONE; very weak. **6.7m:** Moderately weathered, grey, fine to medium SANDSTONE; very weak.	MW						**7.3m:** Black carbonaceous laminations, 2mm, inclined 10°.	
SPT	35	8		EUz2	**7.2m:** Slightly weathered, grey SILTSTONE; very weak.	SW	7.5m: SPT 2,8// 10,14,16,10 for 30mm N = 50+	100					
Box 2 HQ3	34	9			**7.95m to 10.4m:**...trace sandstone interbeds, <5mm.			100	100	100		8.20m: BP 5° 8.65m: BP 10° 8.80m: BP 8°	
SPTC							9m: SPTC 11,39 for 115mm// N = 50+	N/A	N/A	N/A			
HQ3	33	10						94	94	94		**9.4m:** Ripup clasts. 9.51m: BP 14° 9.71m: JT 8° Un, Ro, Cl	

REMARKS:
(1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

Water Level Readings:
Date Time | Hole Depth | Water Level
25/09/24 15:41 | 4.50m | 1.66 m bgl
26/09/24 10:00 | 4.50m | 2.70 m bgl
26/09/24 16:54 | 18.00m | 4.60 m bgl
27/09/24 10:30 | 18.00m | 1.60 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **17 Fleet Street**
Project Reference: **521290-064**

BH43

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Canter Rig 86
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756551.51m
Northing: 5918779.20m
Ground level: 42.58m (NZVD2016)

Date started: 24/09/2024
Date completed: 27/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: CSR
Input by: CSR
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUz2	**7.2m:** Slightly weathered, grey SILTSTONE; very weak.	SW		94	94	94		10.07m: BP 10°	
				EUx	**10.4m:** CORE LOSS								
SPTC	32			EUz2	**10.5m:** Slightly weathered, grey SILTSTONE; very weak.		10.5m: SPTC 7,22// 50 for 70mm N = 50+	N/A	N/A	N/A			
HQ3		11						100	100	92		11.00m: JT 6° Un, Ro, Cl 11.12m: JT 12° Un, Ro, Cl 11.22m: BP 12° 11.40m: BP 12°	
	31				**11.76m to 11.82m:**...fine SANDSTONE; moderately cemented.							11.70m: JT 14° St, Sm, Co, (Infill: clay) 11.78m: BP 14°	
		12				SW						**12m:** Ripup clasts.	
	30											12.17m: BP 6° 12.20m: BP 6°	
					12.71m to 12.86m:...fine SANDSTONE; moderately cemented.			100	100	97		12.68m: JT 12° St, Sm, Co, (Infill: clay)	
		13										13.10m: JT 12° Un, Ro, Cl	
					13.3m to 13.38m:...silty fine SANDSTONE, poorly cemented.							13.35m: JT 6° Un, Ro, Co, (Infill: clay) 13.40m: JT 20° St, Sm, Co, (Infill: clay)	
	29											13.60m: JT 5° St, Sm, Cl 13.70m: BP 4°	
		14		EUs2	**13.93m:** Slightly weathered, grey, fine SANDSTONE; very weak. Moderately cemented. Disseminated black carbonaceous matter flecks. **13.97m to 14.2m:**...weak, well cemented.	SW							
				EUz2	**14.26m:** Slightly weathered, grey SILTSTONE; very weak.			100	100	100		14.25m: JT 5° Un, Ro, Cl	
	28				**14.5m to 14.7m:**...silty fine SANDSTONE; very weak. Alternating beds, 1-10mm thick, well cemented and poorly cemented.	SW						14.61m: BP 20°	
		15											

Box 2 | Box 3 | Box 4

REMARKS:
(1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.

Water Level Readings:
Date Time | Hole Depth | Water Level
25/09/24 15:41 | 4.50m | 1.66 m bgl
26/09/24 10:00 | 4.50m | 2.70 m bgl
26/09/24 16:54 | 18.00m | 4.60 m bgl
27/09/24 10:30 | 18.00m | 1.60 m bgl

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **17 Fleet Street**
Project Reference: **521290-064**

BH43

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Canter Rig 86
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756551.51m
Northing: 5918779.20m
Ground level: 42.58m (NZVD2016)

Date started: 24/09/2024
Date completed: 27/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: CSR
Input by: CSR
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3 Box 4	27	16		EUz2	**14.26m:** Slightly weathered, grey SILTSTONE; very weak. **15.21m to 15.37m:**...silty SANDSTONE, poorly cemented. **16.34m to 16.5m:**...extremely weak. (SILT with minor clay)	SW		100	93	93		15.19m: BP 10° 15.30m: JT 4° St, Sm, Cl 15.79m: JT 22° Un, Ro, Cl 15.90m: JT 10° St, Sm, (Infill: clay) 4mm 16.06m: BP 18°	
HQ3 Box 5	26	17						100	100	100		16.70m: JT 10° Un, Ro, Cl 17.34m: BP 12° 17.52m: BP 4° 17.55m: JT 8° Un, Ro, Cl 17.70m: JT 4° Pl, Ro, Cl	
	25											**17.9m:** Disseminated black carbonaceous matter, inclined 34°.	
		18		EUs2	**18m:** Slightly weathered, grey, fine to medium SANDSTONE; weak. Well cemented.	SW						18.03m to 18.26m: JI 84°	
HQ3	24	19		EUz2	**18.3m:** Slightly weathered, grey SILTSTONE; very weak. **19.04m to 19.2m:**...SANDSTONE, poorly cemented.	SW		100	100	96		18.76m: JT 5° Un, Ro, Co, (Infill: clay) **19m:** Black carbonaceous material, <1mm, inclined 5°. 19.04m: JT 6° Un, Ro, Cl 19.10m: JT 10° St, Sm, Co, (Infill: clay)	
HQ3 Box 6	23	20			**19.72m to 19.74m:**...pink SILTSTONE. **19.81m to 19.89m:**...SANDSTONE, moderately cemented (ripup clast wedge?).			100	97	97		19.65m: BP 14° 19.78m: JT 28° Pl, Ro, Cl 19.90m to 20.05m: JT 72° Pl, Ro, Cl	

REMARKS:
(1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.

Water Level Readings:
Date Time | Hole Depth | Water Level
25/09/24 15:41 | 4.50m | 1.66 m bgl
26/09/24 10:00 | 4.50m | 2.70 m bgl
26/09/24 16:54 | 18.00m | 4.60 m bgl
27/09/24 10:30 | 18.00m | 1.60 m bgl

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

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BH43

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Canter Rig 86
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1756551.51m
Northing: 5918779.20m
Ground level: 42.58m (NZVD2016)

Date started: 24/09/2024
Date completed: 27/09/2024
Inclination: -90°
Azimuth: N/A

Logged by: CSR
Input by: CSR
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	22	21		EUz2	**18.3m:** Slightly weathered, grey SILTSTONE; very weak.	SW							
					20.5m: Slightly weathered, grey, fine to coarse SANDSTONE; weak. Well cemented. Green siltstone clasts, subrounded, up to 2mm.	SW		100	97	97			
HQ3	21	22		EUs2	**21m:** Slightly weathered, grey, silty, fine to medium SANDSTONE; very weak. Moderately cemented. **21.26m to 21.34m:**...fine to coarse sandstone. **22.42m:**...poorly cemented. **22.45m to 22.6m:**...SILTSTONE.	SW		100	93	91		21.05m: JT 12° Un, Ro, Cl **21.39m to 21.47m:** Black carbonaceous material, 3mm, inclined 8°. 21.69m: JT 18° Un, Ro, Cl 22.47m: JT 26° Pl, Ro, Cl 22.49m: JT 34° St, Sm, Cl	
HQ3	20	23		EUs2	**22.9m to 23.21m:**...fine to coarse sandstone. **23.45m:** Slightly weathered, grey, silty, fine to coarse SANDSTONE, very weak. Poorly cemented.	SW		100	63	63		**23.22m:** Black carbonaceous laminae, 1mm, inclined 20°. 23.57m: JT 10° Pl, Ro, Cl	
HQ3	19	24		EUs2	**24m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW						23.94m: JT 52° St, Sm, Cl **24m to 24.15m:** Recovered as broken core (gravel) **24.15m to 24.3m:** Sandstone ripup clasts.	
HQ3	18	25		EUz2	**24.3m:** Slightly weathered, grey SILTSTONE; very weak.	SW		100	86	79		24.30m: JT 4° St, Sm, Cl 24.40m: JT 8° Pl, Ro, Cl	
				EUs2	**24.69m:** Slightly weathered, grey, silty fine SANDSTONE; very weak. Moderately cemented. **24.7m:**...green siltstone ripup clasts up to 10mm.	SW						**24.62m to 24.68m:** Black carbonaceous material, 6mm, inclined 28°. **24.7m:** Green siltstone ripup clasts up to 10mm. 24.70m: JT 4° Pl, Ro, Cl	

Box 6 Box 7 Box 8

REMARKS:
(1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.

Water Level Readings:
Date Time | Hole Depth | Water Level
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26/09/24 10:00 | 4.50m | 2.70 m bgl
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27/09/24 10:30 | 18.00m | 1.60 m bgl

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

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BH43

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1756551.51m	Date started:	24/09/2024	Logged by:	CSR
Equipment:	Canter Rig 86	Northing:	5918779.20m	Date completed:	27/09/2024	Input by:	CSR
Contractor:	Drill Force NZ Ltd	Ground level:	42.58m (NZVD2016)	Inclination:	-90°	Checked by:	BGW
				Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUs2	**24.69m:** Slightly weathered, grey, silty fine SANDSTONE; very weak. Moderately cemented. **25.44m:**...poorly cemented. End of borehole at 25.5m (Termination Depth Achieved)	SW		100	86	79			

Box 8

REMARKS:
(1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

Water Level Readings:
Date Time | Hole Depth | Water Level
25/09/24 15:41 | 4.50m | 1.66 m bgl
26/09/24 10:00 | 4.50m | 2.70 m bgl
26/09/24 16:54 | 18.00m | 4.60 m bgl
27/09/24 10:30 | 18.00m | 1.60 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Basque Park**
Project Reference: **521290-064**

BH44

Sheet **1** of **6**

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1756569.81m	Date started:	14/08/2024	Logged by:	THH
Equipment:	Beretta T46	Northing:	5918769.32m	Date completed:	16/08/2024	Input by:	THH
Contractor:	Drill Force NZ Limited	Ground level:	45.18m (NZVD2016)	Inclination:	-90°	Checked by:	BGW
				Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HA	45			T	**0m:** Sandy SILT with some fibrous rootlets and trace clay; dark brown. Soft, moist, low plasticity. Sand is fine. Rootlets up to 5mm diameter. [TOPSOIL]	MI-SP						**0m: FILL** **0.05m to 0.2m:** ES BH44_0.05-0.2	
HA				FR	**0.2m:** Clayey SILT with some sand, trace gravel and organics; brown grey. Very stiff, moist, high plasticity. Sand is fine. Gravel is fine to coarse, angular basalt. Organics are fibrous rootlets and decomposing wood fragments up to 40mm. [FILL] **0.35m:**...plastic piece 25mm. **0.45m:**...angular glass fragment 35mm. **0.5m:**...trace fine brick fragments. **0.84m:**...metal peg 150mm. **0.9m to 1.5m:**...wet. **1m:**...trace fine brick fragments.	MH	0.3m: ISHSV=157/56kPa 0.7m: ISHSV=28/8kPa 0.95m: ISHSV=115/14kPa 1m: ISHSV=196/59kPa 1.2m: ISHSV=39/11kPa	100				**0.3m to 0.4m:** ES BH44_0.3-0.4 **0.5m to 0.6m:** ES BH44_0.5-0.6 **0.8m to 0.9m:** ES BH44_0.8-0.9 **1.1m to 1.2m:** ES BH44_1.1-1.2 **1.4m to 1.5m:** ES BH44_1.4-1.5	
SPT	44	1		FR	**1.8m:**...plastic pieces up to 60mm.		1.5m: ISHSV=95/34kPa 1.5m: SPT 0,0// 1,1,1,1 N = 4 1.52m: ISHSV=61/45kPa	80				**1.86m to 1.95m:** No recovery	
HQ3	43	2		Fx	**1.95m:** CORE LOSS.			51				**2m to 2.4m:** ES BH44_2.0-2.4	
HQ3				FR	**2.46m:** Silty CLAY with some sand and trace gravels; brown grey mottled orange. Stiff, moist, high plasticity. Sand is fine. Gravel is fine to coarse, angular basalt. [FILL] **2.64m to 2.72m:**...trace brick fragments up to 17mm. **2.83m to 2.9m:**...light grey.	CH							
SPT	42	3		ERc	**3.12m:** Silty CLAY with trace sand and organics; light grey mottled orange. Stiff, moist, high plasticity. Sand is fine. Organics are decomposed rootlets. [RESIDUAL SOIL ECBF]	CH	3m: SPT 0,1// 2,2,2,2 N = 8	62				**3m to 3.4m:** ES BH44_3.0-3.4 **3.12m: EAST COAST BAYS FORMATION**	
				ERx	**3.28m:** NO RECOVERY.								
HQ3				ERc	**3.45m:** Silty CLAY with trace sand and organics; light grey mottled orange. Stiff, moist, high plasticity. Sand is fine. Organics are decomposed rootlets.	CH		100				**3.45m to 4.5m:** Driller changed to half runs due to core loss.	
HQ3	41	4						72					
				ERx	**4.33m:** CORE LOSS.								
U54		5		ERx	**4.5m:** PUSH TUBE. CLAY with some sand; light grey mottled orange. Firm, moist, high plasticity. Sand is fine. **4.7m:**...Stiff, moderate plasticity, slightly moist.			100					

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) A vibrating wire piezometer (VWP) was installed at 17.5m bgl (BH44-PZ01), serial no. 365125.
3) ES refers to environmental sample

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
15/08/24 17:30 | 12.33m | 4.41 m bgl
16/08/24 07:50 | 12.33m | 3.10 m bgl
16/08/24 15:30 | 25.50m | 5.87 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Basque Park**
Project Reference: **521290-064**

BH44

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1756569.81m
Northing: 5918769.32m
Ground level: 45.18m (NZVD2016)

Date started: 14/08/2024
Date completed: 16/08/2024
Inclination: -90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS, WS, MWS, CS, VCS, ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	40	6		ERs	**5m:** Silty fine to medium SAND with minor organics; dark brownish grey. Loose, moist, poorly graded. Organics are decomposed rootlets and wood fragments up to 15mm.	SW-SM		73					
				ERx	**5.73m:** CORE LOSS.								
SPT	39	7		ERs	**6m:** Silty fine to medium SAND; dark brownish grey. Loose, moist, poorly graded.	SW-SM	6m: SPT 1,1// 2,2,2,2 N = 8	100				**6m to 6.3m:** ES BH44_6.0-6.3	
HQ3				ERz	**6.04m:** Clayey SILT with minor sand; grey. Stiff, moist, high plasticity. Sand is fine to medium.	MH						**6.75m:** Black carbonaceous inclusion 4mm.	
	38			ERs	**6.98m:** Silty fine to medium SAND; dark brownish grey mottled black. Loose, moist, poorly graded.	SP-SM		100					
SPT		8		ERz	**7.5m:** Sandy SILT with minor organics and trace clay; bluish grey. Firm, wet, low plasticity. Sand is fine to medium. Organics are decomposed wood fragments up to 17mm. [HIGHLY WEATHERED ECBF]	MI-SP	7.5m: SPT 1,0// 1,0,1,1 N = 3	100					
HQ3	37	9		EWs	**8.05m:** Highly weathered, dark brownish grey, fine to medium SANDSTONE; extremely weak, poorly cemented, contains decomposed wood fragments up to 8mm. (Silty SAND).	HW		38					
				EWx	**8.35m:** CORE LOSS.							**8.35m to 9m:** Driller changed to half runs due to core loss. Core loss possibly a result of running sand.	
SPT	36	10		EWs	**9m:** Highly weathered, dark brownish grey, fine to medium SANDSTONE; extremely weak, poorly cemented. (Silty SAND)	HW	9m: SPT 0,1// 1,6,43 for 70mm N = 50+	100				**9.13m to 9.17m:** Black carbonaceous inclusion 40mm.	
					9.3m: Moderately weathered, grey, fine SANDSTONE; extremely weak, poorly cemented.	MW							
HQ3				EWx	**9.4m:** CORE LOSS.			86	74	49			
				EWs	**9.55m:** Moderately weathered, grey, fine SANDSTONE; extremely weak, poorly cemented.	MW						9.86m: JT 9.86m: JT 50° Un, Ro, Cl	

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) A vibrating wire piezometer (VWP) was installed at 17.5m bgl (BH44-PZ01), serial no. 365125.
3) ES refers to environmental sample

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
15/08/24 17:30 | 12.33m | 4.41 m bgl
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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Basque Park**
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BH44

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1756569.81m
Northing: 5918769.32m
Ground level: 45.18m (NZVD2016)

Date started: 14/08/2024
Date completed: 16/08/2024
Inclination: -90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	35			EWs	**9.55m:** Moderately weathered, grey, fine SANDSTONE; extremely weak, poorly cemented. **10.42m to 10.5m:**...siltstone.	MW		86	74	49		9.97m to 10.10m: Not intact. 10.06m: JT 30° Un, Ro, Cl 10.24m: BPJT 10.24m: BPJT 15° Pl, Sm, Cl 10.29m: BPJT 10.29m: BPJT 10° St, Ro, Cl 10.42m: BPJT 10° Un, Ro, Cl	
SPTC				EWx	**10.5m:** NO RECOVERY.		10.5m: SPTC 5,15// 20,26,4 for 55mm N = 50+	N/A	N/A	N/A		**10.5m to 10.6m:** ES BH44_10.5-10.6	
HQ3	34	11		EWs	**10.85m:** Moderately weathered, grey, fine to medium SANDSTONE; extremely weak, poorly cemented.	MW		100	91	70		11.14m: JT 10° Pl, Sm, Cl 11.35m: BPJT 11.35m: BPJT 5° Un, Ro, Cl 11.38m: JT 11.38m: JT 35° Un, Ro, Cl 11.52m: JT 10° Pl, Ro, Cl 11.59m: JT 11.59m: JT 15° Pl, Ro, Cl 11.83m: JT 11.83m: JT 50° St, Ro, Cl 11.86m: JT 11.86m: JT 5° Un, Sm, Cl 11.98m: JT 11.98m: JT 5° Un, Ro, Cl	
SPTC	33	12		EWx	**12m:** NO RECOVERY.		12m: SPTC 3,11// 16,24,10 for 35mm N = 50+	N/A	N/A	N/A			
HQ3	32	13		EUz2	**12.33m:** Slightly weathered, grey, SILTSTONE; very weak.	SW		100	89	78		12.7m: JT 12.70m: JT 15° Pl, Sm, Cl 12.77m: JT 12.77m: JT 30° Un, Ro, Cl 12.99m: JT 12.99m: JT 30° Pl, Ro, Cl Not intact. 13.16m: JT 5° Pl, Sm, Cl 13.22m: JT 5° Pl, Sm, Cl	
				EUs2	**12.5m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak, moderately cemented. **12.98m to 13.21m:**...siltstone.	SW							
HQ3	31	14		EUz2	**13.41m:** Slightly weathered, grey, SILTSTONE; very weak. **13.62m to 13.7m:**...fine sandstone.	SW		93	93	86		13.41m: BPJT 13.41m: BPJT 2° **13.62m to 13.7m:** Disseminated black carbonaceous material, bedding <2mm, inclined 45°. 13.62m: BP 35° **13.74m to 13.75m:** Disseminated black carbonaceous material, bedding <2mm. 13.82m: BPJT 20°	
				EUs2	**13.9m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak, moderately cemented. **14.21m to 14.34m:**...siltstone. **14.49m to 14.59m:**...siltstone. **14.8m to 14.89m:**...siltstone.	SW						14.21m: BPJT 14.21m: BPJT 5° Un, Ro, Cl **14.31m to 14.33m:** Layers (2) disseminated black carbonaceous material, bedding <2mm, inclined 15°. 14.34m: BPJT 25° Pl, Ro, Cl 14.45m: JT 14.45m: JT 35° Un, Ro, Cl 14.59m: BP 15°	
	15			EUx	**14.89m:** CORE LOSS.								

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3) ES refers to environmental sample

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
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16/08/24 07:50 | 12.33m | 3.10 m bgl
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BH44

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Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1756569.81m
Northing: 5918769.32m
Ground level: 45.18m (NZVD2016)

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Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	30	16		EUz2	**15m:** Slightly weathered, grey, SILTSTONE; very weak.	SW						**15m to 15.22m:** Disseminated black carbonaceous material, bedding <2mm, inclined 10°. 15.05m: JT 15.05m: JT 10° Pl, Sm, Cl 15.22m: BP 15°	
	29			EUs2	**15.22m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak, moderately cemented. **15.73m to 15.84m:**...siltstone. **16.06m to 16.08m:**...siltstone. **16.29m to 16.43m:**...siltstone.	SW		100	82	69		15.72m to 15.82m: Not intact. 15.84m: BPJT 15.84m: BPJT 2° 16.08m: BPJT 16.08m: BPJT 2° 16.23m: JT 16.23m: JT 5° Pl, Sm, Cl 16.25m: JT 80° Pl, Ro, Cl 16.3m: JT 16.30m: JT 5° Pl, Sm, Cl 16.44m: JT 16.44m: JT 20° Pl, Ro, Cl 16.47m: JT 30° Pl, Sm, Cl 16.5m: JT 16.50m: JT 40° Un, Ro, Cl 16.55m: BP 25°	
HQ3	28	17		EUz2	**16.55m:** Slightly weathered, grey, SILTSTONE; very weak. **17.62m:**...Poorly cemented.	SW		99	86	77		17.24m: JT 17.24m: JT 40° Pl, Sm, Cl 17.48m: JT 17.48m: JT 5° Pl, Sm, Cl 17.55m: JT 45° Pl, Sm, Cl	
	27	18		EUs2	**17.66m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak, moderately cemented. **18.21m to 18.25m:**...siltstone. **18.34m to 18.4m:**...siltstone. **18.6m to 19.1m:**...extremely weak, poorly cemented.	SW		85	75	68		17.66m: BP 15° 17.67m: BPJT 17.67m: BPJT 2° **17.84m to 17.86m:** Disseminated brown carbonaceous material, bedding <2mm, inclined 15°. **17.98m to 18m:** Core loss 18.03m: JT 80° Pl, Sm, Cl **18.16m to 18.18m:** Disseminated black carbonaceous material, bedding <2mm, inclined 15°. 18.33m: BP 2° **18.42m:** Disseminated black carbonaceous material, bedding <2mm. 18.6m: JT 18.60m: JT 10° Pl, Sm, Cl 18.69m: JT 45° Un, Ro, Cl 18.81m: JT 35° Un, Ro, Cl 18.99m: JT 50° Pl, Ro, Cl 19.07m: JT 40° Un, Ro, Cl	
	26	19		EUs2	**19.1m to 19.27m:**...SILTSTONE.							**19.14m to 19.19m:** Disseminated brown carbonaceous material, bedding <2mm, inclined 65°.	
				EWx	**19.27m:** CORE LOSS.								
HQ3		20		EUz2	**19.5m:** Slightly weathered, grey, SILTSTONE; very weak.	SW						**19.5m to 21m:** Core fell out of barrel due to fault with catcher during drilling. Core damaged and lost during re-drilling.	
				EUs2	**19.67m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak, moderately cemented, contains moderately inclined 30mm beds of siltstone.	SW		73	67	57		**19.52m to 19.67m:** Disseminated brown carbonaceous material, bedding <2mm, inclined 50°. 19.78m: JT 19.78m: JT 10° Pl, Ro, Cl 19.93m: JT	

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) A vibrating wire piezometer (VWP) was installed at 17.5m bgl (BH44-PZ01), serial no. 365125.
3) ES refers to environmental sample

Water Level Readings:
Date Time | Hole Depth | Water Level
15/08/24 17:30 | 12.33m | 4.41 m bgl
16/08/24 07:50 | 12.33m | 3.10 m bgl
16/08/24 15:30 | 25.50m | 5.87 m bgl

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Basque Park**
Project Reference: **521290-064**

BH44

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1756569.81m
Northing: 5918769.32m
Ground level: 45.18m (NZVD2016)

Date started: 14/08/2024
Date completed: 16/08/2024
Inclination: -90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	25			EUs2	**19.67m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak, moderately cemented, contains moderately inclined 30mm beds of siltstone. **20.33m to 20.44m:**...siltstone.	SW		73	67	57		19.93m: JT 10° Pl, Ro, Cl 19.97m: JT 19.97m: JT 20° St, Sm, Cl	
		21		EUx	**20.6m:** CORE LOSS.							**20.57m to 20.6m:** Disseminated black carbonaceous material, bedding <2mm. 20.58m: JT 20.58m: JT 15° Pl, Sm, Cl	
HQ3	24			EUs2	**21m:** Slightly weathered, grey, fine to medium SANDSTONE; extremely weak, poorly cemented. **21.37m to 21.54m:**...siltstone. **21.57m to 21.62m:**...siltstone. **21.78m to 22.05m:**...siltstone.	SW		100	92	80		**21m to 21.5m:** Driller changed to half run due to core loss. **21.1m to 22.23m:** Disseminated brown carbonaceous material, bedding <2mm, inclined 15°. 21.1m: JT 21.10m: JT 2° Un, Ro, Cl 21.37m: BP 2° 21.62m: BP 2° 21.78m: BP 5°	
HQ3	23	22		EUx	**22.23m:** CORE LOSS.			73	67	66		22m: JT 22.00m: JT 15° Pl, Sm, Cl 22.05m: BP 2°	
HQ3	22	23		EUs2	**22.5m:** Unweathered, grey, fine to medium SANDSTONE; very weak, moderately cemented. [UNWEATHERED ECBF] **23.34m to 23.4m:**...siltstone. **23.59m to 23.74m:**...extremely weak, poorly cemented.	UW		83	79	79		23.40m: BP 2° 23.52m: JT 23.52m: JT 10° Pl, Sm, Cl 23.70m to 23.74m: Not Intact.	
		24		EUx	**23.74m:** CORE LOSS.								
HQ3	21			EUs2	**24m:** Unweathered, grey, fine to coarse SANDSTONE; very weak, moderately cemented.	UW		93	91	86		24.08m: BP 2° **24.12m:** Layers (2) disseminated brown carbonaceous material, bedding <2mm. **24.41m to 24.48m:** Disseminated brown carbonaceous material, bedding <2mm. 24.55m: JT 5° Un, Ro, Cl 24.82m: JT 10° Pl, Ro, Cl	
				EUz2	**24.08m:** Unweathered, grey, SILTSTONE; very weak.	UW							
		25		EUs2	**24.48m:** Unweathered, grey, fine to coarse SANDSTONE; very weak, moderately cemented.	UW							

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) A vibrating wire piezometer (VWP) was installed at 17.5m bgl (BH44-PZ01), serial no. 365125.
3) ES refers to environmental sample

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
15/08/24 17:30 | 12.33m | 4.41 m bgl
16/08/24 07:50 | 12.33m | 3.10 m bgl
16/08/24 15:30 | 25.50m | 5.87 m bgl

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Project: **WIWQIP Motions Catchment Improvements**
Location: **Basque Park**
Project Reference: **521290-064**

BH44

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1756569.81m	Date started:	14/08/2024	Logged by:	THH
Equipment:	Beretta T46	Northing:	5918769.32m	Date completed:	16/08/2024	Input by:	THH
Contractor:	Drill Force NZ Limited	Ground level:	45.18m (NZVD2016)	Inclination:	-90°	Checked by:	BGW
				Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	20			EUs2	**24.48m:** Unweathered, grey, fine to coarse SANDSTONE; very weak, moderately cemented.	UW		93	91	86		**25.16m to 25.4m:** Minor layers of disseminated brown carbonaceous material, bedding <2mm, inclined 25°.	
				EUz2	**25.16m:** Unweathered, grey, SILTSTONE; very weak.	UW							
				EUx	**25.4m:** CORE LOSS.								

End of borehole at 25.5m (Termination Depth Achieved)

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) A vibrating wire piezometer (VWP) was installed at 17.5m bgl (BH44-PZ01), serial no. 365125.
3) ES refers to environmental sample

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
15/08/24 17:30 | 12.33m | 4.41 m bgl
16/08/24 07:50 | 12.33m | 3.10 m bgl
16/08/24 15:30 | 25.50m | 5.87 m bgl

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Client: **Watercare Services Ltd**
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Location: **Basque Park**
Project Reference: **521290-064**

BH45

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1756625.85m
Northing: 5918743.76m
Ground level: 52.57m (NZVD2016)

Date started: 19/08/2024
Date completed: 22/08/2024
Inclination: 90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HA	53	1		F	**0m:** SILT with some fibrous rootlets, minor sand and trace clay; brown. Very soft, moist, low plasticity. Sand is fine. [TOPSOIL]	ML						**0m: FILL** **0.05m to 0.2m:** ES BH45_0.05-0.2	
				FR	**0.15m:** Clayey SILT with some sand, trace gravel and rootlets; brown grey. Very stiff, moist, high plasticity. Sand is fine to coarse. Gravel is fine to medium, angular, scoriaceous basalt. [FILL]		0.3m: ISHSV=168/87kPa 0.45m: ISHSV=196/87kPa					**0.3m to 0.4m:** ES BH45_0.3-0.4	
					0.55m:...basalt 60mm.								
					0.7m:...stiff.		0.7m: ISHSV=59/11kPa	100				**0.8m to 1m:** ES BH45_0.8-1.0	
					0.97m:...decomposing wood fragment 22mm. **1m to 1.1m:**...wet.	MH							
	54				**1.2m:**...very stiff.		1.2m: ISHSV=103/31kPa					**1.4m to 1.6m:** ES BH45_1.4-1.6	
SPT		2			**1.57m:**...fabric piece 27mm.		1.5m: SPT 1,1// 2,2,3,3 N = 10 1.6m: ISHSV=129/28kPa	100					
HQ3	55			Fx	**1.95m:** CORE LOSS.			84					
		3		FR	**2.54m:** Clayey SILT with some sand, trace gravel and rootlets; brown grey. Very stiff, moist, high plasticity. Sand is fine to coarse. Gravel is fine to medium, angular, scoriaceous basalt.	MH							
SPT					**3m:**...scoriaceous basalt 40mm.		3m: IBHSV=UTP 3m: SPT 2,2// 2,2,2,2 N = 8						
	56			Fx	**3.17m:** NO RECOVERY.			38					
HQ3		4		ERs	**3.45m:** Silty fine to medium SAND; brownish orange mottled grey. Loose, moist, uniformly graded. [RESIDUAL SOIL ECBF]	SM						**3.45m: EAST COAST BAYS FORMATION**	
				ERz	**3.59m:** Sandy SILT with trace clay; brownish grey streaked orange. Stiff, moist, low plasticity. Sand is fine to medium. [COMPLETELY WEATHERED ECBF]								
					3.85m to 3.9m:...fine to medium SAND.	MI-SP		100					
	57				**4.25m:** Fine to medium SAND with minor silt; brownish orange. Medium dense, moist.							**4.3m to 4.5m:** ES BH45_4.3-4.5	
SPT				ERs	**4.28m:**...sandstone fragment 40 mm.	SP	4.5m: IBHSV=UTP 4.5m: SPT 2,2// 2,3,3,3 N = 11	73					
		5		ERx	**4.83m:** NO RECOVERY.			60					

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Two vibrating wire piezometers (VWP) were installed at 7m bgl (BH45-PZ01) and 21m bgl (BH45-PZ02). S/N: 361084 and 361302.
3) ES refers to environmental sample

Water Level Readings:
Date Time | Hole Depth | Water Level
21/08/24 16:15 | 18.00m | 1.96 m bgl
22/08/24 08:15 | 18.00m | 5.00 m bgl
22/08/24 12:50 | 30.00m | 2.30 m bgl

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Basque Park**
Project Reference: **521290-064**

BH45

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1756625.85m
Northing: 5918743.76m
Ground level: 52.57m (NZVD2016)

Date started: 19/08/2024
Date completed: 22/08/2024
Inclination: 90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	58	6		ERz	**4.95m:** SILT with some sand and trace clay; light yellowish brown. Stiff, moist, low plasticity.	ML							
				ERs	**5.08m:** Fine to medium SAND with minor silt; brown. Loose, moist, well graded. **5.1m:**...sandstone fragment 25 mm. **5.17m:**...sandstone fragment 10 mm.	SW.		60					
				ERx	**5.58m:** CORE LOSS.								
SPT	59	1		ERz	**6m:** SILT with some sand, trace clay and gravel; brown. Stiff, moist, high plasticity. Sand is fine. Gravel is fine to medium, sandstone.	ML	6m: SPT 2,2// 2,3,3,4 N = 12						
					6.11m: SILT with trace clay; grey. Stiff, moist, high plasticity.			100				**6.2m to 6.45m:** ES BH45_6.2-6.45	
HQ3	60	1			**6.6m to 6.85m:**...fine to medium SAND; brownish orange.	ML		100				6.85m: JT 10° Pl, Ro, Cl relict joint 7.09m: JT 10° Pl, Ro, Cl relict joint 7.18m: JT 30° Pl, Ro, Cl relict joint 7.29m: JT 10° St, Ro, Cl relict joint	
SPT		1			**7.38m to 7.43m:**...fine to medium SAND; grey.		7.5m: SPT 3,6// 5,6,9,10 N = 30	100					
HQ3	61	1		EWs	**7.85m:** Highly weathered, grey, fine to medium SANDSTONE; extremely weak. Poorly cemented. (SAND; medium dense).	HW							
				EWz	**8.03m:** Highly weathered, grey, SILTSTONE; extremely weak. (Clayey SILT; very stiff) **8.05m:**...Poorly cemented.	HW						8.03m: BPJT 2° 8.03m to 8.22m: Not intact. 8.22m: JT 10° Pl, Ro, Cl 8.35m: JT 10° Pl, Sm, Cl	
				EUs2	**8.44m:** Moderately weathered, grey, fine to medium SANDSTONE; extremely weak. Poorly cemented. (SAND; dense). **8.54m to 8.73m:**...SILTSTONE.	MW		88	69	23		8.44m: BPJT 15° 8.48m: JT 10° Pl, Sm, Cl 8.54m: BPJT 15° **8.63m to 8.71m:** Disseminated black carbonaceous material, bedding <2mm thick. 8.73m: BPJT 5° 8.76m: JT 5° Pl, Sm, Cl	
					8.88m: CORE LOSS								
SPT	62	1		EUs2	**9m:** Slightly weathered, grey, fine to coarse SANDSTONE; very weak. Poorly cemented.	SW	9m: SPT 2,5// 16,24,10 for 25mm N = 50+	100					
HQ3		1			**9.4m to 9.52m:**...SILTSTONE.			84	80	74		9.40m: BPJT 5° 9.52m: BPJT 2° **9.57m:** Disseminated black carbonaceous material, bedding <3mm.	

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Two vibrating wire piezometers (VWP) were installed at 7m bgl (BH45-PZ01) and 21m bgl (BH45-PZ02). S/N: 361084 and 361302.
3) ES refers to environmental sample

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
21/08/24 16:15 | 18.00m | 1.96 m bgl
22/08/24 08:15 | 18.00m | 5.00 m bgl
22/08/24 12:50 | 30.00m | 2.30 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Basque Park**
Project Reference: **521290-064**

BH45

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1756625.85m
Northing: 5918743.76m
Ground level: 52.57m (NZVD2016)

Date started: 19/08/2024
Date completed: 22/08/2024
Inclination: 90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	63			EUs2	**9m:** Slightly weathered, grey, fine to coarse SANDSTONE; very weak. Poorly cemented.	SW		84	80	74		10.01m: JT 5° Pl, Ro, Cl 10.04m: JT 5° Pl, Ro, Cl 10.13m: JT 2° Pl, Ro, Cl	
				EUx	**10.3m:** CORE LOSS								
SPTC				EUz2	**10.5m:** Slightly weathered, grey SILTSTONE; very weak.	SW	10.5m: SPTC 15,35 for 110mm// N = 50+	N/A	N/A	N/A			
HQ3	64	11		EUz2	**11.09m to 11.29m:**...fine to medium SANDSTONE.	SW		100	95	92		**10.97m to 11.01m:** Disseminated black carbonaceous material, bedding <2mm, inclined 10°. 11.09m: BPJT 2° 11.29m: BPJT 15°	
		12		EUs2	**11.43m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Poorly cemented.	SW						11.43m: BPJT 2° 11.91m to 11.96m: Not intact.	
SPTC				EUz2	**12m:** Slightly weathered, grey SILTSTONE; very weak.	SW	12m: SPTC 16,34 for 100mm// N = 50+	N/A	N/A	N/A			
	65			EUs2	**12.23m:** Slightly weathered, grey, fine to medium SANDSTONE; extremely weak, poorly cemented.	SW						12.23m: BPJT 2°	
HQ3	66	13		EUz2	**12.59m:** Slightly weathered, grey SILTSTONE; very weak. **12.93m to 13.16m:**...fine SANDSTONE.	SW		100	96	86		12.59m: BPJT 5° 12.76m: JT 5° Pl, Sm, Cl 12.78m to 12.82m: Not intact. 12.89m: JT 10° Un, Ro, Cl 12.93m: BPJT 20° 13.16m: BPJT 2° 13.33m: JT 5° St, Ro, Cl	
					13.5m to 13.65m:...fine to coarse SANDSTONE.							13.50m to 13.53m: Not intact. 13.65m: BP 10°	
HQ3	67	14		EUz2	**13.94m to 14.16m:**...fine to coarse SANDSTONE. **14.35m to 14.58m:**...fine SANDSTONE.	SW		93	88	80		13.94m: BPJT 10° 14.15m: JT 5° St, Ro, Cl 14.16m: BP 15° 14.24m: JT 10° Pl, Ro, Cl 14.69m to 14.72m: Not intact. 14.72m: JT 10° Pl, Sm, Cl 14.82m: JT 2° Pl, Sm, Cl 14.85m: JT 5° Pl, Sm, Cl 14.88m: JT 10° Un, Sm, Cl	
		15		EUx	**14.9m:** CORE LOSS.								

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Two vibrating wire piezometers (VWP) were installed at 7m bgl (BH45-PZ01) and 21m bgl (BH45-PZ02). S/N: 361084 and 361302.
3) ES refers to environmental sample

Water Level Readings:
Date Time | Hole Depth | Water Level
21/08/24 16:15 | 18.00m | 1.96 m bgl
22/08/24 08:15 | 18.00m | 5.00 m bgl
22/08/24 12:50 | 30.00m | 2.30 m bgl

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

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BH45

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1756625.85m
Northing: 5918743.76m
Ground level: 52.57m (NZVD2016)

Date started: 19/08/2024
Date completed: 22/08/2024
Inclination: 90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	68	16		EUz2	**15m:** Slightly weathered, grey, SILTSTONE; very weak.	SW							
				EUs2	**15.14m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Poorly cemented.							15.39m: JT 2° Un, Ro, Cl **15.42m to 15.45m:** Layers (3) of disseminated black carbonaceous material, bedding <2mm, inclined 5°. 15.44m: JT 10° Un, Ro, Cl 15.46m: JT 2° Pl, Ro, Cl 15.64m: JT 10° Un, Ro, Cl 15.67m: JT 15° Pl, Ro, Cl 15.69m: BP 20°	
					15.69m to 15.8m:...SILTSTONE.			95	95	87			
	69					SW						16.28m: JT 2° Pl, Ro, Cl 16.31m: JT 15° Un, Ro, Cl	
HQ3		17			**16.53m to 16.6m:**...SILTSTONE. **16.65m to 16.92m:**...SILTSTONE.							**16.43m to 16.5m:** Core loss **16.46m to 16.48m:** Layers (2) of disseminated black carbonaceous material, bedding <2mm, inclined 10°. 16.53m: BPJT 5° 16.60m: BP 2° 16.82m: JT 15° Un, Ro, Cl 16.92m: BP 5° 16.99m: JT 20° Un, Ro, Cl	
	70							100	96	93		17.15m: JT 10° Un, Ro, Cl	
		18			**17.44m:** Slightly weathered, grey SILTSTONE; very weak.							**17.44m to 17.97m:** Disseminated black carbonaceous material, bedding <2mm. 17.44m: BPJT 10°	
	71			EUz2		SW						17.72m: JT 10° Pl, Ro, Cl 18.00m to 18.08m: Not intact. 18.37m: JT 45° Un, Sm, Cl 18.45m: JT 45° Pl, Sm, Cl	
		19						97	84	78		18.69m: JT 10° Pl, Ro, Cl 18.91m: JT 15° St, Sm, Cl	
	72				**19.28m to 19.5m:**...fine to medium SANDSTONE.							19.28m: BPJT 15° 19.28m to 19.32m: Not intact. 19.36m: JT 5° Un cl, Ro 19.40m: JT 10° Un, Ro, Cl 19.41m to 19.43m: Not intact. **19.45m to 19.5m:** Core loss 19.59m: JT 10° Pl, Ro, Cl	
HQ3		20		EUs2	**19.74m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Poorly cemented.	SW		100	94	88		19.74m: BPJT 20° **19.76m:** Disseminated black carbonaceous material, bedding <4mm.	

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Two vibrating wire piezometers (VWP) were installed at 7m bgl (BH45-PZ01) and 21m bgl (BH45-PZ02). S/N: 361084 and 361302.
3) ES refers to environmental sample

Water Level Readings:
Date Time | Hole Depth | Water Level
21/08/24 16:15 | 18.00m | 1.96 m bgl
22/08/24 08:15 | 18.00m | 5.00 m bgl
22/08/24 12:50 | 30.00m | 2.30 m bgl

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Basque Park**
Project Reference: **521290-064**

BH45

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force NZ Limited

CO-ORDINATES: NZTM2000
Easting: 1756625.85m
Northing: 5918743.76m
Ground level: 52.57m (NZVD2016)

Date started: 19/08/2024
Date completed: 22/08/2024
Inclination: 90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	73	21		EUs2	**19.74m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Poorly cemented.	SW		100	94	88		20.91m to 21.00m: Not intact. 21.00m to 21.06m: Not intact.	
HQ3	74	22		EUs2	**21.17m to 22.24m:**...moderately cemented.	SW		83	75	75		21.45m: JT 5° Pl, Ro, Cl 21.98m: JT 15° Un, Ro, Cl 21.98m to 22.08m: Not intact.	
HQ3	75	23		EUx	**22.24m:** CORE LOSS.								
HQ3	76	24		EUs2	**22.5m:** Slightly weathered, grey SILTSTONE; very weak. **22.55m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Poorly cemented. **22.66m to 22.7m:**...SILTSTONE. **23.42m to 23.7m:**...contains thin 20-50mm beds of SILTSTONE.	SW		80	67	59		22.53m: JT 30° Un, Ro, Cl 22.63m: JT 10° Un, Ro, Cl 22.75m: JT 5° St, Sm, Cl 22.89m to 22.94m: Not intact. 23.01m to 23.05m: Not intact. 23.13m: JT 45° Pl, Sm, Cl 23.15m: JT 85° Pl, Ro, Cl 23.17m: JT 5° Pl, Ro, Cl 23.40m: JT 5° Pl, Sm, Cl **23.42m to 23.7m:** Disseminated black carbonaceous material, bedding <2mm, inclined 5° to 15°.	
HQ3	77	25		EUx	**23.7m:** CORE LOSS.								
HQ3				EUs2	**24m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Poorly cemented. **24.09m to 24.37m:**...contains thin 20-50mm beds of SILTSTONE. **24.54m to 24.73m:**...SILTSTONE.	SW		100	91	91		**24.09m to 24.37m:** Disseminated black carbonaceous material, bedding <2mm, inclined 5° to 15°. 24.09m: BP 15° 24.37m: BP 5° 24.54m: BP 10° 24.73m: BP 10°	

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Two vibrating wire piezometers (VWP) were installed at 7m bgl (BH45-PZ01) and 21m bgl (BH45-PZ02). S/N: 361084 and 361302.
3) ES refers to environmental sample

Water Level Readings:
Date Time | Hole Depth | Water Level
21/08/24 16:15 | 18.00m | 1.96 m bgl
22/08/24 08:15 | 18.00m | 5.00 m bgl
22/08/24 12:50 | 30.00m | 2.30 m bgl

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

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BH45

BOREHOLE INFORMATION
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CO-ORDINATES: NZTM2000
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Northing: 5918743.76m
Ground level: 52.57m (NZVD2016)

Date started: 19/08/2024
Date completed: 22/08/2024
Inclination: 90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUs2	**24m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Poorly cemented.	SW		100	91	91			
	78			EUz2	**25.38m:** Unweathered, grey SILTSTONE; very weak. [UNWEATHERED ECBF]	UW						25.35m: JT 10° Un, Ro, Cl 25.35m to 25.41m: Not intact. **25.45m to 25.46m:** Layers (2) of disseminated black carbonaceous material, bedding <2mm.	
HQ3		26		EUs2	**25.67m:** Unweathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **25.79m to 25.83m:**...SILTSTONE. **26.05m to 26.15m:**...siltstone.	UW		100	95	85		25.67m: BP 2° 25.72m: JT 15° 25.79m: BP 20° 25.88m: JT 5° Un, Ro, Cl 25.91m: JT 25° St, Ro, Cl 26.05m: BPJT 10° 26.15m: BP 10°	
	79				**26.32m:** Unweathered, grey, fine to coarse SANDSTONE; very weak. Moderately cemented.							26.29m: JT 35° Pl, Sm, Cl 26.32m: BPJT 2°	
HQ3		27			**26.83m to 27.17m:**...SILTSTONE.							26.83m: BPJT 2° 26.91m to 26.93m: Not intact. 26.93m: JT 10° Pl, Sm, Cl	
					27.17m to 27.29m:...fine SANDSTONE.	UW						27.17m: BPJT 5° 27.29m: BPJT 10° 27.29m to 27.31m: Not intact. 27.39m: JT 10° Pl, Sm, Cl	
	80							87	79	73			
					27.83m to 27.92m:...SILTSTONE.							27.83m: BPJT 2°	
		28			**27.92m to 28.31m:**...fine to medium SANDSTONE.							**27.93m to 27.96m:** Layers (4) of disseminated black carbonaceous material, bedding <2mm. 28.21m to 28.31m: Not intact.	
	81			EUx	**28.31m:** CORE LOSS.								
HQ3				EUs2	**28.5m:** Unweathered, grey, fine to coarse SANDSTONE; very weak. Moderately cemented. **28.8m to 28.86m:**...SILTSTONE. **28.86m to 29.28m:**...fine to medium SANDSTONE.	UW						28.45m: JT 30° Un, Ro, Cl 28.50m to 28.52m: Not intact. 28.67m: JT 5° Un, Ro, Cl 28.73m: JT 5° Un, Ro, Cl	
		29											
								91	84	74		29.22m: JT 15° Un, Ro, Cl 29.28m: BPJT 10°	
	82			EUz2	**29.28m:** Unweathered, grey SILTSTONE; very weak. Contains very thin 10-45mm beds of fine to medium sandstone, very closely spaced, gently inclined.	UW							
				EUs2	**29.6m:** Unweathered, grey, fine to coarse SANDSTONE; very weak. Moderately cemented.	UW						**29.57m to 29.6m:** Disseminated black carbonaceous material, bedding <2mm. 29.74m: JT 15° Pl, Ro, Cl 29.74m to 29.78m: Not intact. 29.82m to 29.86m: Not intact.	
		30		EUx	**29.86m:** CORE LOSS.								

REMARKS: End of borehole at 30m (Termination Depth Achieved)
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Two vibrating wire piezometers (VWP) were installed at 7m bgl (BH45-PZ01) and 21m bgl (BH45-PZ02). S/N: 361084 and 361302.
3) ES refers to environmental sample

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
21/08/24 16:15 | 18.00m | 1.96 m bgl
22/08/24 08:15 | 18.00m | 5.00 m bgl
22/08/24 12:50 | 30.00m | 2.30 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Basque Park**
Project Reference: **521290-064**

BH46

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force

CO-ORDINATES: NZTM2000
Easting: 1756622.41m
Northing: 5918739.97m
Ground level: 52.67m (NZVD2016)

Date started: 23/08/2024
Date completed: 26/08/2024
Inclination: 90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HA	53			FR	**0m:** Clayey SILT with some sand and trace gravel; brown grey. Very stiff, moist, high plasticity. Sand is fine to coarse. Gravel is fine to medium, angular basalt. [TOPSOIL]							**0m: FILL** **0.05m to 0.2m:** ES BH46_0.05-0.2	
					0.3m to 0.5m:...Non-engineered fill including ceramic fragments up to 62mm.		0.4m: ISHSV=151/56kPa 0.55m: ISHSV=103/36kPa					**0.4m to 0.5m:** ES BH46_0.4-0.5	
					0.7m:...Coarse basalt 25 mm. **0.75m:**...Coarse basalt 30 mm.			100				**0.8m to 1m:** ES BH46_1.0-1.1	
		1					0.9m: ISHSV=148/67kPa						
	54				**1.25m to 1.35m:**...Black discolouration, no odour.	MH	1.35m: ISHSV=UTP					**1.4m to 1.6m:** ES BH46_1.4-1.5	
SPT					**1.46m:**...Trace fine brick fragments. **1.5m to 2.55m:**...Minor fine to coarse gravel, angular, basalt.		1.5m: SPT 2,2// 4,3,3,3 N = 13 1.6m: ISHSV=196/73kPa	100					
					1.82m:...Siltstone fragment 23 mm.								
HQ3		2											
	55				**2.37m to 2.43m:**...5mm black inclusions with burnt-like odour, inclusions are sand and fine angular gravel.			57					
				Fx	**2.55m:** CORE LOSS							**2.55m:** Driller added core catcher.	
		3											
SPT				FR	**3m:** Sandy SILT with some clay and gravel. Stiff, moist, high plasticity. Sand is fine to coarse. Gravel is fine to coarse, angular, scoriaceous basalt and trace siltstone. **3.1m to 3.11m:**...10mm grey sandstone inclusion with lead-like odour, breaks down to a sand on reworking.	MH	3m: IBTHSV=UTP 3m: SPT 2,2// 3,3,3,3 N = 12						
	56							75					
				Fx	**3.34m:** NO RECOVERY								
HQ3				FR	**3.45m:** Sandy SILT with some clay and gravel. Stiff, moist, high plasticity. Sand is fine to coarse. Gravel is fine to coarse, angular scoriaceous basalt and trace siltstone.							**3.5m to 3.6m:** ES BH46_3.5-3.6	
					3.67m:...Glass fragment 8mm.								
		4			**3.85m:**...Coarse scoriaceous basalt 50mm.			95					
	57					MH							
SPT					**4.45m:**...Coarse scoriaceous basalt 58mm. **4.5m to 5.13m:**...Minor fine to medium gravel.		4.5m: SPT 1,1// 2,2,3,3 N = 10	89					
		5						81					

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 7cm and vertical accuracy of 8cm.
2) Geophysical profiling undertaken downhole on 26/08/2024, comprising an Optical and Acoustic Televiewer.
3) ES refers to environmental sample

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
26/08/24 08:50 | 15.00m | 5.16 m bgl
26/08/24 14:50 | 21.00m | 5.69 m bgl
27/08/24 08:00 | 21.00m | 6.04 m bgl
28/08/24 12:15 | 21.00m | 6.33 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Basque Park**
Project Reference: **521290-064**

BH46

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force

CO-ORDINATES: NZTM2000
Easting: 1756622.41m
Northing: 5918739.97m
Ground level: 52.67m (NZVD2016)

Date started: 23/08/2024
Date completed: 26/08/2024
Inclination: 90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	58	6		FR	**5.13m:** Clayey SILT with minor sand and trace gravel; brownish orange with greenish grey inclusions. Stiff, moist, high plasticity. Sand is fine to medium. Gravel is fine to medium, angular basalt.	MH		81					
				ERz	**5.5m to 5.55m:**...2mm black inclusions with burnt-like odour. Inclusions are sand and fine decomposing wood fragments.	MH						**5.55m: EAST COAST BAYS FORMATION**	
				ERz	**5.55m:** Clayey SILT with minor sand; brownish orange mottled grey. Stiff, moist, high plasticity. Sand is fine to medium. [RESIDUAL SOIL ECBF]								
					5.8m: CORE LOSS								
U54	59	7		ERx	**6m:** PUSHTUBE. Silty SAND; brownish orange speckled black. Medium dense, non-plastic to slightly plasticity. Sand is fine to coarse.		6m: IBHSV=140/64kPa	80					
					6.24m:...Sandy SILT; brownish orange. Stiff to very stiff, slightly moist, slight to moderately plasticity. Sand is fine.								
SPT				ERs	**6.42m:**...Silty SAND; brownish orange with speckled black. Medium dense, moist, non-plastic to slight plasticity. Sand is fine to coarse.		6.5m: SPT 1,1// 2,2,1,2 N = 7	89					
					6.5m: Silty fine to medium SAND; brownish orange mottled grey. Loose, moist, uniformly graded.	MI							
					6.76m:...Fine black organic inclusions, breaks down to a sand on reworking.							**6.95m:** Major loss of drilling fluid, driller added casing.	
HQ3	60	8			**7.09m to 7.15m:**...SILT with siltstone fragments.			55					
				ERx	**7.25m:** CORE LOSS								
SPT				ERs	**7.5m:** Silty fine to medium SAND; brownish orange mottled grey. Loose, moist, uniformly graded.	MI	7.5m: SPT 0,1// 1,1,1,1 N = 4					**7.5m to 7.8m:** ES BH46_7.5-7.8	
				ERx	**7.65m:** NO RECOVERY			33					
HQ3	61	9		ERz	**7.95m:** Sandy SILT with trace clay; brownish orange streaked grey. Stiff, moist, high plasticity. Sand is fine to medium.	MI-SP		100					
					8.04m to 8.06m:...Siltstone fragments.								
				ERs	**8.18m:** Silty fine to coarse SAND; brownish orange with grey inclusions. Loose, wet. [COMPLETELY WEATHERED ECBF]	SM							
					8.44m: Highly weathered, grey, fine to medium SANDSTONE; extremely weak. Poorly cemented. (Silty SAND).	HW						**8.5m to 8.7m:** ES BH46_8.5-8.7	
					8.88m to 9.07m:...SILTSTONE.		9m: IBHSV=UTP						
SPT	62	10		EWs	**9.07m:** Moderately weathered, grey, fine to medium SANDSTONE; very weak.		9m: SPT 5,8// 18,32 N = 50+	100				**9m to 9.3m:** ES BH46_9.0-9.3	
HQ3					**9.66m to 9.84m:**...Fine to coarse.	MW		100	100	100		9.80m: JT 20° Un, Ro, Cl	

REMARKS:
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2) Geophysical profiling undertaken downhole on 26/08/2024, comprising an Optical and Acoustic Televiewer.
3) ES refers to environmental sample

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
26/08/24 08:50 | 15.00m | 5.16 m bgl
26/08/24 14:50 | 21.00m | 5.69 m bgl
27/08/24 08:00 | 21.00m | 6.04 m bgl
28/08/24 12:15 | 21.00m | 6.33 m bgl

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BH46

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force

CO-ORDINATES: NZTM2000
Easting: 1756622.41m
Northing: 5918739.97m
Ground level: 52.67m (NZVD2016)

Date started: 23/08/2024
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Inclination: 90°
Azimuth: N/A

Logged by: THH
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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	63			EWs	**9.07m:** Moderately weathered, grey, fine to medium SANDSTONE; very weak. **10.23m to 10.34m:**...SILTSTONE with minor beds of disseminated black carbonaceous material, <2mm, inclined 15°. **10.42m to 10.5m:**...SILTSTONE with trace beds of disseminated black carbonaceous material, <2mm, inclined 10°.	MW		100	100	100		10.25m: JT 20° Un, Ro, Cl	
SPTC							10.5m: SPTC 15,35 for 100mm// N = 50+	N/A	N/A	N/A		**10.5m:** SPTc bouncing | ES BH46_10.5-10.6	
				EUz2	**10.6m:** Slightly weathered, grey SILTSTONE; very weak.	SW							
HQ3	64	11		EUs2	**10.85m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Poorly cemented. **11.48m to 11.59m:**...SILTSTONE.	SW		100	100	100		11.48m: BP 5°	
SPTC		12					12m: SPTC 15,35 for 100mm// N = 50+	N/A	N/A	N/A		**12m:** SPTc bouncing | ES BH46_12.0-12.1 | Water pressure permeability test BH46_PPT01 12.0-13.5 m	
	65			EUs2	**12.1m:** Slightly weathered, grey, medium SANDSTONE; very weak. Moderately cemented.	SW							
				EUz2	**12.39m:** Slightly weathered, grey, SILTSTONE; very weak. Contains minor beds of disseminated black carbonaceous material <2mm, inclined 15°.	SW						12.39m: BP 15° 12.56m: BPJT 30° Pl, Sm, Cl	
HQ3		13		EUs2	**12.82m:** Slightly weathered, grey, fine SANDSTONE; very weak. Poorly cemented. Contains trace beds of disseminated black carbonaceous material <2mm, inclined 10°.	SW		100	100	98			
	66				**13.36m:** Slightly weathered, grey SILTSTONE; very weak.							13.36m: BP 25° 13.42m: JT 15° Pl, Ro, Cl	
		14		EUz2	**13.61m to 13.81m:**...Fine to coarse SANDSTONE.	SW		98	95	93		13.61m: BP 20° 13.79m: BP 10° 13.81m: BP 15° 14.03m: BP 15° 14.14m: JT 20° Un, Ro, Cl	
HQ3	67				**14.39m to 14.7m:**...Fine to medium SANDSTONE.							14.25m: BP 15°	
		15			**14.79m to 14.82m:**...Fine to medium SANDSTONE with disseminated black carbonaceous material <2mm.								

REMARKS:
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Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
26/08/24 08:50 | 15.00m | 5.16 m bgl
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28/08/24 12:15 | 21.00m | 6.33 m bgl

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BH46

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Contractor: Drill Force

CO-ORDINATES: NZTM2000
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Ground level: 52.67m (NZVD2016)

Date started: 23/08/2024
Date completed: 26/08/2024
Inclination: 90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	68			EUz2	**13.36m:** Slightly weathered, grey SILTSTONE; very weak. **15.12m to 15.36m:**...Fine SANDSTONE.	SW						15.04m: JT 10° Pl, Sm, Cl	
HQ3	69	16		EUs2	**15.66m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Poorly cemented. **15.89m to 16.15m:**...SILTSTONE.	SW		98	97	84		15.66m: BP 2° 15.89m: BP 25° **16.15m to 16.24m:** Beds (6) of disseminated black carbonaceous material <2mm, inclined 2-5°. 16.15m: BP 5° 16.23m: JT 10° Pl, Sm, Cl 16.41m: JT 30° Pl, Ro, Cl	
HQ3	70	17		EUs2	**16.57m to 17.62m:**...Moderately thin 40-120mm beds of siltstone. **16.74m to 16.79m:**...Moderately cemented. **17.16m to 17.21m:**...Medium to coarse.	SW		75	68	40		16.57m: JT 5° Pl, Sm, Cl 16.61m: BP 15° 16.66m: JT 20° Pl, Sm, Cl 16.74m: JT 10° Pl, Sm, Cl **17.01m to 17.1m:** Beds (3) of disseminated black carbonaceous material <2mm, inclined 10°. 17.01m: BP 5° 17.24m: BP 20° 17.28m: JT 7° Pl, Ro, Cl 17.33m: JT 10° Pl, Sm, Cl 17.44m: JT 40° Un, Ro, Cl 17.52m to 17.62m: Not intact	
		18		EUx	**17.62m:** CORE LOSS								
HQ3	71	19		EUs2 EUz2	**18m:** Slightly weathered, grey, fine to coarse SANDSTONE; very weak. Moderately cemented. **18.12m:** Slightly weathered, grey SILTSTONE; very weak. Contains moderately thin 45-180mm beds of fine to medium sandstone.	SW SW		77	77	76		18.12m: BP 10° 18.25m: JT 10° St, Sm, Cl **18.28m to 18.29m:** Disseminated black carbonaceous material <2mm, inclined 15°. 18.30m: BP 20° 18.35m: BP 30° 18.68m: BP 15° 18.77m: BP 25° 18.95m: BP 18°	
	72			EUx	**19.16m:** CORE LOSS								
HQ3		20		EUz2	**19.5m:** Slightly weathered, grey, SILTSTONE; very weak. Contains laminated 2-7mm beds of fine sandstone.	SW		98	97	91		19.86m: JT 10° Pl, Ro, Cl	

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 7cm and vertical accuracy of 8cm.
2) Geophysical profiling undertaken downhole on 26/08/2024, comprising an Optical and Acoustic Televiewer.
3) ES refers to environmental sample

Water Level Readings:
Date Time | Hole Depth | Water Level
26/08/24 08:50 | 15.00m | 5.16 m bgl
26/08/24 14:50 | 21.00m | 5.69 m bgl
27/08/24 08:00 | 21.00m | 6.04 m bgl
28/08/24 12:15 | 21.00m | 6.33 m bgl

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Basque Park**
Project Reference: **521290-064**

BH46

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46
Contractor: Drill Force

CO-ORDINATES: NZTM2000
Easting: 1756622.41m
Northing: 5918739.97m
Ground level: 52.67m (NZVD2016)

Date started: 23/08/2024
Date completed: 26/08/2024
Inclination: 90°
Azimuth: N/A

Logged by: THH
Input by: THH
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3		21	× ×	EUz2	**19.5m:** Slightly weathered, grey, SILTSTONE; very weak. Contains laminated 2-7mm beds of fine sandstone. **20.58m to 20.76m:**...Fine to medium SANDSTONE. End of borehole at 21m (Termination Depth Achieved)	SW		98	97	91		20.42m: BP 2° 20.49m: JT 20° Pl, Ro, Cl 20.58m: BP 2° 20.69m: BP 10° 20.92m: JT 15° Pl, Sm, Cl **20.96m to 20.98m:** Beds (2) of disseminated black carbonaceous material <2mm, inclined 20°.	

REMARKS:
1) Co-ordinates captured using a Leica Zeno FLX100 plus smart antenna, with horizontal accuracy of 7cm and vertical accuracy of 8cm.
2) Geophysical profiling undertaken downhole on 26/08/2024, comprising an Optical and Acoustic Televiewer.
3) ES refers to environmental sample

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
26/08/24 08:50 | 15.00m | 5.16 m bgl
26/08/24 14:50 | 21.00m | 5.69 m bgl
27/08/24 08:00 | 21.00m | 6.04 m bgl
28/08/24 12:15 | 21.00m | 6.33 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **43 Cooper Street**
Project Reference: **521290-064**

BH48

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1755526.25m
Northing: 5918324.69m
Ground level: 34.39m (NZVD2016)

Date started: 1/07/2024
Date completed: 4/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	34			P	**0m:** ASPHALT.							**0m: FILL** **0.05m to 0.2m:** ES BH48_0.05-0.2	
				FEg	**0.1m:** Silty coarse GRAVEL with some cobbles and concrete; grey. Tightly packed, moist. Gravel is sub-angular, slightly weathered basalt. Cobbles and concrete up to 250mm. Cobbles are slightly weathered, moderately strong basalt. [FILL]	GM	0.5m: ISHSV=UTP						
		1		ERc	**0.6m:** CLAY; brown. Very stiff, moist, high plasticity. [RESIDUAL ECBF]	CL	1m: ISHSV=139/21kPa					**0.6m: EAST COAST BAY FORMATION** **0.6m:** Residual ECBF soils?	
	33				**1.5m:**...Light brown with orange. Very stiff.		1.5m: ISHSV=118/19kPa	0					
		2		ERs	**2m:** Silty fine SAND; light brown. Dense, moist. [COMPLETELY WEATHERED ECBF]	SM	2m: ISHSV=139/34kPa 2.5m: ISHSV=UTP						
	32												
		3		EWz	**3m:** Moderately weathered, grey mottled orange, SILTSTONE; extremely weak. (SILT).	MW	3m: ISHSV=UTP 3m: SPT 1,0// 5,10,25,10 for 25mm N = 50+					**3m: EAST COAST BAYS FORMATION** **3m to 3.1m:** ES BH48_3-3.1	
SPT	31												
				EWs	**3.2m:** Moderately weathered, grey, fine to medium SANDSTONE; poorly cemented, extremely weak. (Silty SAND).	MW		89				**3.2m: EAST COAST BAY FORMATION**	
HQ3		4			**3.45m:** Moderately weathered, grey, SANDSTONE; very weak. Poorly cemented. **3.56m to 3.66m:**...Black carbonaceous material disseminated through layer.	MW							
					3.95m to 4.05m:...SILTSTONE; very weak. 10mm black carbonaceous material along top boundary.			95	95	95			
	30			EUz2	**4.22m:** Slightly weathered, grey, SILTSTONE; very weak. **4.23m to 4.28m:**...Subhorizontal layer of black carbonaceous material disseminated throughout.	SW							
SPTC							4.5m: SPTC 5,12// 50 N = 50+	N/A	N/A	N/A		**4.5m:** Moved to SPTc due to being in competent rock.	
HQ3		5		EUs2	**4.73m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **4.8m to 4.89m:**...SILTSTONE. 5mm gently inclined black carbonaceous material layer on bottom boundary of the	SW		94	76	63			

Box 1

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 4cm and vertical accuracy of 4cm.
2) Geophysical profiling undertaken downhole on 03/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 5.5 m bgl (BH48_PZ01) and 17m bgl (BH48_PZ02). S/N: 361080 and 366174.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
01/07/24 16:00 | 7.50m | 1.18 m bgl
02/07/24 08:00 | 7.50m | 2.00 m bgl
02/07/24 15:30 | 27.00m | 3.00 m bgl
03/07/24 07:30 | 27.00m | 6.72 m bgl
03/07/24 10:00 | 30.00m | 8.44 m bgl
03/07/24 16:20 | 30.00m | 4.90 m bgl
04/07/24 12:00 | 30.00m | 5.54 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **43 Cooper Street**
Project Reference: **521290-064**

BH48

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1755526.25m
Northing: 5918324.69m
Ground level: 34.39m (NZVD2016)

Date started: 1/07/2024
Date completed: 4/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3 Box 1	29			EUs2	siltstone. **4.73m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented. **5.26m to 5.37m:**...SILTSTONE. Black carbonaceous material in two horizontal bands, 10mm, on bottom boundary.	SW		94	76	63		5.04m to 5.20m: JT 80° Un, Sm, Cl 5.25m: JT 60° Un, Sm, Cl 5.53m to 5.61m: JT 65° Un, Sm, Cl	
				EUz2	**5.6m:** Slightly weathered, grey, SILTSTONE; very weak.	SW						**5.6m:** Core damaged during removal from splits to core box.	
SPTC		6					6m: SPTC 7,31// 50 for 45mm N = 50+	N/A	N/A	N/A		5.95m: BP 15° **6m:** SPTs terminated due to N=50+ being achieved 3 times.	
HQ3 Box 2	28			EUs2	**6.2m:** Slightly weathered, grey, fine to medium SANDSTONE; very weak. Moderately cemented.	SW		96	88	88		**6.5m to 6.7m:** ES BH48_6.5-6.7	
	27	7			**6.9m:** Slightly weathered, grey, fine to medium SANDSTONE; weak. Moderately cemented. **7.04m to 7.11m:**...SILTSTONE, weak. **7.11m to 7.47m:**...Very weak. **7.47m to 7.57m:**...SILTSTONE, weak.	SW						**7m:** Core damaged during removal from splits.	
				EUz2	**7.7m:** Slightly weathered, grey, SILTSTONE; weak.	UW						7.67m: JT 45° Pl, Ro, Cl	
		8										7.90m to 8.00m: JT 70° Pl, Ro, Cl	
HQ3 Box 3	26			EUs2	**8m:** Unweathered, grey, fine to medium SANDSTONE; weak. Moderately cemented. **8.4m to 8.6m:**...Very weak. **8.61m to 8.75m:**...SILTSTONE; weak. Fibrous black carbonaceous material along the top boundary. **8.84m to 9.15m:**...SILTSTONE; weak. Subhorizontal bed of black carbonaceous material, 10mm.	UW		100	75	73		8.50m to 8.60m: JT 80° Pl, Ro, Cl	
		9											
	25				**9.5m to 9.65m:**...SILTSTONE.			93	93	93		9.60m: JT 40° Pl, Sm, Cl 9.80m: JI 50° Pl, Ro, Cl	
		10											

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 4cm and vertical accuracy of 4cm.
2) Geophysical profiling undertaken downhole on 03/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 5.5 m bgl (BH48_PZ01) and 17m bgl (BH48_PZ02). S/N: 361080 and 366174.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
01/07/24 16:00 | 7.50m | 1.18 m bgl
02/07/24 08:00 | 7.50m | 2.00 m bgl
02/07/24 15:30 | 27.00m | 3.00 m bgl
03/07/24 07:30 | 27.00m | 6.72 m bgl
03/07/24 10:00 | 30.00m | 8.44 m bgl
03/07/24 16:20 | 30.00m | 4.90 m bgl
04/07/24 12:00 | 30.00m | 5.54 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **43 Cooper Street**
Project Reference: **521290-064**

BH48

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**					
Method:	Rotary Core Wireline	Easting:	1755526.25m	Date started:	1/07/2024	Logged by:	AP
Equipment:	Hydrapower Trekker 2100	Northing:	5918324.69m	Date completed:	4/07/2024	Input by:	AP
Contractor:	Drill Force NZ Ltd	Ground level:	34.39m (NZVD2016)	Inclination:	-90°	Checked by:	PK
				Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	24				**8m:** Unweathered, grey, fine to medium SANDSTONE; weak. Moderately cemented. **10.05m to 10.3m:**...SILTSTONE. Two thinly laminated, subhorizontal bands of black carbonaceous material, extremely closely spaced, on top boundary.			93	93	93		**10.4m to 10.5m:** Core loss due to washing out bottom.	
HQ3	23	11			**10.63m to 11.04m:**...SILTSTONE. **11.04m to 11.11m:**...Subhorizontal laminated black carbonaceous material bands. **11.62m to 11.69m:**...SILTSTONE. **11.82m to 11.88m:**...SILTSTONE. **11.88m to 12.05m:**...Black carbonaceous material disseminated throughout.			97	97	97			
HQ3	22	12		EUs2	**12.2m to 12.34m:**...SILTSTONE.	UW		88	68	68		**11.95m to 12m:** Core loss 0.05m.	
HQ3	21	13			**12.52m to 12.89m:**...SILTSTONE. **12.57m to 12.89m:**...SILTSTONE. **12.58m to 12.7m:**...Fibrous black carbonaceous material disseminated throughout, up to 5mm wide and 60mm length.							12.85m to 12.99m: JT 60° Pl, Ro, Cl	
HQ3	20	14			**13.81m to 14.01m:**...SILTSTONE. **13.96m to 13.98m:**...Band of black carbonaceous material.			69	36	36		**13.5m to 15m:** Core washed out bottom. Core broken on multiple attempts of retrieval.	
		15		EUx	**14.54m:** CORE LOSS.							**14.54m: East Coast Bays Formation** **14.54m to 15m:** Drill induced core loss. Driller had to go back down multiple times to retrieve core. Core was retrieved but was too damaged to add to corebox. Was noted as core loss due to not being able to log the core.	

Box 3
Box 4

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 4cm and vertical accuracy of 4cm.
2) Geophysical profiling undertaken downhole on 03/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 5.5 m bgl (BH48_PZ01) and 17m bgl (BH48_PZ02). S/N: 361080 and 366174.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
01/07/24 16:00 | 7.50m | 1.18 m bgl
02/07/24 08:00 | 7.50m | 2.00 m bgl
02/07/24 15:30 | 27.00m | 3.00 m bgl
03/07/24 07:30 | 27.00m | 6.72 m bgl
03/07/24 10:00 | 30.00m | 8.44 m bgl
03/07/24 16:20 | 30.00m | 4.90 m bgl
04/07/24 12:00 | 30.00m | 5.54 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **43 Cooper Street**
Project Reference: **521290-064**

BH48

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1755526.25m
Northing: 5918324.69m
Ground level: 34.39m (NZVD2016)

Date started: 1/07/2024
Date completed: 4/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS, WS, MWS, CS, VCS, ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 4 HQ3	19			EUs	**15m:** Unweathered, grey, SANDSTONE; weak. Well cemented.	UW		95	95	95		**16m to 19m:** Water pressure permeability test (BH48_PPT01)	
		16											
	18			EUz2	**16.28m:** Unweathered, grey, SILTSTONE; weak.	UW						16.65m: JT 90° Sm, Cl	
		17			**16.87m to 16.92m:**...5mm layer of black carbonaceous material disseminated throughout.							16.98m to 17.14m: JT 70° Un, Ro, Cl	
Box 5 HQ3	17				**16.92m:** Unweathered, grey, SANDSTONE; weak. Well cemented.			100	87	85		17.20m to 17.34m: JT 70° Un, Ro, Cl 17.40m: BP 10°	
		18											
	16			EUs2	**18.08m to 18.2m:**...SILTSTONE. Black carbonaceous layer on bottom boundary.	UW						**18.2m to 18.3m:** Drilling induced crushed zone.	
					18.4m to 18.5m:...SILTSTONE. 10mm of laminated black carbonaceous material layers extremely closely spaced.							**18.5m to 18.54m:** Drilling induced crushed zone. 18.55m to 18.65m: JT 80° Pl, Ro, Cl	
Box 6 HQ3		19			**18.73m to 19m:**...SILTSTONE.			100	73	70		18.84m: JT 70° Pl, Ro, Cl 19.10m to 19.30m: JT 60° Un, Ro, Cl	
	15												
HQ3		20			**19.6m to 19.66m:**...SILTSTONE. **19.9m to 20m:**...SILTSTONE.			100	100	100			

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 4cm and vertical accuracy of 4cm.
2) Geophysical profiling undertaken downhole on 03/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 5.5 m bgl (BH48_PZ01) and 17m bgl (BH48_PZ02). S/N: 361080 and 366174.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
01/07/24 16:00 | 7.50m | 1.18 m bgl
02/07/24 08:00 | 7.50m | 2.00 m bgl
02/07/24 15:30 | 27.00m | 3.00 m bgl
03/07/24 07:30 | 27.00m | 6.72 m bgl
03/07/24 10:00 | 30.00m | 8.44 m bgl
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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **43 Cooper Street**
Project Reference: **521290-064**

BH48

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1755526.25m
Northing: 5918324.69m
Ground level: 34.39m (NZVD2016)

Date started: 1/07/2024
Date completed: 4/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	14	21		EUs2	**16.92m:** Unweathered, grey, SANDSTONE; weak. Well cemented. **20.17m to 20.48m:**...SILTSTONE. **20.61m to 20.88m:**...SILTSTONE.			100	100	100		20.00m: BP 10°	
HQ3	13	22			**21.03m to 21.08m:**...SILTSTONE. **21.18m to 21.3m:**...SILTSTONE. **21.57m to 21.7m:**...SILTSTONE. Black carbonaceous material fragments disseminated 10mm from bottom boundary. **21.79m to 22.03m:**...SILTSTONE.			100	100	100		21.70m: JT 25° Pl, Ro, Cl 22.00m: BP 40°	
HQ3	12	23				UW		97	97	97		**22.75m:** BP <5°, RO, Cl **23.15m:** BP <5°, RO, Cl	
HQ3	11	24			**23.64m to 23.76m:**...SILTSTONE. **23.82m to 23.9m:**...SILTSTONE.								
HQ3	10	25			**24.48m to 24.78m:**...SILTSTONE. Black carbonaceous material bands 30mm along bottom boundary.			100	97	97		24.35m: JT 45° Ro, Cl	

Box 6 Box 7 Box 8

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 4cm and vertical accuracy of 4cm.
2) Geophysical profiling undertaken downhole on 03/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 5.5 m bgl (BH48_PZ01) and 17m bgl (BH48_PZ02). S/N: 361080 and 366174.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
01/07/24 16:00 | 7.50m | 1.18 m bgl
02/07/24 08:00 | 7.50m | 2.00 m bgl
02/07/24 15:30 | 27.00m | 3.00 m bgl
03/07/24 07:30 | 27.00m | 6.72 m bgl
03/07/24 10:00 | 30.00m | 8.44 m bgl
03/07/24 16:20 | 30.00m | 4.90 m bgl
04/07/24 12:00 | 30.00m | 5.54 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **43 Cooper Street**
Project Reference: **521290-064**

BH48

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1755526.25m
Northing: 5918324.69m
Ground level: 34.39m (NZVD2016)

Date started: 1/07/2024
Date completed: 4/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: AP
Input by: AP
Checked by: PK
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	9			EUs2	**16.92m:** Unweathered, grey, SANDSTONE; weak. Well cemented.			100	97	97			
HQ3	8	26			**25.8m to 25.85m:**...SILTSTONE.			100	100	100		**26.2m:** BP <5°	
					26.3m to 26.41m:...SILTSTONE.							**26.8m:** BP <5°	
HQ3	7	27			**27.31m:**...Two thinly laminated extremely close bands of black carbonaceous material.	UW		93	93	93			
					27.4m to 27.5m:...SILTSTONE.								
					27.6m to 27.62m:...Band of black carbonaceous material, 20mm width.								
					27.7m to 27.79m:...SILTSTONE.								
		28			**28.05m to 28.28m:**...SILTSTONE.								
	6				**28.3m to 28.35m:**...Band of black carbonaceous material, 5mm width.								
HQ3	5	29						100	100	100		**28.5m:** Core damaged from removal from splits.	
		30			End of borehole at 30m (Termination Depth Achieved)								

Box 8
Box 9

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy 4cm and vertical accuracy of 4cm.
2) Geophysical profiling undertaken downhole on 03/07/24, comprising of optical and acoustic televiewer down the length of the hole.
3) ES refers to Environmental Sample.
4) Vibrating wire piezometer (VWP) were installed at 5.5 m bgl (BH48_PZ01) and 17m bgl (BH48_PZ02). S/N: 361080 and 366174.

Hand Shear Vane Serial No: 1378 Correction Factor: 1.479

Water Level Readings:
Date Time | Hole Depth | Water Level
01/07/24 16:00 | 7.50m | 1.18 m bgl
02/07/24 08:00 | 7.50m | 2.00 m bgl
02/07/24 15:30 | 27.00m | 3.00 m bgl
03/07/24 07:30 | 27.00m | 6.72 m bgl
03/07/24 10:00 | 30.00m | 8.44 m bgl
03/07/24 16:20 | 30.00m | 4.90 m bgl
04/07/24 12:00 | 30.00m | 5.54 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Arch Hill Reserve**
Project Reference: **521290-064**

BH49

Sheet **1** of **4**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1755462.64m
Northing: 5918300.13m
Ground level: 26.87m (NZVD2016)

Date started: 8/07/2024
Date completed: 12/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HA	26	1		T	**0m:** SILT with minor clay and trace organics; greyish brown. Stiff, moist, low plasticity. Organics are amorphous. [TOPSOIL]	ML							**0m: FILL** **0.05m to 0.2m:** ES BH49_0.05-0.20m	
				Fc	**0.2m:** Silty CLAY with some gravel; brown. Very stiff, moist, high plasticity. Gravel is slightly weathered, subangular, fine greywacke. [FILL]	CH	0.35m: ISHSV=129/39kPa	100				**0.3m to 0.4m:** ES BH49_0.30-0.40m **0.35m:** ES BH49_0.35m	
					0.5m to 0.9m:...some fine sand, stiff.		0.5m: ISHSV=76/34kPa					**0.5m to 0.6m:** ES BH49_0.50-0.60m	
							0.8m: ISHSV=84/17kPa						
					0.9m:...brownish grey.							**1m to 1.1m:** ES BH49_1.00-1.10m	
SPT	25	2		ERc	**1.2m:** Silty CLAY; light orange mottled grey. Stiff, moist, high plasticity. [RESIDUAL SOIL ECBF]	CH	1.5m: ISHSV=86/11kPa 1.5m: SPT 1,0// 0,0,1,1 N = 2	78				**1.2m: EAST COAST BAYS FORMATION** **1.4m to 1.5m:** ES BH49_1.40-1.50m	
				ERx	**1.85m:** CORE LOSS.								
HQ3	24	3		ERc	**1.95m:** CLAY with some silt and minor sand; light grey mottled orange. Stiff, moist, high plasticity. Sand is fine.	CH		86				**2.7m to 2.8m:** ES BH49_2.70-2.80m	
				ERx	**2.85m:** CORE LOSS.								
SPT				ERc	**3m:** Sandy CLAY with some silt; light grey mottled orange. Firm, moist, high plasticity. Sand is fine. **3.1m:**...light grey.	SC	3m: IBHSV=27/0kPa 3m: SPT 0,0// 0,0,0,0 N = 0	100				3m: SPT sunk under own weight.	
HQ3	23	4		ERc	**3.65m:** CLAY with some silt and sand; light grey mottled light orange. Firm, moist, high plasticity. Sand is fine.	CH		95					
SPT	22	5		ERc			4.5m: IBHSV=47/15kPa 4.5m: SPT 0,1// 0,1,1,1 N = 3	100				**4.45m to 4.5m:** Core loss	
								100					

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 11/07/2024, comprising an Optical and Acoustic Televiewer.
3) ES = Environmental Sample.
4) A vibrating wire piezometer (VWP) was installed at 17m bgl (BH49-PZ01), serial no. 365173. An additional VWP was installed in BH49A, approx. 1m east of BH49, at 7m bgl (BH49A-PZ01), serial no. 366078.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
10/07/24 14:45 | 15.00m | 3.05 m bgl
11/07/24 08:00 | 15.00m | 5.53 m bgl
11/07/24 14:10 | 20.00m | 2.90 m bgl
12/07/24 07:30 | 20.00m | 5.53 m bgl
12/07/24 11:30 | 20.00m | 5.69 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Arch Hill Reserve**
Project Reference: **521290-064**

BH49

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1755462.64m
Northing: 5918300.13m
Ground level: 26.87m (NZVD2016)

Date started: 8/07/2024
Date completed: 12/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 1 HQ3	21	6		ERc	**4.95m:**...soft, minor fine SAND. **3.65m:** CLAY with some silt and sand; light grey mottled light orange. Firm, moist, high plasticity. Sand is fine.							4.95m: Cased to 3m. **5m to 5.1m:** ES BH49_5.00-5.10m	
				ERz	**5.3m:** SILT with some clay; light grey. Stiff, moist, high plasticity. [COMPLETELY WEATHERED ECBF]	MH		100					
					5.75m:...very stiff, streaked dark brownish grey. **5.8m:**...some fine SAND.								
SPT				EWs	**5.9m:** Highly weathered, light greenish grey, silty medium SANDSTONE; extremely weak. Poorly cemented. (Silty SAND)	HW	6m: SPT 1,1// 3,4,5,6 N = 18					**5.9m to 6m:** ES BH49_5.90-6.00m	
					6.15m to 6.25m:...fine SANDSTONE.			100					
					6.35m to 6.4m:...SILTSTONE.								
Box 2 HQ3	20	7			**6.55m:** Moderately weathered, greenish grey, medium SANDSTONE; extremely weak. Moderately cemented.	MW						6.45m: Changed from extended nozzle to normal nozzle at 7m. **6.5m:** Drill induced breaks - discing. 6.55m to 6.75m: JT 70° Un, Ro, Cl	
				EWx	**7m:** CORE LOSS.			86	83	83			
				EUs2	**7.15m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **7.23m to 7.36m:**...medium SANDSTONE.	SW						**7.3m to 7.5m:** Core fractured upon recovery due to transition from weathered to unweathered material **7.4m:** disseminated black carbonaceous material.	
SPTC					**7.5m:** Slightly weathered, light grey, medium SANDSTONE; very weak. Moderately cemented.		7.5m: SPTC 8,20// 50 N = 50+	N/A	N/A	N/A			
HQ3	19	8										7.83m to 8.30m: JT 80° Un, Ro, Cl dip angle 60° from 8.2m. **8m to 8.1m:** ES BH49_8.00-8.10m	
					8.27m to 8.32m:...SILTSTONE. **8.32m to 8.65m:**...coarse SANDSTONE.			100	83	61		8.30m: JT 70° Pl, Sm, Cl 8.42m: BP 5° Pl, Ro, Cl	
					8.65m to 9m:...SILTSTONE.	SW						8.73m: JT 45° Pl, Ro, Cl **8.87m:** black carbonaceous material, <2mm, inclined 5°.	
SPTC	18	9					9m: SPTC 7,30// 50 for 65mm N = 50+	N/A	N/A	N/A			
Box 3 HQ3					**9.23m to 9.35m:**...fine SANDSTONE.							**9.3m to 9.4m:** turbidite sequence?	
					9.6m to 9.66m:...fine SANDSTONE. **9.66m to 9.85m:**...coarse SANDSTONE. **9.7m to 9.85m:**...SILTSTONE.			100	97	97		**9.5m to 9.6m:** disseminated black carbonaceous material. 9.63m: JT 10° Pl, Ro, Cl	
	17	10			**9.85m to 10.5m:**...coarse SANDSTONE with occasional siltstone lithics 2-10mm.							9.82m: BP 30°	

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 11/07/2024, comprising an Optical and Acoustic Televiewer.
3) ES = Environmental Sample.
4) A vibrating wire piezometer (VWP) was installed at 17m bgl (BH49-PZ01), serial no. 365173. An additional VWP was installed in BH49A, approx. 1m east of BH49, at 7m bgl (BH49A-PZ01), serial no. 366078.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
10/07/24 14:45 | 15.00m | 3.05 m bgl
11/07/24 08:00 | 15.00m | 5.53 m bgl
11/07/24 14:10 | 20.00m | 2.90 m bgl
12/07/24 07:30 | 20.00m | 5.53 m bgl
12/07/24 11:30 | 20.00m | 5.69 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Arch Hill Reserve**
Project Reference: **521290-064**

BH49

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1755462.64m
Northing: 5918300.13m
Ground level: 26.87m (NZVD2016)

Date started: 8/07/2024
Date completed: 12/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUs2	**7.5m:** Slightly weathered, light grey, medium SANDSTONE; very weak. Moderately cemented. **10.01m to 10.1m:**...fine SANDSTONE.	SW		100	97	97		9.98m to 10.14m: JT 70° Un, Ro, Cl **10m to 15m:** Water Pressure Permeability Test (BH48-PPT01).	
SPTC							10.5m: SPTC 20,30 for 130mm// N = 50+	N/A	N/A	N/A			
				EUx	**10.63m:** CORE LOSS.								
	16			EUs2	**10.8m:** Slightly weathered, light grey, coarse SANDSTONE; very weak. Moderately cemented.	SW						10.86m to 11.12m: JT 85° Un, Ro, Cl	
		11										11.07m to 11.14m: JI 85°	
												11.14m to 11.24m: JT 85° Un, Ro, Cl	
HQ3				EUz2	**11.3m:** Slightly weathered, light grey, laminated SILTSTONE; very weak. Bedding is thick, 2-6mm, inclined <5°.	SW		88	74	74		11.45m: BP 20°	
	15				**11.78m to 12m:**...coarse SANDSTONE.							**11.78m to 11.8m:** disseminated black carbonaceous material.	
		12										11.90m to 12.00m: JT 35° Un, Ro, Cl	
												12m: Driller said core loss in zone of poorly cemented sandstone.	
												12.12m to 12.2m: black carbonaceous material, <2mm, inclined 5°.	
					12.5m to 12.55m:...medium SANDSTONE. **12.55m to 12.59m:**...coarse SANDSTONE with shell fragments. **12.65m to 12.73m:**...coarse SANDSTONE with shell fragments. **12.8m to 12.87m:**...medium SANDSTONE, poorly cemented.								
	14							67	60	60		12.70m: BP 25°	
		13		EUx	**12.87m:** CORE LOSS.								
				EUz2	**13.37m:** Slightly weathered, light grey, laminated SILTSTONE; very weak. Bedding is thick, 2-6mm, inclined <5°. **13.46m to 13.5m:**...medium SANDSTONE, poorly cemented.	SW						13.5m: Driller said core loss in zone of poorly cemented sandstone.	
HQ3	13				**13.75m to 13.85m:**...medium SANDSTONE, poorly cemented.								
		14			**13.95m to 14.16m:**...medium SANDSTONE, poorly cemented.								
					14.2m to 14.25m:...medium SANDSTONE.			87	81	81			
					14.58m to 14.65m:...fine SANDSTONE.							**14.73m to 14.75m:** black carbonaceous material, <2mm, inclined 10°.	
	12			EUx	**14.81m:** CORE LOSS.								
	15												

Box 3
Box 4

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 11/07/2024, comprising an Optical and Acoustic Televiewer.
3) ES = Environmental Sample.
4) A vibrating wire piezometer (VWP) was installed at 17m bgl (BH49-PZ01), serial no. 365173. An additional VWP was installed in BH49A, approx. 1m east of BH49, at 7m bgl (BH49A-PZ01), serial no. 366078.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:
Date Time | Hole Depth | Water Level
10/07/24 14:45 | 15.00m | 3.05 m bgl
11/07/24 08:00 | 15.00m | 5.53 m bgl
11/07/24 14:10 | 20.00m | 2.90 m bgl
12/07/24 07:30 | 20.00m | 5.53 m bgl
12/07/24 11:30 | 20.00m | 5.69 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Arch Hill Reserve**
Project Reference: **521290-064**

BH49

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1755462.64m
Northing: 5918300.13m
Ground level: 26.87m (NZVD2016)

Date started: 8/07/2024
Date completed: 12/07/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: BGW
Reviewed by: SM

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	11	16		EUs2	**15m:** Slightly weathered, light grey, fine to medium SANDSTONE; very weak. Moderately cemented. **15.35m to 15.5m:**...SILTSTONE.	SW		89	82	77		15m: Driller said core loss in zone of poorly cemented sandstone. 15.72m: JT 15° Un, Sm, Cl 15.79m: JT 10° Un, Ro, Cl **15.92m to 15.95m:** black carbonaceous material, <2mm, inclined 5°. 16.18m: JT 10° Un, Ro, Cl	
				EUx	**16.33m:** CORE LOSS.								
HQ3	10	17		EUs2	**16.5m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **16.65m to 16.75m:**...SILTSTONE. **16.75m to 17.1m:**...medium SANDSTONE.	SW						16.5m: Driller said core loss in zone of poorly cemented sandstone. 16.62m: JT 20° Pl, Ro, Cl 16.70m: JT 10° Pl, Sm, Cl **16.75m:** black carbonaceous material, <2mm, inclined 5°.	
				EUx	**17.1m:** CORE LOSS.			60	53	53		**17.1m to 17.7m:** Core loss due to poorly cemented sandstone.	
HQ3	9	18		EUs2	**17.7m:** Slightly weathered, light grey, medium to coarse SANDSTONE; very weak. Moderately cemented. **17.95m to 18m:**...SILTSTONE. **18.1m to 18.19m:**...poorly cemented. **18.19m to 18.25m:**...SILTSTONE.	SW						17.95m: JT 10° Un, Ro, Cl 18m: 75% water loss.	
				EUx	**18.27m:** CORE LOSS.								
HQ3	8	19		EUs2	**18.75m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **18.9m to 19.28m:**...coarse SANDSTONE. **19.17m to 19.28m:**...poorly cemented. **19.25m to 19.5m:**...occassional siltstone laminations.	SW		68	61	61		**18.75m to 18.77m:** black carbonaceous material, <2mm, inclined 5°. 18.91m: JT 10° St, Ro, Cl 19.31m: JT 5° Pl, Ro, Cl 19.5m: Cased to 7m.	
HQ3	7	20			**19.6m to 20m:**...coarse SANDSTONE.			100	100	100			

REMARKS: End of borehole at 20m (Termination Depth Achieved)
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 2cm and vertical accuracy of 3cm.
2) Geophysical profiling undertaken downhole on 11/07/2024, comprising an Optical and Acoustic Televiewer.
3) ES = Environmental Sample.
4) A vibrating wire piezometer (VWP) was installed at 17m bgl (BH49-PZ01), serial no. 365173. An additional VWP was installed in BH49A, approx. 1m east of BH49, at 7m bgl (BH49A-PZ01), serial no. 366078.

Hand Shear Vane Serial No: 3178 Correction Factor: 1.398

Water Level Readings:

Date Time	Hole Depth	Water Level
10/07/24 14:45	15.00m	3.05 m bgl
11/07/24 08:00	15.00m	5.53 m bgl
11/07/24 14:10	20.00m	2.90 m bgl
12/07/24 07:30	20.00m	5.53 m bgl
12/07/24 11:30	20.00m	5.69 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Arch Hill Reserve**
Project Reference: **521290-064**

BH51

Sheet **1** of **3**

BOREHOLE INFORMATION		**CO-ORDINATES: NZTM2000**		Date started:	15/08/2024	Logged by:	GMR
Method:	Rotary Core Wireline	Easting:	1755328.44m	Date completed:	16/08/2024	Input by:	GMR
Equipment:	Massenza MM3	Northing:	5918295.36m	Inclination:	-90°	Checked by:	BGW
Contractor:	McMillan Drilling (N I) Ltd	Ground level:	22.52m (NZVD2016)	Azimuth:	N/A	Reviewed by:	SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HA	22			T	**0m:** SILT with some clay and trace organics; dark brown. Firm, moist, high plasticity. Organics are fibrous rootlets. [TOPSOIL]	MH						**0m: FILL** 0m: 70mm hand auger head. **0.05m to 0.2m:** ES BH51_0.05-0.2	
				Fc	**0.15m:** SILT with some gravel and minor clay; brown mottled orange. Stiff, moist, high plasticity. Gravel is fine to coarse, sub-angular to angular, grey, moderately strong, slightly weathered basalt and greywacke. [FILL]	MH	0.6m: ISHSV=73/7kPa	100				**0.5m to 0.6m:** ES BH51_0.5-0.6	
HQ3		1		Fg	**0.75m:** Fine to coarse GRAVEL; bluish grey. Loosely packed, dry. Gravel is sub-angular to angular, moderately strong, slightly weathered basalt and greywacke.	GW						**0.7m:** Basalt cobble, 75mm. 0.75m: Wash out of fines in fill.	
	21			Fx	**1m:** CORE LOSS.			33				**1.45m:** Asphalt with clasts of medium, sub-angular basalt gravel.	
HQ3		2		TAc	**1.5m:** Silty CLAY with trace gravel; greenish grey mottled orange. Very stiff, moist, high plasticity. Gravel is fine, rounded, moderately weathered, orangish brown. [UNDIFFERENTIATED ALLUVIUM]	CH		100				**1.5m: TAURANGA GROUP ALLUVIUM** 1.5m: Clay expanded in barrel.	
SPT					**1.9m:** CLAY with some silt and trace organics; bluish grey. Soft, moist, high plasticity. Organics are fibrous rootlets.	CH	2m: SPT 0,0// 0,0,0,0 N = 0	80				**2m to 2.45m:** ES BH51_2.0-2.45 2m: SPT sunk under own weight. **2m to 2.45m:** ES BH51_2.0-2.45	
	20				**2.45m:**...pinkish grey, firm.							**2.36m to 2.45m:** Core loss.	
HQ3					**2.55m:**...trace fine sand. **2.6m:**...fibrous wood fragment, 20mm. **2.65m:**...fibrous wood fragment, 10mm.			100				2.45m: Clay expanded in barrel.	
		3		TAo	**2.7m:** Organic CLAY with minor silt; dark pinkish brown. Soft, moist, high plasticity. Organics are amorphous with fibrous rootlets, 10-30mm.	CH							
U54				TAx	**3m:** PUSH TUBE. Organic CLAY; dark grey mottled brownish grey, speckled black. Soft, very moist, high plasticity.		3m: IBHSV=10/3kPa	100				**3m to 3.2m:** ES BH51_3.0-3.2	
	19				**3.28m:**...Sandy SILT with occasional organics; light grey. Soft to firm, very moist, moderate plasticity. Sand is fine.								
SPT				TAo	**3.5m:** Organic CLAY; dark pinkish brown. Soft, moist, high plasticity. Organics are fibrous wood fragments, 30-60mm.	CH	3.5m: SPT 0,0// 0,0,0,0 N = 0					**3.5m to 3.95m:** ES BH51_3.5-3.95 3.5m: SPT sunk under own weight. **3.5m to 3.95m:** ES BH51_3.5-3.95	
					3.6m: CLAY with some silt, minor sand and organics; greenish grey. Soft, moist, high plasticity. Sand is fine. Organics are fibrous rootlets, 20-70mm.			100					
		4			**3.85m:**...firm.							3.95m: Cased to 3m at 4.5m bgl.	
HQ3				TAc		CH		100					
	18				**4.46m:**...45mm rootlet.								
U54				TAx	**4.5m:** PUSH TUBE. Sandy CLAY with trace organics. Stiff to very stiff, slight moist, moderate to high plasticity. Sand is fine.		4.5m: IBHSV=53/13kPa	80					
		5											

Box 1 Box 2

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 4cm and vertical accuracy of 6cm.
2) ES = Environmental Sample.
3) A standpipe was installed in BH51 with a screened interval between 4-6m bgl.

Water Level Readings:
Date Time | Hole Depth | Water Level
15/08/24 16:30 | 15.00m | 1.90 m bgl
16/08/24 08:00 | 15.00m | 1.70 m bgl

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

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Level 3, Te Tihi, 110 Carlton Gore Road
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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Arch Hill Reserve**
Project Reference: **521290-064**

BH51

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1755328.44m
Northing: 5918295.36m
Ground level: 22.52m (NZVD2016)

Date started: 15/08/2024
Date completed: 16/08/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT				TAc	**5m:** CLAY with some silt, minor sand and organics; light brownish grey. Soft, moist, high plasticity. Sand is fine. Organics are fibrous rootlets, 20-70mm.		5m: SPT 0,0// 0,0,0,1 N = 1	100				**5m to 5.45m:** ES BH51_5.0-5.45	
HQ3	17					CH		100				5.45m: Clay expanded in barrel. Excess taken for laboratory sampling.	
U54		6		TAx	**6m:** PUSH TUBE. Sandy CLAY with occasional organics. Soft, very moist to wet, high plasticity. Sand is fine to medium. **6.18m:**...Stiff.		6m: IBHSV=10/3kPa	100					
SPT	16			TAc	**6.5m:** CLAY with some silt and minor sand; light brownish grey. Soft, moist, high plasticity. Sand is fine. **6.7m to 6.74m:**...some fine sand.	CH	6.5m: SPT 0,0// 1,1,1,1 N = 4	100				**6.5m to 6.95m:** ES BH51_6.5-6.95	
HQ3		7		ERc	**6.95m:** Sandy CLAY with some silt; bluish grey. Firm, moist, high plasticity. Sand is fine. [RESIDUAL SOIL ECBF] **7.2m:**...medium gravel clasts of moderately cemented fine sand.	CH		100				**6.95m: EAST COAST BAYS FORMATION** 6.95m: Clay expanded in barrel. Excess taken for laboratory sampling.	
U54	15			ERx	**7.5m:** PUSH TUBE.			100					
SPT		8		ERs	**8m:** Silty fine SAND with minor clay; bluish grey. Firm, moist, low plasticity. [COMPLETELY WEATHERED ECBF]	SM	8m: SPT 3,4// 4,5,7,8 N = 24	78				**8m to 8.45m:** ES BH51_8.0-8.45 **8.35m to 8.45m:** Core loss.	
HQ3	14			EWz	**8.45m:** Highly weathered, greenish grey sandy SILTSTONE; extremely weak. (SILT with some fine sand).	HW		100	69	55			
SPTC		9		EWs	**8.6m:** Moderately weathered, greenish grey, fine to medium SANDSTONE; extremely weak. Poorly cemented. **8.65m to 8.7m:**...laminated SILTSTONE, bedding 15°, iron oxidation along bedding planes. **8.9m to 9m:**...laminated SILTSTONE, bedding <5°, iron oxidation along bedding planes.	MW	9m: SPTC 5,7// 10,14,18,8 for 30mm N = 50+	N/A	N/A	N/A		**8.7m:** black carbonaceous material, thinly laminated <2mm, <5°. 8.70m: BP 15° St FeO oxidation. 8.85m to 8.95m: JT 75° Pl, Ro, Cl 8.98m: BP 5° **9m to 9.45m:** ES BH51_9.0-9.45	
HQ3	13				**9.41m:** Moderately weathered, greenish grey, fine to medium SANDSTONE; extremely weak. Moderately cemented. **9.42m to 9.6m:**...poorly cemented. **9.8m to 9.87m:**...poorly cemented. **9.87m to 9.89m:**...slightly weathered, fine SANDSTONE.	MW		84	41	38		9.64m: JT 60° Pl, Ro, Cl 9.72m: JT 75° Pl, Ro, St FeO oxidation. 9.77m: JT 35° Pl, Ro, St FeO oxidation. 9.93m: JT 55° Un, Ro, St FeO oxidation.	
		10											

Box 2
Box 3

REMARKS:
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 4cm and vertical accuracy of 6cm.
2) ES = Environmental Sample.
3) A standpipe was installed in BH51 with a screened interval between 4-6m bgl.

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

Water Level Readings:
Date Time | Hole Depth | Water Level
15/08/24 16:30 | 15.00m | 1.90 m bgl
16/08/24 08:00 | 15.00m | 1.70 m bgl

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Client: **Watercare Services Ltd**
Project: **WIWQIP Motions Catchment Improvements**
Location: **Arch Hill Reserve**
Project Reference: **521290-064**

BH51

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MM3
Contractor: McMillan Drilling (N I) Ltd

CO-ORDINATES: NZTM2000
Easting: 1755328.44m
Northing: 5918295.36m
Ground level: 22.52m (NZVD2016)

Date started: 15/08/2024
Date completed: 16/08/2024
Inclination: -90°
Azimuth: N/A

Logged by: GMR
Input by: GMR
Checked by: BGW
Reviewed by: SS

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS MS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EWx	**10.02m:** CORE LOSS.							9.97m: BP 40°	
HQ3				EUz	**10.19m:** Slightly weathered, light grey SILTSTONE; very weak.	SW		84	41	38		10.24m: BP 5°	
SPTC	12			EWs	**10.5m:** Moderately weathered, greenish grey, fine to medium SANDSTONE; extremely weak. Moderately cemented.	MW	10.5m: SPTC 7,11// 13,12,19,6 for 25mm N = 50+	N/A	N/A	N/A		10.48m: BP 10°	
HQ3	11	11		EWs	**11.25m:**...light grey.	MW		100	59	32		10.94m: BP 35° 10.97m: BP 35° **11.02m to 11.05m:** black carbonaceous material, thinly laminated <2mm, 15°. 11.04m: BPJT 15° Un, Ro, Cl 11.10m: JT 50° Pl, Ro, Cl 11.25m: JI 70°	
				EWs	**11.4m to 11.65m:**...dark greenish grey.						11.34m: BP 25° 11.42m to 11.50m: BP 75° FeO oxidation. 11.47m to 11.59m: JI 80° 11.48m to 11.64m: JT 75° Pl, Ro, Vn FeO oxidation.	
				EWs	**11.7m to 12m:**...medium SANDSTONE.						11.67m: JT 55° Pl, Ro, Cl 11.71m: JT 35° Pl, Ro, Cl	
SPTC	12	12		EWs	**11.9m to 12m:**...dark greenish grey.	MW	12m: SPTC 10,16// 19,23,8 for 30mm N = 50+	N/A	N/A	N/A		11.90m: JT 45° Pl, Ro, Cl 11.94m: BP 40° dark greenish grey weathering. 11.95m: JT 40° Pl, Ro, Cl **12m to 12.33m:** ES BH51_12-12.33	
HQ3	10			EWz	**12.33m:** Moderately weathered, greenish grey, sandy SILTSTONE; extremely weak.	MW						12.48m: JT 40° Pl, Ro, Cl	
				EUz	**12.57m:** Slightly weathered, light grey SILTSTONE; very weak. **12.6m to 12.65m:**...interbedded laminations of siltstone, <5mm, sub-horizontal.	SW						12.58m to 12.62m: JI 50° 12.59m: BP 15° 12.61m: JT 10° Pl, Ro, Cl 12.62m: BP 10° 12.63m: BP 10° 12.65m: BP 10° 12.72m: BP 40°	
	13			EUs	**12.8m:** Slightly weathered, light grey, fine SANDSTONE; very weak. Moderately cemented. **12.82m to 13.14m:**...medium SANDSTONE. **13m to 13.03m:**...poorly cemented.	SW		90	75	67		**12.82m:** black carbonaceous material, thinly laminated <2mm, 10°.	
				EUs	**13.14m to 13.22m:**...siltstone, indistinct bedding.							13.17m: JT 50° Pl, Ro, Cl 13.22m: BPJT 5° Pl, Ro, Cl	
				EUx	**13.38m:** CORE LOSS.							**13.24m:** black carbonaceous material, thinly laminated <2mm, 10°. 13.25m to 13.38m: JI 85°	
	9			EUz	**13.5m:** Slightly weathered, light grey SILTSTONE; very weak.	SW						**13.27m:** black carbonaceous material, thinly laminated <2mm, 10°. 13.34m: JT 10° Pl, Ro, Cl 13.60m: JT 65° Pl, Ro, Cl	
				EUz	**13.65m to 13.85m:**...fine to medium SANDSTONE.								
	14			EUz	**14m to 14.07m:**...medium SANDSTONE.							14.07m: BP 20°	
				EUz	**14.15m to 14.28m:**...fine to medium SANDSTONE.			75	71	68		14.24m: JT 80° Un, Ro, Cl	
	8			EUx	**14.28m:** CORE LOSS.								
				EUz	**14.66m:** Slightly weathered, light grey, laminated SILTSTONE; very weak. Bedding inclined 10°.	SW						14.80m: BP 15°	
	15			EUz	**14.9m to 15m:**...fine SANDSTONE.								

REMARKS: End of borehole at 15m (Termination Depth Achieved)
1) Co-ordinates captured using a Leico Zeno FLX100 plus smart antenna, with a horizontal accuracy of 4cm and vertical accuracy of 6cm.
2) ES = Environmental Sample.
3) A standpipe was installed in BH51 with a screened interval between 4-6m bgl.

Water Level Readings:
Date Time | Hole Depth | Water Level
15/08/24 16:30 | 15.00m | 1.90 m bgl
16/08/24 08:00 | 15.00m | 1.70 m bgl

Hand Shear Vane Serial No: 3732 Correction Factor: 1.649

Box 3 Box 4 Box 5

Attachment D - Photographic evidence

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PHOTOGRAPHS

Client Name:	**Site Location:**	**Project No.**
Watercare	WIWQIP Motions Catchment Improvements	521290-064

Photo No.	**Date:**
1	08/07/2024

Description:
ACM fibre board identified at 0.35 m bgl at Shaft location SH15 (BH49 and within the Arch Hill area).

Photo No.	**Date:**
2	08/07/2024

Description:
SH15 (BH49) where the bulk ACM was identified.

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PHOTOGRAPHS

Client Name:	**Site Location:**	**Project No.**
Watercare	WIWQIP Motions Catchment Improvements	521290-064

Photo No.	**Date:**
3	14/08/2024

Description:
Fill encountered within Basque Park (BH44)

Photo No.	**Date:**
4	19/08/2024

Description:
Fill encountered within Basque Park (BH45)

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PHOTOGRAPHS

Client Name:	**Site Location:**	**Project No.**
Watercare	WIWQIP Motions Catchment Improvements	521290-064

Photo No.	**Date:**
3	14/08/2024

Description:
Fill encountered within Basque Park (BH44)

Photo No.	**Date:**
4	19/08/2024

Description:
Fill encountered within Basque Park (BH45)

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PHOTOGRAPHS

Client Name:	Site Location:	Project No.
Watercare	WIWQIP Motions Catchment Improvements	521290-064

Photo No.	Date:
5	30/08/2024

Description:
Fill encountered within Suffolk Reserve (BH07).

Photo No.	Date:
6	13/05/2024

Description:
Location of BH30, facing northeast, in Western Springs Park

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PHOTOGRAPHS

Client Name:	**Site Location:**	**Project No.**
Watercare	WIWQIP Motions Catchment Improvements	521290-064

Photo No.	**Date:**
7	22/07/2024

Description:
Plastic, wood, concrete, and glass encountered within the fill at a depth of 0.5 m bgl at SH06 (BH21).

Photo No.	**Date:**
8	04/07/2024

Description:
SH13 (BH48) where the exceedance of the PA criteria for lead was recorded.

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PHOTOGRAPHS

Client Name:	**Site Location:**	**Project No.**
Watercare	WIWQIP Motions Catchment Improvements	521290-064

Photo No.	**Date:**
9	24/09/2024

Description:
SH12A (BH43) where the exceedance of the MfE petroleum guideline soil acceptance criteria for protection of groundwater was recorded.

Photo No.	**Date:**
10	26/09/2024

Description:
SH02 (BH06) where the exceedance of the ANZG DGVs were recorded.

Attachment E - Groundwater field monitoring sheets

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 20-Jun-24 | **BH15 - Nixon Park Carpark | Data collected by: T.Hill** | **Multiprobe No:** YSI-6050000 (from ENVCO) Professional plus fill featured

Well ID: BH15 **Time:** 1:00 pm **NAPL Depth:** - **DTW:** 4.87 @ 7:30am **DTB:** 27 m @ 7:30 am **Sampled at:** 1:00pm **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	11	17	22						
Time	1:11pm	1:22pm	1:28pm	1:33pm						
°C	18.4	18.6	18.6	18.6						
DO%	88.2	75.9	69.5	65.5						
DO mg/l	8.27	7.08	6.49	6.13						
µs/cm^c	-	-	-	-						
µs/cm	519.8	522.4	523.6	526.2						
pH	8.33	8.61	8.66	8.69						
ORP	81.6	62	53.9	56.1						
DTW	11.42 m	-	-	6.9 m						
Additonal Notes:	6 x 38 mm bailers were extracted from the borehole. Discarded water was hydrovacced along with other water									

Groundwater Comments: (Colour, Sed, Odour, etc.)

Groundwater was discoloured brown (likely impacted from well development) with inclusions of brown specks which floated to the top of sample bottles.

Volume of water purged: 3 x 200L (total 600L)

Containers collected:

Dissolved Heavy metals x 2 | Water for organics x 2 BTEX/VOC x 4 | TOC/DOC x 1

Well Condition	Prior to sampling (at 9:30am) the drilling of BH15 was complete and well development had begun including flushing the hole three times removing a total of 600L of fluid.
	Sampling was undertaken directly after well development had finished and whilst groundwater was recharging in the hole (to allow for geotech monitoring installation).

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 26-Sep-24 | **BH51 - Arch Hill | Data collected by: T.Hill** | **Multiprobe No:** YSI ProDSS - 16E102905 (from

Well ID: BH51 **Time:** 11:00am **NAPL Depth:** - **DTW:** 1.32m @ 11am **DTB:** **Sampled at:** **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	5	10	15	20					
Time	11:09am	11:14am	11:19am	11:24am	11:29am					
°C	15	15	15.2	15.3	15.3					
mbars	1016.6	1016.6	1016.4	1016.4	1016.5					
DO%	22.4	24.8	26.6	24.4	39.9					
DO mg/l	2.26	2.5	2.66	2.44	3.99					
µs/cm^c	525	529	539	663	665					
µs/cm	648	654	663	540	541					
pH	6.33	6.34	6.36	6.35	6.41					
ORP	28.9	1.5	-0.1	-8.1	12.5					
Turbidity (NTU)	926.98	25581.26	814.17	561.81	7379.69					
DTW	-	-	-	1.74	1.76					
Additonal Notes:	Water samples were collected from the 2nd and 3rd bailer. 7 x 38mm bailers were extracted from the borehole.									

Groundwater Comments: (Colour, Sed, Odour, etc.)

First 1-2 Bailers of liquid water was clear with orange solids up to ~7mm. Final 3-7 Bailers had increasing tubidity turning a light brown.

Volume of water purged:

Containers collected:

Dissolved Heavy Metals (100ml)| Water for Organics (500ml)| Unpreserved bottle (1L)

Well Condition	Well was developed (extracted 3 x well volume on 16th August 2024).	* light colour = 2nd bailer sample
	Well was clean, capped, with not evidence of tampering or external environmental influence.	* dark colour = 3rd bailer sample

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 26-Sep-24 | **BH06 - Suffolk Reserve | Data collected by: T.Hill** | **Multiprobe No:** YSI ProDSS - 16E102905 (from

Well ID: BH06 **Time:** 12:35pm **NAPL Depth:** - **DTW:** 0.56 **DTB:** **Sampled at:** **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	5	10	15	20					
Time	12:40	12:45	12:50	12:55	1:00					
°C	15.4	15.3	15.4	15.2	15.1					
mbars	1013.1	1013.2	1013.2	1013	1013					
DO%	26.1	20.1	22.7	26.7	30.8					
DO mg/l	2.61	2.02	2.27	2.67	3.1					
µs/cm^c	385.6	380.4	377.7	369.4	370.4					
µs/cm	471.9	467.2	463.1	454.7	457.2					
pH	5.47	5.24	5.27	5.3	5.3					
ORP	162	188.8	188.6	194.4	84.4					
Turbidity (FNU)	1718.2	1504.22	6903.09	11470.37	4369.6					
DTW	0.95	1.68*	1.83*	1.94	1.85					
Additonal Notes:	Water samples were collected from the 2nd and 3rd bailer. 7 x 38mm bailers were extracted from the borehole.									

Groundwater Comments: (Colour, Sed, Odour, etc.)

First 1-2 Bailers of liquid water was clear. Final 3-7 Bailers had increasing tubidity turning brown.

Volume of water purged:

Containers collected:

Dissolved Heavy Metals (100ml)| Water for Organics (500ml)| Unpreserved bottle (1L) | TPH (250ml)

Well Condition	Well was developed (extracted 3 x well volume on 27th September 2024). * refers to 2x bailers extracted prior to measuring DTW.	* light colour = 2nd bailer sample
	Well was clean, capped, with not evidence of tampering or external environmental influence.	* dark colour = 3rd bailer sample

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 26-Sep-24 | **BH46 - Basque Park | Data collected by: T.Hill** | **Multiprobe No:** YSI ProDSS - 16E102905 (from

Well ID: BH46 **Time:** 2:20pm **NAPL Depth:** - **DTW:** 7.85 **DTB:** **Sampled at:** **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	5	15	52						
Time	2:23	2:28	2:38	3:30						
°C	17.7	17.4		17.4						
mbars	1010.9	1010.8		1010.4						
DO%	28.2	41.5	Not enough sample after 10 min to collect data.	49.1						
DO mg/l	2.68	3.97		4.7						
µs/cm^c	285.8	344.9		347.5						
µs/cm	332	294.8		406.7						
pH	7.15	6.49		7.23						
ORP	-21	91.7		5.7						
Turbidity (FNU)	1984.45	12349.49		11075.77						
DTW	7.46	7.94*	7.79	7.54						
Additonal Notes:	Water samples were collected from the 2nd and 3rd bailer. 3 x 38mm bailers were extracted from the borehole.									

Groundwater Comments: (Colour, Sed, Odour, etc.)

First bailer of liquid water was clear. Final 2 bailers had increasing tubidity and sediment content turning brown. Bailer was hitting the bottom of the well. BH46_01 UP1L and HM100 water samples were highly impacted by the sediment/ turbidity.

Volume of water purged:

Containers collected:

Dissolved Heavy Metals (100ml)| Water for Organics (500ml)| Unpreserved bottle (1L) | TPH (250ml)

Well Condition	Well was developed (extracted 3 x well volume on 27th September 2024). * refers to 2x bailers extracted prior to measuring DTW.	* light colour = 2nd bailer sample
	Well was clean, capped, with not evidence of tampering or external environmental influence.	* dark colour = 3rd bailer sample

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 26-Sep-24 | **BH44 - Basque Park | Data collected by: T.Hill** | **Multiprobe No:** YSI ProDSS - 16E102905 (from

Well ID: BH44 **Time:** 2:50 **NAPL Depth:** - **DTW:** 0.87 **DTB:** **Sampled at:** **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	5	10	25						
Time	2:51	2:56	3:01	3:16						
°C	15.5	15.4	15.5	Not enough sample after 10 min to collect data.						
mbars	1011.6	1011.6	1011.5							
DO%	33.7	38.5	1.9							
DO mg/l	3.36	3.85	0.19							
µs/cm^c	531	530	543							
µs/cm	649	650	663							
pH	7.57	7.83	7.65							
ORP	43.7	12	-134.2							
Turbidity (FNU)	867.19	1180.51	721.93							
DTW	0.85	2.35*	2.72	2.68						
Additonal Notes:	Water samples were collected from the 2nd and 3rd bailer. 5 x 38mm bailers were extracted from the borehole.									

Groundwater Comments: (Colour, Sed, Odour, etc.)

First bailer of liquid water was slightly murky. Final 3 bailers had increasing tubidity and sediment content turning a non-transparejnt, grey in colour and thickening in texture.

Volume of water purged:

Containers collected:

Dissolved Heavy Metals (100ml)| Water for Organics (500ml)| TPH (250ml)

Well Condition	Well was developed (extracted 3 x well volume on 27th September 2024). * refers to 2x bailers extracted prior to measuring DTW.
	Well was clean, capped, with not evidence of tampering or external environmental influence.

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 26-Sep-24 | **BH10 - Mostyn Street | Data collected by: T.Hill** | **Multiprobe No:** YSI ProDSS - 16E102905 (from

Well ID: BH10 **Time:** 3:50 **NAPL Depth:** - **DTW:** 0.52 **DTB:** **Sampled at:** **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	5	10	15	20					
Time	3:56	4:01	4:06	4:11	4:16					
°C	15.3	15.2	15.2	15.3	15.3					
mbars	1013.9	1013.8	1013.7	1013.8	1013.7					
DO%	22.7	27.7	26.3	28.2	28.5					
DO mg/l	2.27	2.79	2.64	2.83	2.85					
µs/cm^c	309.2	304.5	311.8	344	462.6					
µs/cm	379.5	375.9	383.3	422.3	376.8					
pH	7.2	7.04	6.87	6.7	6.73					
ORP	29.2	-6.2	-48.2	-69.6	21.3					
Turbidity (FNU)	1320.98	1228.59	1094.92	1900.82	1845.36					
DTW	1.34*	1.67*	1.96	1.86	-					
Additonal Notes:	Water samples were collected from the 2nd and 3rd bailer. 5 x 38mm bailers were extracted from the borehole.									

Groundwater Comments: (Colour, Sed, Odour, etc.)

First bailers of liquid water was clear. Final 2-7 bailers had increasing tubidity turning light brown.

Volume of water purged:

Containers collected:

Dissolved Heavy Metals (100ml)| Water for Organics (500ml)| Unpreserved bottle (1L)

Well Condition	Well was developed (extracted 3 x well volume on 27th September 2024). * refers to 2x bailers extracted prior to measuring DTW.	* light colour = 2nd bailer sample
	Well was clean, capped, with not evidence of tampering or external environmental influence.	* dark colour = 3rd bailer sample

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 30-Sep-24 | **BH25 - Myrtle Street | Data collected by: T.Hill** | **Multiprobe No:** YSI ProDSS - 16E102905 (from

Well ID: BH25 **Time:** 8:50am **NAPL Depth:** - **DTW:** 1.92 **DTB:** 5.97 **Sampled at:** **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	5	10	15						
Time	8:55	9:00	9:05	9:10						
°C	15.1	15.4	15.6	15.4						
mbars	1025.6	1025.7	1025.7	1025.8						
DO%	36	35.1	33.9	38.7						
DO mg/l	3.62	3.51	3.37	3.87						
µs/cm^c	467.7	380.3	382.5	380.9						
µs/cm	379.4	465.3	466.1	466.1						
pH	6.63	6.48	6.48	6.49						
ORP	21.4	-19.4	-16	-13.7						
Turbidity (FNU)	775.63	1425.78	2596.74	3248.99						
DTW	-	2.91*	2.97	-						
Additonal Notes:	Water samples were collected from the 2nd and 3rd bailer. 6 x 38mm bailers were extracted from the borehole.									

Groundwater Comments: (Colour, Sed, Odour, etc.)

First 1-3 bailers of liquid water was clear. Final 3-6 Bailers had increasing tubidity turning light brown.

Volume of water purged:

Containers collected:

Dissolved Heavy Metals (100ml)| Water for Organics (500ml)| Unpreserved bottle (1L)

Well Condition	Well was developed (extracted 3 x well volume on 3rd September 2024). * refers to 4x bailers extracted prior to measuring DTW.	* light colour = 2nd bailer sample
	Well was clean, capped, with not evidence of tampering or external environmental influence.	* dark colour = 3rd bailer sample

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 30-Sep-24 | **BH17 - Kingsland Avenue | Data collected by: T.Hill** | **Multiprobe No:** YSI ProDSS - 16E102905 (from

Well ID: BH17 **Time:** 10:20am **NAPL Depth:** - **DTW:** 0.65 **DTB:** 8.2 **Sampled at:** **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	5	10							
Time	10:26	10:31	10:36							
°C	17.3	17.4	17.5							
mbars	1025.2	1025.2	1025.3							
DO%	34.2	26.3	32.5							
DO mg/l	3.27	2.52	3.1							
µs/cm^c	455.4	381.8	383.5							
µs/cm	388.8	446.9	447.3							
pH	7.7	7.64	7.59							
ORP	69.1	53.9	37.2							
Turbidity (FNU)	238.86	1601.15	9046.23							
DTW	1.39*	1.78*	1.58							
Additonal Notes:	Water samples were collected from the 2nd and 3rd bailer. 5 x 38mm bailers were extracted from the borehole.									

Groundwater Comments: (Colour, Sed, Odour, etc.)

Water was clear with very minor small particles.

Volume of water purged:

Containers collected:

Dissolved Heavy Metals (100ml)| Water for Organics (500ml)| Unpreserved bottle (1L)

Well Condition	Well was developed (extracted 3 x well volume on 12th September 2024). * refers to 2x bailers extracted prior to measuring DTW.	* light colour = 2nd bailer sample
	Well was clean, capped, with not evidence of tampering or external environmental influence.	* dark colour = 3rd bailer sample

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 30-Sep-24 | **BH38 - Gundry Street | Data collected by: T.Hill** | **Multiprobe No:** YSI ProDSS - 16E102905 (from

Well ID: BH38 **Time:** 11:10am **NAPL Depth:** - **DTW:** 3.74 **DTB:** 4.55 **Sampled at:** **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	5	10							
Time	11:15	11:20	11:25							
°C	17	16.7	16.7							
mbars	1021.4	1021.4	1021.4							
DO%	31.3	35.6	30.7							
DO mg/l	3	3.46	2.99							
µs/cm^c	282.9	288.8	292.9							
µs/cm	333.8	343.3	347.8							
pH	6.95	6.68	6.56							
ORP	18.7	-16.4	-19.6							
Turbidity (FNU)	1165.58	1218.7	1221.77							
DTW	3.7	3.87*	3.88							
Additonal Notes:	Water samples were collected from the 2nd, 4th and 5th bailer. 5 x 38mm bailers were extracted from the borehole.									

Groundwater Comments: (Colour, Sed, Odour, etc.)

Water was a murky light brown with increasing sediment content in the final 2 bailers.

Volume of water purged:

Containers collected:

Dissolved Heavy Metals (100ml)| Water for Organics (500ml)| Unpreserved bottle (1L) | TPH (250ml)

Well Condition	Well was developed (extracted 3 x well volume on 26th September 2024). * refers to 2x bailers extracted prior to measuring DTW.	* light colour = 2nd bailer sample
	Well was clean and capped. The PVC pipe was cut downon the same day as sampling.	* dark colour = 4th and 5th bailer sample

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 30-Sep-24 | **BH36 - Ophir Street | Data collected by: T.Hill** | **Multiprobe No:** YSI ProDSS - 16E102905 (from

Well ID: BH36 **Time:** 11:40am **NAPL Depth:** - **DTW:** 8.57 **DTB:** 14.93 **Sampled at:** **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	5	10							
Time	11:45	11:50	11:55							
°C	18.1	18	18.3							
mbars	1020.4	1020.4	1020.3							
DO%	30.7	42.1	37.3							
DO mg/l	2.9	3.99	3.51							
µs/cm^c	271.1	301.3	308.4							
µs/cm	312.4	348.1	353.9							
pH	6.02	6.14	6.12							
ORP	51.1	26.3	39							
Turbidity (FNU)	404.3	4963.26	4898.82							
DTW	-	-	9.78*							
Additonal Notes:	Water samples were collected from the 2nd, 3rd and 5th bailer. 5 x 38mm bailers were extracted from the borehole.									

Groundwater Comments: (Colour, Sed, Odour, etc.)

Water was light brown and included sediment content.

Volume of water purged:

Containers collected:

Dissolved Heavy Metals (100ml)| Water for Organics (500ml)| Unpreserved bottle (1L) | TPH (250ml)

Well Condition	Well was developed (extracted 3 x well volume on 17th September 2024). * refers to 4x bailers extracted prior to measuring DTW.	* light colour = 2nd bailer sample
	Well was clean, capped, with not evidence of tampering or external environmental influence.	* dark colour = 4th and 5th bailer sample

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 10-Oct-24 | **BH39 - Burgoyne Street | Data collected by: H.S/M.G** | **Multiprobe No:** YSI ProDSS - 16E102905 (from

Well ID: BH39 **Time:** 9:25am **NAPL Depth:** - **DTW:** 6.98 **DTB:** **Sampled at:** **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	5								
Time	9:25	9:30								
°C	16	16.2								
mbars	1011.1	1011.3								
DO%	58.1	66.5								
DO mg/l	5.73	6.52								
µs/cm^c	441.9	439.6								
µs/cm	365.9	365.8								
pH	18.5	19.2								
ORP	79.9	-5.6								
Turbidity (FNU)	1247.76	869.23								
DTW	-	-								
Additonal Notes:										

Groundwater Comments: (Colour, Sed, Odour, etc.)

Water was slightly murky.

Volume of water purged:

Containers collected:

Dissolved Heavy Metals (100ml)| Water for Organics (500ml)| Unpreserved bottle (1L) | TPH (250ml)

Well Condition	Well was developed (extracted 3 x well volume on 20th September 2024). * refers to 4x bailers extracted prior to measuring DTW.
	Well was clean, sealed, with not evidence of tampering or external environmental influence.

521290-064 WIWQIP MOTIONS CATCHMENT IMPROVEMENTS

Date: 10-Oct-24 | **BH14 - Nixon Carpark | Data collected by: H.S/M.G** | **Multiprobe No:** YSI ProDSS - 16E102905 (from

Well ID: BH14 **Time:** 9:40am **NAPL Depth:** - **DTW:** 2.96 **DTB:** 5.82 **Sampled at:** **Sample Method:** 38 mm biodegradable BioBailer

DTW measured from: Ground level/Top of well pipe/ Top Hat (delete as appropriate)

Time (min)	0	5								
Time	9:40	9:45								
°C	17.7	17.5								
mbars	1016.3	1016.2								
DO%	67	67								
DO mg/l	9.32	8.05								
µs/cm^c	412.4	420.1								
µs/cm	323.4	340.4								
pH	9.51	9.55								
ORP	82.3	93.1								
Turbidity (FNU)	132.6	174								
DTW	-	-								
Additonal Notes:										

Groundwater Comments: (Colour, Sed, Odour, etc.)

First several Bailers of liquid water was clear. Additional bailers had increasing tubidity.

Volume of water purged:

Containers collected:

Dissolved Heavy Metals (100ml)| Water for Organics (500ml)| Unpreserved bottle (1L) | TPH (250ml)

Well Condition	Well was developed (extracted 3 x well volume on 20th September 2024). * refers to 4x bailers extracted prior to measuring DTW.
	Well was clean, capped, with not evidence of tampering or external environmental influence.

Attachment F - Chain of custody records

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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: 368 0726
Date Recv: 26-Sep-24 16:51
Received by: Olivia Tod
3136807266

Quote No	126272	
Primary Contact	Tiana Hill	298786
Submitted By		
Client Name	Aurecon New Zealand Limited	32359
Address	Te Tihi Level 3 / 110 Carlton Gore Road	
Newmarket, Auckland	*Postcode* 1023	
Phone	*Mobile* 021 0883 4125	
Email	nzenvlabs@aurecongroup.com	
Charge To	Aurecon New Zealand Limited	32359
Client Reference	521290-064	
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* andrew.allcock@aurecongroup.com
☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 26 09 24
Name: T. Hill
☑ *Tick if you require COC to be emailed back*
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* — *Temp:* 12.5

☐ *Sample and Analysis details checked*
Signature:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.
BH44-01 → if enough sample to complete TSS analysis too please do so otherwise don't worry :)

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	BH06_01	26.09.24	12:40	Water	Diss HMs, PAH, TSS (total suspended solids)
2	BH14_01	26.09.24	11:50	Water	Diss HMs, PAH, TPH, TSS, SVOCs
3	BH51_01	26.09.24	11:00	Water	Diss HMs, TSS
4	BH44_01	26.09.24	2:50	Water	Diss HMs, PAH, TPH, ~~TSS~~, SVOCs
5	BH46_02	26.09.24	2:25	Water	Diss HMs, PAH, TPH, TSS, SVOCs
6	BH10_01	26.09.24	4:00pm	Water	Diss HMs, TSS
7					
8					
9					
10					
11					
12					

UPT 1L HM Diss TPH Org 500
UPT 1L HM Diss Org 500
UPT 1L HM Diss Org 500
~~Org 500~~ Diss HM TPH
Org 500 Diss HM TPH BTM 1L
UTP1L Diss HM Org 500

Continued on next page

R J Hill Laboratories Limited
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Hamilton 3240 New Zealand

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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3680726
Contact:	Tiana Hill	**Date Registered:**	28-Sept-2024 12:55 pm
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	04-Oct-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH06_01 26-Sept-2024 12:40 pm	Ground Water	UP1L, Org500, TPH250, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq
2	BH14_01 26-Sept-2024 11:50 am	Ground Water	UP1L, Org500, TPH250, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq, Total Petroleum Hydrocarbons in Water, Semivolatile Organic Compounds Screening in Water by GC-MS
3	BH51_01 26-Sept-2024 11:00 am	Ground Water	UP1L, Org500, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn
4	BH44_01 26-Sept-2024 2:50 pm	Ground Water	Org500, TPH250, UPte100	Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq, Total Petroleum Hydrocarbons in Water, Semivolatile Organic Compounds Screening in Water by GC-MS
5	BH46_02 26-Sept-2024 2:25 pm	Ground Water	UP1L, Org500, TPH250, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq, Total Petroleum Hydrocarbons in Water, Semivolatile Organic Compounds Screening in Water by GC-MS
6	BH10_01 26-Sept-2024 4:00 pm	Ground Water	UP1L, Org500, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn

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: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) : Online Edition.	3 g/m^3	1-3, 5-6
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-6
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m^3	1-6
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m^3	1-2, 4-5
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid / liquid extraction, GC-MS analysis. In-house based on US EPA 8270.	0.003 - 0.10 g/m^3	2, 4-5
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m^3	2, 4-5
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m^3	2, 4-5

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m^3	2, 4-5
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m^3	2, 4-5

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ANALYSIS REQUEST

R J Hill Laboratories Limited
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Job No: **368 2863**
Date Recv: 30-Sep-24 18:10
Received by: Alexa Badenhorst

Quote No	126272
Primary Contact	Tiana Hill 298786
Submitted By	
Client Name	Aurecon New Zealand Limited 32359
Address	Te Tihi Level 3 / 110 Carlton Gore Road
	Newmarket, Auckland *Postcode* 1023
Phone	*Mobile* 021 0883 4125
Email	nzenvlabs@aurecongroup.com
Charge To	Aurecon New Zealand Limited 32359
Client Reference	521290-064
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* andrew.allcock@aurecongroup.com
☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 30-09-24
Name: T. Hill
☑ *Tick if you require COC to be emailed back*
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 18.4

☐ *Sample and Analysis details checked*
Signature:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.
can water and soil samples please be placed on seperate CoC's :)

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	BH17_01	30.09.24		Water	Dissolved metals, TSS total susp. solids
2	BH25_01	30.09.24		Water	Dissolved metals, PAH, TSS
3	BH38_01	30.09.24		water	Dissolved metals, TSS
4	BH36_01	30.09.24		water	Dissolved metals, TSS
5	BH36_5.45	12.09.24		Soil	HM(7)
6	BH14_10.0-10.1	30.09.24		Soil	HM(7)
7	BH14_2.5-2.6	30.09.24		Soil	HM(7)
8	BH43_2.3	25.09.24		Soil	HM(7)
9	BH43_0.5-0.6	24.09.24		Soil	HM(7), TPH, PAH, Asb SQ
10					
11					
12					

Continued on next page

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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3682863
Contact:	Tiana Hill	**Date Registered:**	01-Oct-2024 1:21 pm
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	Sampled 24/09/24
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	03-Oct-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH43_0.5-0.6	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; 28 Heather Street, Auckland.	0.1 g	1
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g	1
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1
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; 28 Heather Street, Auckland.	0.1 g dry wt	1
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1
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; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1
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
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1
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

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1
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
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

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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: 368 3703
Date Recv: 01-Oct-24 13:16
Received by: Olivia Tod
3136837030

Quote No 126272

Primary Contact Tiana Hill 298786

Submitted By

Client Name Aurecon New Zealand Limited 32359

Address Te Tihi Level 3 / 110 Carlton Gore Road

Newmarket, Auckland *Postcode* 1023

Phone *Mobile* 021 0883 4125

Email nzenvlabs@aurecongroup.com

Charge To Aurecon New Zealand Limited 32359

Client Reference 521290-064

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 andrew.allcock@aurecongroup.com

☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 30-09-24
Name: T. Hill
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 18.4

☐ Sample and Analysis details checked
Signature:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.
can wate and soil samples please be placed on seperate CoC's :)

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	BH17_01	30-09-24		Water	Dissolved metals, TSS total susp solids
2	BH25_01	30-09-24		Wate	Dissolved metals, PAH, TSS
3	BH38_01	30-09-24		water	Dissolved metals, TSS
4	BH36_01	30-09-24		Water	Dissolved metals, TSS
5	BH36_5.45	12 09-24		Soil	HM(7)
6	BH14_10.0-10.1	30-09-24		Soil	HM(7)
7	BH14_2.5-2.6	30-09-24		Soil	HM(7)
8	BH43_2.3	25-09-24		Soil	HM(7)
9	BH43_0.5-0.6	24-09-24		Soil	HM(7), TPH, PAH, Asb SQ
10					
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:	Aurecon New Zealand Limited	**Lab No:**	3683703
Contact:	Tiana Hill	**Date Registered:**	02-Oct-2024 9:23 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date*:	04-Oct-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	BH36_5.45 12-Sept-2024	Soil	GSoil300	Heavy Metals, Screen Level
2	BH14_10.0-10.1 30-Sept-2024	Soil	GSoil300	Heavy Metals, Screen Level
3	BH14_2.5-2.6 30-Sept-2024	Soil	GSoil300	Heavy Metals, Screen Level
4	BH43_2.3 25-Sept-2024	Soil	GSoil300	Heavy Metals, Screen Level
5	BH43_0.5-0.6 24-Sept-2024	Soil	GSoil300	Heavy Metals, 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).	-	1-5
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	5
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	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	5
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	5
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	5

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-5
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.	-	5
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	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	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	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	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

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: 368 3704
Date Recv: 01-Oct-24 13:17
Received by: Olivia Tod

Quote No	126272	
Primary Contact	Tiana Hill	298786
Submitted By		
Client Name	Aurecon New Zealand Limited	32359
Address	Te Tihi Level 3 / 110 Carlton Gore Road	
Newmarket, Auckland	*Postcode* 1023	
Phone	*Mobile* 021 0883 4125	
Email	nzenvlabs@aurecongroup.com	
Charge To	Aurecon New Zealand Limited	32359
Client Reference	521290-064	
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 andrew.allcock@aurecongroup.com
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 30.09.24
Name: T. Hill
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 18.4

☐ Sample and Analysis details checked
Signature:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.
can wate and soil samples please be placed on seperate COC's :)

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	BH17_01	30.09.24		Water	Dissolved metals, TSS total susp. solids.
2	BH25_01	30.09.24		Wate	Dissolved metals, PAH, TSS
3	BH38_01	30.09.24		wate	Dissolved metals, TSS
4	BH36_01	30.09.24		Water	Dissolved metals, TSS
5	BH36_5.45	12.09.24		Soil	HM(7)
6	BH14_10.0-10.1	30.09.24		Soil	HM(7)
7	BH14_2.5-2.6	30.09.24		Soil	HM(7)
8	BH43_2.3	25.09.24		Soil	HM(7)
9	BH43_0.5-0.6	24.09.24		Soil	HM(7), TPH, PAH, Asb SQ
10					
11					
12					

Continued on next page

R J Hill Laboratories Limited
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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3683704
Contact:	Tiana Hill	**Date Registered:**	02-Oct-2024 10:02 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	08-Oct-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH17_01 30-Sept-2024	Ground Water	UP1L, Org500, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn
2	BH25_01 30-Sept-2024	Ground Water	UP1L, Org500, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq
3	BH38_01 30-Sept-2024	Ground Water	UP1L, Org500, TPH250, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq, Total Petroleum Hydrocarbons in Water
4	BH36_01 30-Sept-2024	Ground Water	UP1L, Org500, TPH250, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq, Total Petroleum Hydrocarbons in Water

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: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) : Online Edition.	3 g/m^3	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-4
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m^3	1-4
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m^3	2-4
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m^3	3-4
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m^3	3-4
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m^3	3-4
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m^3	3-4

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: **368 4098**
Date Recv: 01-Oct-24 16:53
Received by: Olivia Tod
3136840986

Quote No 126272

Primary Contact Tiana Hill 298786

Submitted By

Client Name Aurecon New Zealand Limited 32359

Address Te Tihi Level 3 / 110 Carlton Gore Road

Newmarket, Auckland *Postcode* 1023

Phone *Mobile* 021 0883 4125

Email nzenvlabs@aurecongroup.com

Charge To Aurecon New Zealand Limited 32359

Client Reference 521290-064

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* andrew.allcock@aurecongroup.com

☐ *Other*

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 1.10.2024
Name: T.Hill
☑ *Tick if you require COC to be emailed back*
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 10.4

☐ *Sample and Analysis details checked*
Signature:

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	QAQC_01	29.08.2024		Soil	HM (7)
2	QAQC_02	05.07.2024		Soil	HM (7)
3	QAQC_03	10.07.2024		Soil	HM (7)
4	QAQC_04	26.08.2024		Soil	HM (7)
5					
6					
7					
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9					
10					
11					
12					

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:	Aurecon New Zealand Limited	**Lab No:**	3684098
Contact:	Tiana Hill	**Date Registered:**	02-Oct-2024 8:33 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	08-Oct-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	QAQC_01 29-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level
2	QAQC_02 05-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
3	QAQC_03 10-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
4	QAQC_04 26-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level
5	QAQC_05	Soil	cGSoil	Heavy Metals, Screen Level
6	QAQC_06	Soil	cGSoil	Heavy Metals, Screen Level
7	QAQC_07	Soil	cGSoil	Heavy Metals, Screen Level
8	QAQC_08	Soil	cGSoil	Heavy Metals, 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
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).	-	1-8
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-8

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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: **369 0956**
Date Recv: 10-Oct-24 12:17
Received by: Olivia Tod

3136909565

Quote No 126272

Primary Contact ~~Hannah Sussex~~ Hannah Sussex ~~298786~~

Submitted By

Client Name Aurecon New Zealand Limited 32359

Address Te Tihi Level 3 / 110 Carlton Gore Road
Newmarket, Auckland *Postcode* 1023

Phone *Mobile* ~~021 [illegible]~~

Email nzenvlabs@aurecongroup.com

Charge To Aurecon New Zealand Limited 32359

Client Reference 521290-064

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 andrew.allcock@aurecongroup.com
☑ Other hannah.sussex@aurecongroup.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 10/10/24
Name: Hannah Sussex
☑ Tick if you require COC to be emailed back
Signature: H. Sussex

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 16.9

☐ Sample and Analysis details checked
Signature:

Priority ☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	BH14-01	10/10/24		Water	SVOCs, TSS, Dis HM, PAH, TPH
2	BH14A-02	↓		↓	Dis HM, TSS, PAH
3	BH14B-03				Dis HM, TSS, PAH
4	BH14C-04				Dis HM, TSS, PAH
5	BH39-01				SVOCs, TSS, Dis HM, PAH, TPH
6					
7					
8					
9					
10					
11					
12					

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:	Aurecon New Zealand Limited	**Lab No:**	3690956
Contact:	Hannah Sussex	**Date Registered:**	11-Oct-2024 9:38 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	Sampled 10/10/24
		Submitted By:	Hannah Sussex
		Charge To:	Aurecon New Zealand Limited
		Target Date:	17-Oct-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH14-01 10-Oct-2024	Ground Water	UP1L, Org500, TPH250, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq, Semivolatile Organic Compounds Screening in Water by GC-MS, Total Petroleum Hydrocarbons in Water
2	BH14A-02 10-Oct-2024	Ground Water	UP1L, Org500, TPH250, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq
3	BH14B-03 10-Oct-2024	Ground Water	UP1L, Org500, TPH250, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq
4	BH14C-04 10-Oct-2024	Ground Water	UP1L, Org500, TPH250, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq
5	BH39-01 10-Oct-2024	Ground Water	UP1L, Org500, TPH250, UPte100	Total Suspended Solids, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn, Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq, Semivolatile Organic Compounds Screening in Water by GC-MS, Total Petroleum Hydrocarbons in Water

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: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) : Online Edition.	3 g/m^3	1-5
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-5
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m^3	1-5
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.00010 - 0.0005 g/m^3	1-5
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid / liquid extraction, GC-MS analysis. In-house based on US EPA 8270.	0.003 - 0.10 g/m^3	1, 5
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m^3	1, 5
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m^3	1, 5
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m^3	1, 5

Sample Type: Aqueous			
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.	0.7 g/m^3	1, 5

Hill Labs

ANALYSIS REQUEST

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 No: **369 4107**

Date Recv: 15-Oct-24 14:37

Received by: Sanaya Hansotia

313694 1079

Quote No 126272

Primary Contact Hannah Sussex 308625

Submitted By Hannah Sussex 308625

Client Name Aurecon New Zealand Limited 32359

Address PO Box 2292, Tauranga 3140

Phone 07 578 6183 *Mobile*

Email nzenvlabs@aurecongroup.com

Charge To Aurecon New Zealand Limited 32359

Client Reference

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
☐ Other

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

CHAIN OF CUSTODY RECORD

Sent to Hill Labs
☐ *Tick if you require COC to be emailed back*
Date & Time: 15/10/24
Name: Hannah Sussex
Signature: H. Sussex

Received at Hill Labs
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 20.5

☐ Sample & Analysis details checked
Signature:

ADDITIONAL INFORMATION / KNOWN HAZARDS

Priority ☐ Low ☐ Normal ☑ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 10 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

Quoted Sample Types

Soil (Soil), Ground Water (GW)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	BH38 - 6.9-7.0	15.10.24	Soil	Heavy Metals
2				
3				
4				
5				
6				
7				
8				
9				
10				

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:	Aurecon New Zealand Limited	**Lab No:**	3694107
Contact:	Hannah Sussex	**Date Registered:**	16-Oct-2024 8:00 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	
		Add. Client Ref:	
		Submitted By:	Hannah Sussex
		Charge To:	Aurecon New Zealand Limited
		Target Date*:	18-Oct-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	BH38_6.9-7.0 15-Oct-2024	Soil	GSoil300	Heavy Metals, 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
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
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1

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ANALYSIS REQUEST

R J Hill Laboratories Limited
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W www.hill-laboratories.com

Job No: **358 2989**

Date Recv: **16-May-24 12:14**

Received by: Sanaya Hansotia

3135829893

Quote No 126272

Primary Contact Tiana Hill 298786

Submitted By

Client Name Aurecon New Zealand Limited 32359

Address Te Tihi Level 3 / 110 Carlton Gore Road

Newmarket, Auckland *Postcode* 1023

Phone *Mobile* 021 0883 4125

Email nzenvlabs@aurecongroup.com

Charge To Aurecon New Zealand Limited 32359

Client Reference 521290-064

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* andrew.allcock@aurecongroup.com

☐ *Other*

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:*

Name:

☑ *Tick if you require COC to be emailed back* *Signature:*

Received at Hill Laboratories *Date & Time:*

Name:

Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 13.4

☐ *Sample and Analysis details checked*

Signature:

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	BH30_0.23m	13/05/2024		Soil	HMsSoil, PAH, ASB(SQ), OCP
2	BH30_0.62m	13/05/2024		Soil	HMsSoil, PAH, ASB(SQ)
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Continued on next page

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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3582989
Contact:	Tiana Hill	**Date Registered:**	17-May-2024 9:50 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date*:	21-May-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	BH30_0.23m 13-May-2024	Soil	cGSoil	Heavy Metals, Screen Level, Organochlorine Pesticides Screening in Soil, Polycyclic Aromatic Hydrocarbons Screening in Soil
2	BH30_0.62m 13-May-2024	Soil	cGSoil	Heavy Metals, Screen Level, Polycyclic Aromatic Hydrocarbons Screening 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
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).	-	1-2
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	1-2
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-2
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	1
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	1-2
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	1-2
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from; Benzo(a) anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a) pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1-2
Benzo[a]pyrene Toxic Equivalence (TEF)	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1-2

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Job No: **358 3099**

Date Recv: **16-May-24 13:46**

Received by: **Sanaya Hansotia**

3135830996

Quote No 126272

Primary Contact Tiana Hill 298786

Submitted By

Client Name Aurecon New Zealand Limited 32359

Address Te Tihi Level 3 / 110 Carlton Gore Road

Newmarket, Auckland *Postcode* 1023

Phone *Mobile* 021 0883 4125

Email nzenvlabs@aurecongroup.com

Charge To Aurecon New Zealand Limited 32359

Client Reference 521290-064

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* andrew.allcock@aurecongroup.com

☐ *Other*

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:*

Name:

☑ *Tick if you require COC to be emailed back* *Signature:*

Received at Hill Laboratories *Date & Time:*

Name:

Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 13.4

☐ *Sample and Analysis details checked*

Signature:

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	BH30_0.23m	13/05/2024		Soil	HMsSoil, PAH, ASB(SQ), OCP
2	BH30_0.62m	13/05/2024		Soil	HMsSoil, PAH, ASB(SQ)
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Continued on next page

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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3583099
Contact:	Tiana Hill	**Date Registered:**	16-May-2024 1:58 pm
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	Sampled: 13/05/24
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	20-May-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH30_0.23m	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer
2	BH30_0.62m	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil, Asbestos in Soil ESdat Electronic Transfer

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; 28 Heather Street, Auckland.	0.1 g	1-2
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	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; 28 Heather Street, Auckland.	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; 28 Heather Street, Auckland.	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; 28 Heather Street, Auckland.	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; 28 Heather Street, Auckland. 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
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; 28 Heather Street, Auckland. 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; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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; 28 Heather Street, Auckland. 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
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
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
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

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ANALYSIS REQUEST

R J Hill Laboratories Limited
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Job No: **359 0857**

Date Recv: 24-May-24 11:18

Received by: Alexa Badenhorst

3135908574

Quote No	126272
Primary Contact	Tiana Hill 298786
Submitted By	ANDREW ALLCOCK
Client Name	Aurecon New Zealand Limited 32359
Address	Te Tihi Level 3 / 110 Carlton Gore Road
	Newmarket, Auckland *Postcode* 1023
Phone	*Mobile* 021 0883 4125
Email	nzenvlabs@aurecongroup.com
Charge To	Aurecon New Zealand Limited 32359
Client Reference	521290-064
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* andrew.allcock@aurecongroup.com

☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 24/5/2024
Name: ANDREW ALLCOCK
☑ *Tick if you require COC to be emailed back*
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition Temp: 9.8
☐ *Room Temp* ☐ *Chilled* ☐ *Frozen*

☐ *Sample and Analysis details checked*
Signature:

Priority ☐ **Low** ☐ **Normal** ☑ **High**
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	BH22_0.2-0.3m	22/5/24		SOIL	HMs Soil
2	BH22_0.6m	22/5/24		SOIL	HMs Soil
3					
4					
5					
6					
7					
8					
9					
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:	Aurecon New Zealand Limited	**Lab No:**	3590857
Contact:	Tiana Hill	**Date Registered:**	25-May-2024 10:12 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Andrew Allcock
		Charge To:	Aurecon New Zealand Limited
		Target Date*:	29-May-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	BH22_0.2-0.3m 22-May-2024	Soil	GSoil300	Heavy Metals, Screen Level
2	BH22_0.6m 22-May-2024	Soil	cGSoil	Heavy Metals, 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
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).	-	1-2
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-2

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ANALYSIS REQUEST

R J Hill Laboratories Limited
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W www.hill-laboratories.com

Job No: **361 0977**

Date Recv: 20-Jun-24 14:41

Received by: Sanaya Hansotia

3136109772

Quote No	126272
Primary Contact	Tiana Hill 298786
Submitted By	THill
Client Name	Aurecon New Zealand Limited 32359
Address	Te Tihi Level 3 / 110 Carlton Gore Road
	Newmarket, Auckland *Postcode* 1023
Phone	*Mobile* 021 0883 4125
Email	nzenvlabs@aurecongroup.com
Charge To	Aurecon New Zealand Limited 32359
Client Reference	521290-064
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* andrew.allcock@aurecongroup.com
☐ *Other*

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.
will send updated COC via email.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 20.06.2024
Name: Tiana Hill
☑ *Tick if you require COC to be emailed back*
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 17.7

☐ *Sample and Analysis details checked*
Signature:

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	BH15_01.	20.06.24	1:00pm	water	Hold cold
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Continued on next page

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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3610977
Contact:	Tiana Hill	**Date Registered:**	21-Jun-2024 9:59 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	27-Jun-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH15_01 20-Jun-2024	Ground Water	Org500, Org500, TPH250, TOC125, UPte100, VOC40, VOC40, VOC40, VOC40, cUPte100	Dissolved Mercury, Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn

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: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m^3	1
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1
Filtration for dissolved metals analysis - Misc	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m^3	1

Hill Laboratories
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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: **362 0390**
Date Recv: 04-Jul-24 17:14
Received by: Sanaya Hansotia
3136203908

Quote No 126272
Primary Contact Tiana Hill 298786
Submitted By
Client Name Aurecon New Zealand Limited 32359
Address Te Tihi Level 3 / 110 Carlton Gore Road
Newmarket, Auckland *Postcode* 1023
Phone *Mobile* 021 0883 4125
Email nzenvlabs@aurecongroup.com
Charge To Aurecon New Zealand Limited 32359
Client Reference 521290-064
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 andrew.allcock@aurecongroup.com
☐ Other

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.
Will send updated COC via email.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 4·7·24
Name: T. Hill
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 16.9

☐ Sample and Analysis details checked
Signature:

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	BH29_0.05-0.2	4.7.24		Soil	Hold Cold
2	BH48_0.05-0.2	4.7.24		Soil	↓
3	BH10_0.05-0.2	4.7.24		Soil	
4	BH10_0.4-0.5	4.7.24		Soil	
5	BH10_1.0-1.1	4.7.24		Soil	
6	BH10_1.4-1.5	4.7.24		Soil	
7					
8					
9					
10					
11					
12					

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:	Aurecon New Zealand Limited	**Lab No:**	3620390
Contact:	Tiana Hill	**Date Registered:**	06-Jul-2024 10:48 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Andrew Allcock
		Charge To:	Aurecon New Zealand Limited
		Target Date:	14-Aug-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH29_0.05-0.2 04-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
2	BH48_0.05-0.2 04-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level, TCLP Profile
3	BH10_0.05-0.2 04-Jul-2024	Soil	GSoil300	Hold Cold
4	BH10_0.4-0.5 04-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH + PAH + BTEX profile
5	BH10_1.0-1.1 04-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH + PAH + BTEX profile
6	BH10_1.4-1.5 04-Jul-2024	Soil	GSoil300	Hold Cold
7	BH48_0.05-0.2 [TCLP Extract]	TCLP Extract	TCLPext	Total Lead

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).	-	1-2, 4-5
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	4-5
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	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	4-5
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	4-5
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-2, 4-5

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	4-5
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	4-5
TCLP Profile	Extraction at 30 +/- 2 rpm for 18 +/- 2 hours, (Ratio 1g sample : 20g extraction fluid). US EPA 1311.	-	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	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	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	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	4-5
TCLP Profile			
TCLP Weight of Sample Taken	Gravimetric. US EPA 1311.	0.1 g	2
TCLP Initial Sample pH	pH meter. US EPA 1311.	0.1 pH Units	2
TCLP Acid Adjusted Sample pH	pH meter. US EPA 1311.	0.1 pH Units	2
TCLP Extractant Type	US EPA 1311.	-	2
TCLP Extraction Fluid pH	pH meter. US EPA 1311.	0.1 pH Units	2
TCLP Post Extraction Sample pH	pH meter. US EPA 1311.	0.1 pH Units	2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Total Digestion of Extracted Samples	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	7
Total Lead	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B : Online Edition.	0.0021 g/m^3	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: **362 1286**
Date Recv: 05-Jul-24 14:43
Received by: Sanaya Hansotia

Quote No	126272	
Primary Contact	Tiana Hill	298786
Submitted By		
Client Name	Aurecon New Zealand Limited	32359
Address	Te Tihi Level 3 / 110 Carlton Gore Road	
	Newmarket, Auckland *Postcode* 1023	
Phone	*Mobile* 021 0883 4125	
Email	nzenvlabs@aurecongroup.com	
Charge To	Aurecon New Zealand Limited	32359
Client Reference	521290-064	
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* andrew.allcock@aurecongroup.com
☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 4·7·24
Name: T. Hill
☑ *Tick if you require COC to be emailed back*
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 16.9

☐ *Sample and Analysis details checked*
Signature:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.
Will send updated COC via email.

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	BH29_0.05-0.2	4.7.24		Soil	Hold Cold
2	BH48_0.05-0.2	4.7.24		Soil	↓
3	BH10_0.05-0.2	4.7.24		Soil	
4	BH10_0.4-0.5	4.7.24		Soil	
5	BH10_1.0-1.1	4.7.24		Soil	
6	BH10_1.4-1.5	4.7.24		Soil	
7					
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12					

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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3621286
Contact:	Tiana Hill	**Date Registered:**	05-Jul-2024 5:21 pm
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	Sampled: 04/07/24
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	11-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH29_0.05-0.2	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
2	BH48_0.05-0.2	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
3	BH10_0.05-0.2	Soil	PSoil500Asb	Hold
4	BH10_0.4-0.5	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
5	BH10_1.0-1.1	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
6	BH10_1.4-1.5	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; 28 Heather Street, Auckland.	0.1 g	1-2, 4-5
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g	1-2, 4-5
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1-2, 4-5
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1-2, 4-5
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; 28 Heather Street, Auckland.	0.1 g dry wt	1-2, 4-5
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1-2, 4-5
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-2, 4-5
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1-2, 4-5
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; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2, 4-5

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	1-2, 4-5
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2, 4-5
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, 4-5
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2, 4-5
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, 4-5
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, 4-5

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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 4078**
Date Recv: 10-Jul-24 12:58

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: Alisha Poipoi

3136240781

Quote No 126272

Primary Contact Tiana Hill 298786

Submitted By

Client Name Aurecon New Zealand Limited 32359

Address Te Tihi Level 3 / 110 Carlton Gore Road

Newmarket, Auckland *Postcode* 1023

Phone *Mobile* 021 0883 4125

Email nzenvlabs@aurecongroup.com

Charge To Aurecon New Zealand Limited 32359

Client Reference 521290-064

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 andrew.allcock@aurecongroup.com

☐ Other

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 09/07/2024
Name: Tiana H
☑ *Tick if you require COC to be emailed back*
Signature: TH

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 9.4 °C

☐ Sample and Analysis details checked
Signature:

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	BH49_0.05-0.2	08.07.2024	T/F	Soil	TPBXp, HMsSoil, AsbSoil
2	BH49_0.3-0.4	08.07.2024	F (ASB)	Soil	TPBXp, HMsSoil, AsbSoil
~~3~~	~~BH49_0.5-0.6~~	~~08.07.2024~~	~~F~~	~~Soil~~	Disregard Sample - TH
4	BH49_1.0-1.1	08.07.2024	N/F	Soil	Hold Cold
5	BH49_1.4-1.5	08.07.2024	N	Soil	Hold Cold
6	BH49_B1 0.35 m	08.07.2024	ASB	Bulk	ASB P/A
7	BH10_1.8-1.9	05.07.2024	AL	Soil	HMsSoil
8	BH10_3.3-3.4	05.07.2024	AL	Soil	HMsSoil
9	BH10_5.9-6.0	05.07.2024	AL	Soil	HMsSoil
10	BH10_9.4-9.5	05.07.2024	EC	Soil	HMsSoil
11			Disregard Column - TH		
12					

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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:	Aurecon New Zealand Limited	**Lab No:**	3624078
Contact:	Tiana Hill	**Date Registered:**	11-Jul-2024 9:33 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand 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	BH49_0.05-0.2 08-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH + PAH + BTEX profile
2	BH49_0.3-0.4 08-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH + PAH + BTEX profile
3	BH49_1.0-1.1 08-Jul-2024	Soil	GSoil300	Hold Cold
4	BH49_1.4-1.5 08-Jul-2024	Soil	GSoil300	Hold Cold
5	BH10_1.8-1.9 05-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
6	BH10_3.3-3.4 05-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
7	BH10_5.9-6.0 05-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
8	BH10_9.4-9.5 05-Jul-2024	Soil	GSoil300	Heavy Metals, 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).	-	1-2, 5-8
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	1-2
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	1-2
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from; Benzo(a) anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a) pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	1-2
Benzo[a]pyrene Toxic Equivalence (TEF)	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	1-2

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-2, 5-8
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	1-2
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	1-2
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	1-2
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1-2
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1-2
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	1-2

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: **362 4326**
Date Recv: 10-Jul-24 14:41
Received by: May Aifante

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Quote No	126272	
Primary Contact	Tiana Hill	298786
Submitted By		
Client Name	Aurecon New Zealand Limited	32359
Address	Te Tihi Level 3 / 110 Carlton Gore Road	
	Newmarket, Auckland *Postcode* 1023	
Phone	*Mobile* 021 0883 4125	
Email	nzenvlabs@aurecongroup.com	
Charge To	Aurecon New Zealand Limited	32359
Client Reference	521290-064	
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* andrew.allcock@aurecongroup.com
☐ *Other*

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 09/07/2024
Name: Tiana H
☑ *Tick if you require COC to be emailed back*
Signature: TH

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 9.4°C

☐ *Sample and Analysis details checked*
Signature:

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	BH49_0.05-0.2	08.07.2024	TS/F	Soil	TPBXp, HMsSoil, AsbSoil
2	BH49_0.3-0.4	08.07.2024	F (ASB)	Soil	TPBXp, HMsSoil, AsbSoil
~~3~~	~~BH49_0.5-0.6~~	~~08.07.2024~~	~~F~~	~~Soil~~	Disregard Sample - TH
4	BH49_1.0-1.1	08.07.2024	N/F	Soil	Hold Cold
5	BH49_1.4-1.5	08.07.2024	N	Soil	Hold Cold
6	BH49_B1 0.35 m	08.07.2024	ASB	Bulk	ASB P/A
7	BH10_1.8-1.9	05.07.2024	AL	Soil	HMsSoil
8	BH10_3.3-3.4	05.07.2024	AL	Soil	HMsSoil
9	BH10_5.9-6.0	05.07.2024	AL	Soil	HMsSoil
10	BH10_9.4-9.5	05.07.2024	EC	Soil	HMsSoil
11			Disregard Column - TH		
12					

Continued on next page

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28 Duke Street Frankton 3204
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0508 HILL LAB (44 555 22)
+64 7 858 2000
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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3624326
Contact:	Tiana Hill	**Date Registered:**	11-Jul-2024 9:46 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	Sampled: 8/07/24
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	12-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH49_B1 0.35m / BH49	Building Material	cpzBag2	Asbestos in Bulk Material

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: Building Material

Test	Method Description	Default Detection Limit	Sample No
Asbestos in Bulk Material			
Sample Category	Assessment of sample type. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	-	1
Sample Weight on receipt	Sample weight (approximate). Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.01 g	1
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1
Description of Asbestos in Non Homogeneous Samples	Form, dimensions and/or weight of asbestos fibres present. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1

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: **362 4327**
Date Recv: 10-Jul-24 14:41
Received by: May Alfante
3136243270

Quote No 126272
Primary Contact Tiana Hill 298786
Submitted By
Client Name Aurecon New Zealand Limited 32359
Address Te Tihi Level 3 / 110 Carlton Gore Road
Newmarket, Auckland *Postcode* 1023
Phone *Mobile* 021 0883 4125
Email nzenvlabs@aurecongroup.com
Charge To Aurecon New Zealand Limited 32359
Client Reference 521290-064
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 andrew.allcock@aurecongroup.com
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 09/07/2024
Name: Tiana H
☑ Tick if you require COC to be emailed back
Signature: TH

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition
☐ Room Temp ☐ Chilled ☐ Frozen
Temp: 9.4°C

☐ Sample and Analysis details checked
Signature:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

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	BH49_0.05-0.2	08.07.2024	TS/F	Soil	TPBXp, HMsSoil, AsbSoil
2	BH49_0.3-0.4	08.07.2024	F (ASB)	Soil	TPBXp, HMsSoil, AsbSoil
~~3~~	~~BH49_0.5-0.6~~	~~08.07.2024~~	~~F~~	~~Soil~~	Disregard Sample -TH
4	BH49_1.0-1.1	08.07.2024	N/F	Soil	Hold Cold
5	BH49_1.4-1.5	08.07.2024	N	Soil	Hold Cold
6	BH49_B1 0.35 m	08.07.2024	ASB	Bulk	ASB P/A
7	BH10_1.8-1.9	05.07.2024	AL	Soil	HMsSoil
8	BH10_3.3-3.4	05.07.2024	AL	Soil	HMsSoil
9	BH10_5.9-6.0	05.07.2024	AL	Soil	HMsSoil
10	BH10_9.4-9.5	05.07.2024	EC	Soil	HMsSoil
11			Disregard Column -TH		
12					

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Hamilton 3240 New Zealand

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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3624327
Contact:	Tiana Hill	**Date Registered:**	10-Jul-2024 5:49 pm
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	Sampled: 8/07/24
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	12-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH49_0.05-0.2	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
2	BH49_0.3-0.4	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; 28 Heather Street, Auckland.	0.1 g	1-2
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	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; 28 Heather Street, Auckland.	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; 28 Heather Street, Auckland.	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; 28 Heather Street, Auckland.	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; 28 Heather Street, Auckland. 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
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; 28 Heather Street, Auckland. 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; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-2

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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; 28 Heather Street, Auckland. 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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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: **362 5593**
Date Recv: 11-Jul-24 17:52
Received by: Sanaya Hansotia
3136255934

Quote No 126272
Primary Contact Tiana Hill 298786
Submitted By
Client Name Aurecon New Zealand Limited 32359
Address Te Tihi Level 3 / 110 Carlton Gore Road
Newmarket, Auckland *Postcode* 1023
Phone *Mobile* 021 0883 4125
Email nzenvlabs@aurecongroup.com
Charge To Aurecon New Zealand Limited 32359
Client Reference 521290-064
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* andrew.allcock@aurecongroup.com
☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 11/07/2024
Name: ~~A. Allcock~~ T. Hill
☑ *Tick if you require COC to be emailed back*
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 19.3
☐ *Sample and Analysis details checked*
Signature:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

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	BH13_0.05-0.2	10.07.2024		Soil	Hold Cold
2	BH13_0.4-0.5	10.07.2024		Soil	HM(7), ASB (SQ), TPH, PAH
3	BH13_1.0-1.1	10.07.2024		Soil	Hold Cold
4	BH13_1.4-1.5	10.07.2024		Soil	HM(7), TPH, PAH
5					
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10					
11					
12					

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R J Hill Laboratories Limited
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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3625593
Contact:	Tiana Hill	**Date Registered:**	13-Jul-2024 11:17 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Andrew Allcock
		Charge To:	Aurecon New Zealand Limited
		Target Date*:	17-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	BH13_0.05-0.2 10-Jul-2024	Soil	cGSoil	Hold Cold
2	BH13_0.4-0.5 10-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH Oil Industry Profile + PAHscreen
3	BH13_1.0-1.1 10-Jul-2024	Soil	GSoil300	Hold Cold
4	BH13_1.4-1.5 10-Jul-2024	Soil	GSoil300	Heavy Metals, 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, 4
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, 4
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
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, 4
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, 4
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, 4
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 4

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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
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
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
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

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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: **362 6399**

Date Recv: 12-Jul-24 13:46

Received by: Sanaya Hansotia

3136263993

Quote No 126272

Primary Contact Tiana Hill 298786

Submitted By

Client Name Aurecon New Zealand Limited 32359

Address Te Tihi Level 3 / 110 Carlton Gore Road

Newmarket, Auckland *Postcode* 1023

Phone *Mobile* 021 0883 4125

Email nzenvlabs@aurecongroup.com

Charge To Aurecon New Zealand Limited 32359

Client Reference 521290-064

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* andrew.allcock@aurecongroup.com

☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time: 11/07/2024

Name: ~~A. Allcock~~ T. Hill

☑ *Tick if you require COC to be emailed back*

Signature: ~~AA~~

Received at Hill Laboratories

Date & Time:

Name:

Signature:

Condition

☐ *Room Temp* ☐ *Chilled* ☐ *Frozen*

~~Temp~~: 14.3

☐ *Sample and Analysis details checked*

Signature:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

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	BH13_0.05-0.2	10.07.2024		Soil	Hold Cold
2	BH13_0.4-0.5	10.07.2024		Soil	HM(7), ASB (SQ), TPH, PAH
3	BH13_1.0-1.1	10.07.2024		Soil	Hold Cold
4	BH13_1.4-1.5	10.07.2024		Soil	HM(7), TPH, PAH
5					
6					
7					
8					
9					
10					
11					
12					

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:	Aurecon New Zealand Limited	**Lab No:**	3626399
Contact:	Tiana Hill	**Date Registered:**	12-Jul-2024 4:49 pm
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	Sampled: 10/07/24
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	16-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH13_0.05-0.2	Soil	PSoil500Asb	Hold
2	BH13_0.4-0.5	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
3	BH13_1.0-1.1	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; 28 Heather Street, Auckland.	0.1 g	2
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g	2
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	2
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	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; 28 Heather Street, Auckland.	0.1 g dry wt	2
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	2
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	2
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	2
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; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	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	2
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	2

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	2
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	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	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	2

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
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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **362 9193**
Date Recv: 17-Jul-24 11:46
Received by: Sanaya Hansotia
3136291939

Quote No 126272

Primary Contact Tiana Hill 298786

Submitted By

Client Name Aurecon New Zealand Limited 32359

Address Te Tihi Level 3 / 110 Carlton Gore Road

Newmarket, Auckland *Postcode* 1023

Phone *Mobile* 021 0883 4125

Email nzenvlabs@aurecongroup.com

Charge To Aurecon New Zealand Limited 32359

Client Reference 521290-064

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* andrew.allcock@aurecongroup.com

☐ *Other*

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:*

Name:

☑ *Tick if you require COC to be emailed back* *Signature:*

Received at Hill Laboratories *Date & Time:*

Name:

Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 19.0

☐ *Sample and Analysis details checked*

Signature:

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	~~BH39_0.2-0.3~~	~~16.07.2024~~	F	Soil	Ignore AA
2	BH39_0.5-0.6	16.07.2024	F	Soil	Asb(SQ), HM(7), PAH TPH BTEX
3	BH39_1.0-1.1	16.07.2024	N	Soil	Hold cold
4	BH39_1.5-1.6	16.07.2024	N	Soil	HM(7)
5	BH39_1.9-2.0	16.07.2024	N	Soil	Ignore AA
6			Ignore AA		
7					
8					
9					
10					
11					
12					

Continued on next page

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
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mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3629193
Contact:	Tiana Hill	**Date Registered:**	18-Jul-2024 8:47 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290 - 064
		Add. Client Ref:	
		Submitted By:	Andrew Allcock
		Charge To:	Aurecon New Zealand Limited
		Target Date:	12-Aug-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH39_0.5-0.6 16-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH + PAH + BTEX profile
2	BH39_1.0-1.1 16-Jul-2024	Soil	GSoil300	Total Recoverable Arsenic
3	BH39_1.5-1.6 16-Jul-2024	Soil	GSoil300	Heavy Metals, 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).	-	1-2
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. 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	1
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
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	2
Total Recoverable Arsenic	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	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	1
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

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3
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
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
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
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
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
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

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: **362 9428**

Date Recv: **17-Jul-24 15:40**

Received by: **Sanaya Hansotia**

3136294289

Quote No 126272

Primary Contact Tiana Hill 298786

Submitted By

Client Name Aurecon New Zealand Limited 32359

Address Te Tihi Level 3 / 110 Carlton Gore Road

Newmarket, Auckland *Postcode* 1023

Phone *Mobile* 021 0883 4125

Email nzenvlabs@aurecongroup.com

Charge To Aurecon New Zealand Limited 32359

Client Reference 521290-064

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* andrew.allcock@aurecongroup.com

☐ *Other*

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:*

Name:

☑ *Tick if you require COC to be emailed back* *Signature:*

Received at Hill Laboratories *Date & Time:*

Name:

Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 19.0

☐ *Sample and Analysis details checked*

Signature:

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	~~BH39_0.2-0.3~~	~~16.07.2024~~	F	Soil	Ignore AA
2	BH39_0.5-0.6	16.07.2024	E	Soil	Asb(SQ), HM(7), PAH TPH BTEX
3	BH39_1.0-1.1	16.07.2024	N	Soil	Hold cold
4	BH39_1.5-1.6	16.07.2024	N	Soil	HM(7)
5	BH39_1.9-2.0	16.07.2024	N	Soil	Ignore AA
6			Ignore AA		
7					
8					
9					
10					
11					
12					

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)
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mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3629428
Contact:	Tiana Hill	**Date Registered:**	17-Jul-2024 4:27 pm
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290 - 064
		Add. Client Ref:	Sampled: 16/07/24
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	19-Jul-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH39_0.5-0.6	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; 28 Heather Street, Auckland.	0.1 g	1
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g	1
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1
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; 28 Heather Street, Auckland.	0.1 g dry wt	1
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1
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; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1
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
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1
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

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1
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
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

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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 4409**

Date Recv: 24-Jul-24 11:13

Received by: Sanaya Hanscotia

3136344096

Quote No 126272

Primary Contact Tiana Hill 298786

Submitted By

Client Name Aurecon New Zealand Limited 32359

Address Te Tihi Level 3 / 110 Carlton Gore Road

Newmarket, Auckland *Postcode* 1023

Phone *Mobile* 021 0883 4125

Email nzenvlabs@aurecongroup.com

Charge To Aurecon New Zealand Limited 32359

Client Reference 521290-064

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* andrew.allcock@aurecongroup.com

☐ *Other*

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:*

Name:

☑ *Tick if you require COC to be emailed back* *Signature:*

Received at Hill Laboratories *Date & Time:*

Name:

Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* Temp: 8.3

☐ *Sample and Analysis details checked*

Signature:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.

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	BH21_5.4-5.5	22.07.2024		SOIL	HM7
2	BH21_6.6-6.7	22.07.2024		SOIL	
3	BH21_11.0-11.1	22.07.2024		SOIL	HM7
4	BH21_16.4-16.5	22.07.2024		SOIL	HM7
5	BH35_3.4-3.5	22.07.2024		SOIL	HMsSoil, PAH, [redacted]), TPH AA
6	BH35_4.0-4.1	22.07.2024		SOIL	HM7
7	BH35_5.3-5.4	22.07.2024		SOIL	~~HM7~~ AA
8	BH35_7.4-7.5	22.07.2024		SOIL	
9	BH39_3.0-3.45	22.07.2024		SOIL	HM7
10	BH39_4.5-4.95	22.07.2024		SOIL	
11	BH39_6.0-6.45	22.07.2024		SOIL	HM7
12	BH39_7.5-7.95	22.07.2024		SOIL	

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	BH39_9.0-9.45	22.07.2024		SOIL	HM7
14	BH39_10.5-10.95	22.07.2024		SOIL	
15	BH39_12.0-12.45	22.07.2024		SOIL	HM7
16	BH48_3.0-3.1	22.07.2024		SOIL	HM7
17	BH48_6.5-6.7	22.07.2024		SOIL	HM7
18	BH49_2.7-2.8	22.07.2024		SOIL	HM7
19	BH49_5.0-5.1	22.07.2024		SOIL	HM7
20	BH49_5.9-6.0	22.07.2024		SOIL	HM7
21	BH49_8.0-8.1	22.07.2024		SOIL	
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R J Hill Laboratories Limited
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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3634409
Contact:	Tiana Hill	**Date Registered:**	25-Jul-2024 10:51 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date*:	29-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	BH21_5.4-5.5 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
2	BH21_11.0-11.1 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
3	BH21_16.4-16.5 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
4	BH35_3.4-3.5 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH Oil Industry Profile + PAHscreen
5	BH35_4.0-4.1 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
6	BH39_3.0-3.45 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
7	BH39_6.0-6.45 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
8	BH39_9.0-9.45 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
9	BH39_12.0-12.45 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
10	BH48_3.0-3.1 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
11	BH48_6.5-6.7 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
12	BH49_2.7-2.8 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
13	BH49_5.0-5.1 22-Jul-2024	Soil	GSoil300	Heavy Metals, Screen Level
14	BH49_5.9-6.0 22-Jul-2024	Soil	GSoil300	Heavy Metals, 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).	-	1-14
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	4
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	4
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	4

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	4
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	4
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-14
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	4
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	4
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	4
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	4

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: **365 1482**
Date Recv: **16-Aug-24 16:34**
Received by: Olivia Tod
3136514821

Quote No 126272
Primary Contact Tiana Hill 298786
Submitted By
Client Name Aurecon New Zealand Limited 32359
Address Te Tihi Level 3 / 110 Carlton Gore Road
Newmarket, Auckland *Postcode* 1023
Phone *Mobile* 021 0883 4125
Email nzenvlabs@aurecongroup.com
Charge To Aurecon New Zealand Limited 32359
Client Reference 521290-064
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 andrew.allcock@aurecongroup.com
☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 16-08-24
Name: Tiana Hill
☑ *Tick if you require COC to be emailed back*
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 8.9
☐ Sample and Analysis details checked
Signature:

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.
Please disregard items crossed out

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	~~BH44_0.05-0.2~~	~~14.08.24~~	Topsoil	~~Soil~~	~~TH~~
2	BH44_0.3-0.4	14.08.24	Fill	Soil	HM(7), TPH, PAH, Asb
3	~~BH44_0.5-0.6~~	~~14.08.24~~		~~Soil~~	~~TH~~
4	~~BH44_0.8-0.9~~	~~14.08.24~~		~~Soil~~	~~TH~~
5	BH44_1.1-1.2	14.08.24		Soil	HM(7), TPH, PAH, Asb
6	~~BH44_1.4-1.5~~	~~14.08.24~~		~~Soil~~	~~TH~~
7	~~BH44_2.0-2.4~~	~~15.08.24~~		~~Soil~~	~~TH~~
8	BH44_3.0-3.4	15.08.24	interface	Soil	HM(7), TPH, PAH, Asb
9	BH44_6.0-6.3	15.08.24	clayey silt	Soil	HM(7)
10	BH44_10.5-10.6	15.08.24.	sandstone	Soil	HM(7)
11	BH51_0.5-0.6	15.08.24		Soil	HM(7), TPH, PAH, Asb
12	BH51_2.0-2.45	15.08.24		Soil	HM(7), 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:	Aurecon New Zealand Limited	**Lab No:**	3651482
Contact:	Tiana Hill	**Date Registered:**	17-Aug-2024 11:51 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date*:	22-Aug-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	BH44_0.3-0.4 14-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH Oil Industry Profile + PAHscreen
2	BH44_1.1-1.2 14-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH Oil Industry Profile + PAHscreen
3	BH44_3.0-3.4 15-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH Oil Industry Profile + PAHscreen
4	BH44_6.0-6.3 15-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level
5	BH44_10.5-10.6 15-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level
6	BH51_0.5-0.6 15-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH Oil Industry Profile + PAHscreen
7	BH51_2.0-2.45 15-Aug-2024	Soil	GSoil300	Heavy Metals, 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).	-	1-7
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	1-3, 6-7
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	1-3, 6-7
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	1-3, 6-7
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	1-3, 6-7

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, 6-7
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-7
Total Petroleum Hydrocarbons in Soil			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	1-3, 6-7
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	1-3, 6-7
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	1-3, 6-7
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	1-3, 6-7

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: **365 1494**
Date Recv: **16-Aug-24 16:43**
Received by: Olivia Tod
3136514946

Quote No	126272	
Primary Contact	Tiana Hill	298786
Submitted By		
Client Name	Aurecon New Zealand Limited	32359
Address	Te Tihi Level 3 / 110 Carlton Gore Road	
	Newmarket, Auckland *Postcode* 1023	
Phone	*Mobile* 021 0883 4125	
Email	nzenvlabs@aurecongroup.com	
Charge To	Aurecon New Zealand Limited	32359
Client Reference	521290-064	
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 andrew.allcock@aurecongroup.com
☐ Other

ADDITIONAL INFORMATION

Esdat files please. Please advise before disposal.
Please disregard items crossed out

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 16-08-24
Name: Tiana Hill
☑ Tick if you require COC to be emailed back
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition Temp: 8.9
☐ Room Temp ☐ Chilled ☐ Frozen
☐ Sample and Analysis details checked
Signature:

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	~~BH44_0.05-0.2~~	~~14.08.24~~	~~Topsoil~~	~~Soil~~	~~TH~~
2	BH44_0.3-0.4	14.08.24	Fill	Soil	HM(7), TPH, PAH, Asb
3	~~BH44_0.5-0.6~~	~~14.08.24~~		~~Soil~~	~~TH~~
4	~~BH44_0.8-0.9~~	~~14.08.24~~		~~Soil~~	~~TH~~
5	BH44_1.1-1.2	14.08.24		Soil	HM(7), TPH, PAH, Asb
6	~~BH44_1.4-1.5~~	~~14.08.24~~		~~Soil~~	~~TH~~
7	~~BH44_2.0-2.4~~	~~15.08.24~~		~~Soil~~	~~TH~~
8	BH44_3.0-3.4	15.08.24	interface	Soil	HM(7), TPH, PAH, Asb
9	BH44_6.0-6.3	15.08.24	clayey silt	Soil	HM(7)
10	BH44_10.5-10.6	15.08.24	sandstone	Soil	HM(7)
11	BH51_0.5-0.6	15.08.24		Soil	HM(7), TPH, PAH, Asb
12	BH51_2.0-2.45	15.08.24		Soil	HM(7), 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:	Aurecon New Zealand Limited	**Lab No:**	3651494
Contact:	Tiana Hill	**Date Registered:**	16-Aug-2024 4:59 pm
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	Sampled: 14-15/08/24
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date:	21-Aug-2024 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	BH44_0.3-0.4	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
2	BH44_1.1-1.2	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
3	BH44_3.0-3.4	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
4	BH51_0.5-0.6	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; 28 Heather Street, Auckland.	0.1 g	1-4
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g	1-4
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1-4
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1-4
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; 28 Heather Street, Auckland.	0.1 g dry wt	1-4
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland.	0.1 g dry wt	1-4
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1-4
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1-4
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; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-4
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	1-4

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-4
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	1-4
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 28 Heather Street, Auckland. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1-4
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	1-4
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	1-4

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)
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Job No: **365 5466**

Date Recv: 22-Aug-24 17:59

Received by: May Alfante

3136554662

Client

Name: Aurecon NZ limited

Address: Te Tihi level 3 / 110 Carlton Gore road. Newmarket, Auckland

Phone: 0210853412 5 Fax:

Client Reference: 521290-064

Quote No: 126272 Order Number:

Primary Contact Tiana Hill 298786

Submitted By Andrew Allcock

Charge To Aurecon NZ limited. 32359

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☑ Email Submitter

☑ Other nzenvlabs@aurecongroup.com

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: Name: Signature:

☑ Please tick if you require COC to be faxed back

Received at Hill Laboratories Date & Time: Name: Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 16.1 °C

☐ Sample Analysis details checked Signature:

ADDITIONAL INFORMATION

Esdat files please.
Please advise before disposal

Priority

☐ Low ☑ Normal ☑ High

☐ Urgent (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2** Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3** Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool** Swimming/Spa Pool
	TW	Trade Waste					
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL** Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM** BM Biological Material

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required
1	BH46 ~~0.05~~ 0.4-0.5	19-08-2024	Soil	HM(7), TPH, PAH, Asb
2	BH46-1.4-1.6	19-08-2024	Soil	HM(7), TPH, PAH, Asb
3	BH45-0.8-1.0	19-08-2024	Soil	HM(7), TPH, PAH, Asb
4	BH51-5.0-5.45	15-08-2024	Soil	HM(7)
5	BH51-8.0-8.45	15-08-2024	Soil	HM(7)
6	BH51-12.0-12.33	15-08-2024	Soil	HM(7)
7				
8				
9				
10				

Continued on next page

R J Hill Laboratories Limited
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Job Information Summary

Client:	Aurecon New Zealand Limited	**Lab No:**	3655466
Contact:	Andrew Allcock	**Date Registered:**	24-Aug-2024 10:40 am
	C/- Aurecon New Zealand Limited	**Priority:**	High
	PO Box 9762	**Quote No:**	126272
	Newmarket	**Order No:**	126272
	Auckland 1149	**Client Reference:**	521290-064
		Add. Client Ref:	
		Submitted By:	Tiana Hill
		Charge To:	Aurecon New Zealand Limited
		Target Date*:	28-Aug-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	BH46_0.4-0.5 19-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH Oil Industry Profile + PAHscreen
2	BH46_1.4-1.6 19-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH Oil Industry Profile + PAHscreen
3	BH45_0.8-1.0 19-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level, TPH Oil Industry Profile + PAHscreen
4	BH51_5.0-5.45 15-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level
5	BH51_8.0-8.45 15-Aug-2024	Soil	GSoil300	Heavy Metals, Screen Level
6	BH51_12.0-12.33 15-Aug-2024	Soil	GSoil300	Heavy Metals, 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).	-	1-6
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
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
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
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
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

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-6
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
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
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
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