Watercare Services Limited

QUEEN STREET WASTEWATER DIVERSION PROGRAMME: MAYORAL DRIVE ALIGNMENT PROJECT

PRELIMINARY AND DETAILED SITE INVESTIGATION

24 JUNE 2025

CONFIDENTIAL

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Watercare Services Limited

WSP
Auckland
Level 3 The Westhaven
100 Beaumont St
Auckland 1010, New Zealand
+64 9 355 9500
wsp.com/nz

REV	DATE	DETAILS
1	24/01/2024	First Issue
2	22/01/2025	Second Issue – Updated Construction Methodology
3	24/06/2025	Third Issue - Updated to reflect April 3 design changes

WSP
Auckland
100 Beaumont St
Auckland 1010, New Zealand
+64 9 355 9500
wsp.com/nz

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ABBREVIATIONS AND DEFINITIONS

AC	Auckland Council
AEE	Assessment of Environmental Effects
AT	Auckland Transport
AUP-OP	Auckland Unitary Plan (Operative in Part)
DSI	Detailed Site Investigation
m bgl	Metres below ground level
MfE	Ministry for the Environment
NESCS	National Environmental Standard
NPS	National Policy Statement
PAH	Polycyclic Aromatic Hydrocarbons
PSI	Preliminary Site Investigation
The Project	The new wastewater pipeline between Part 3 – Part 4 Connector Tunnel within 329 Queen Street and P1MH1 within Vincent Street
TMPs	Traffic Management Plans
Watercare	Watercare Services Limited
WSP	WSP New Zealand Limited

EXECUTIVE SUMMARY

WSP New Zealand Limited (WSP) were engaged by Watercare Services Limited (WSL) to undertake a Preliminary and Detailed Site Investigation (PSI/DSI) for the Mayoral Drive Alignment of the proposed Queen Street Wastewater Diversion project within the Auckland City Centre.

The Mayoral Drive Alignment involves a new wastewater pipe within or adjacent to the road reserve of Mayoral Drive; refer to Figure 1 below for an overview. The combined PSI/DSI comprised a desktop review and sampling investigation along the alignment. Sampling was undertaken due to potential Hazardous Activities and Industries List (HAIL) activities within the vicinity of the proposed alignment to assess the risk to human health during and following soil disturbance. Samples were also analysed for disposal purposes.

The PSI identified that HAIL Category G3 (HAIL G3) may apply to the works. HAIL G3 relates to *Landfill sites*. The Greys Avenue car park at the southern end of the alignment is a potential HAIL G3 activity based on previous investigations, which identified demolition rubble underlying the asphalt surfacing. The rubble was reported to include concrete slabs, timber, bricks, and refuse.

Based on the above, a DSI was undertaken targeting the Greys Avenue carpark and for soil disposal purposes along the alignment.

The scope of the DSI comprised:

- Collection of 35 soil samples from nine locations along the alignment.
- Analysis of representative soil samples for potential contaminants of concern, including heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc), total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and asbestos.

Based on soil results reporting an exceedance of background concentrations at BH23/02, BH23/03, BH23/05, BH23/06, and BH23/07, the *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (NESCS) is considered to apply to land at and adjacent to these locations under regulation 5 (7). The proposed works are expected to exceed permitted soil disturbance volumes under regulation 8 (3) and therefore a controlled consent is required. However, at locations where asbestos soil guidelines values for commercial/industrial land use criteria were exceeded (at BH23/03, BH23/05 and BH23/07), a restricted discretionary consent is required.

With respect to the Auckland Unitary Plan (AUP), three samples (BH23/04_0.5A, BH23/05_0.45, BH23/06_0.5) reported concentrations of nickel, lead and zinc above the AUP-OP Permitted Activity Criteria. Therefore, the AUP is considered likely to apply to land at and adjacent to these locations. The total soil disturbance in areas where the AUP applies is expected to exceed the permitted activity criteria for the project of 200 m^3. Therefore, a controlled activity consent is required. Under Chapter E30.6.2.1, a Site Management Plan (SMP) will be required, which has been completed by WSP.

Without further delineation sampling, and taking a conservative approach, the NESCS and AUP are considered to apply to land up to halfway to the next adjacent sampling location from the locations noted above. An aerial map of areas where the NESCS and AUP are considered to apply is shown in the attached Figure 2 at the end of this document.

WSP have completed a SMP for the proposed soil disturbance works, to provide guidance on the framework of Health, Safety and Environmental risk control measures that should be enacted at

the site during the works. The SMP includes an Unexpected Discovery Protocol (UDP) outlining the course of action if evidence of contaminated soils and groundwater or hazardous materials are encountered during earthworks. The SMP has been attached to the resource consent application in Appendix F.2.

RECOMMENDATIONS

Based on the findings of this assessment, it is recommended that:

- For the area of the alignment where the NESCS is considered to apply, it is unlikely that soils would be considered cleanfill material. If off-site soil disposal is required, WSP would advise seeking confirmation from the landfill operator prior to earthworks to confirm their acceptance and conditions.
- For the area of the alignment where the NESCS is not considered to apply, soil may be considered for removal as cleanfill. If off-site soil disposal is required, WSP would advise seeking confirmation from the receiving facility prior to earthworks to confirm their acceptance and conditions.
- Asbestos removal controls are recommended at the following areas of construction during soil disturbance:
  - P4MH3: Soil disturbance should be supervised by an asbestos competent person. If construction & demolition material and/or asbestos containing material is observed, trace asbestos contamination controls should be put in place, escalating to higher controls if deemed necessary.
  - P4MH2: Soil disturbance should be supervised by an asbestos competent person with trace asbestos contamination controls in place, escalating to higher controls if deemed necessary.
  - P4MH1B/P4MH1A: From surface to 0.5 m bgl trace asbestos controls should be in place, from 0.5 to 3 m bgl works low level asbestos controls, with no controls required then onwards.
  - P5MH2: From surface to 3 m bgl trace asbestos controls should be in place.

1 INTRODUCTION

Watercare is proposing to upgrade the existing wastewater network of the upper (southern) catchment of Auckland City Centre. The current network has insufficient capacity to meet future needs based on increased development in the area. The wider programme of works has been split into separate parts for the purpose of design, consenting and construction; the consenting and construction packages of the Queen Street programme are shown in Figure 1-1.

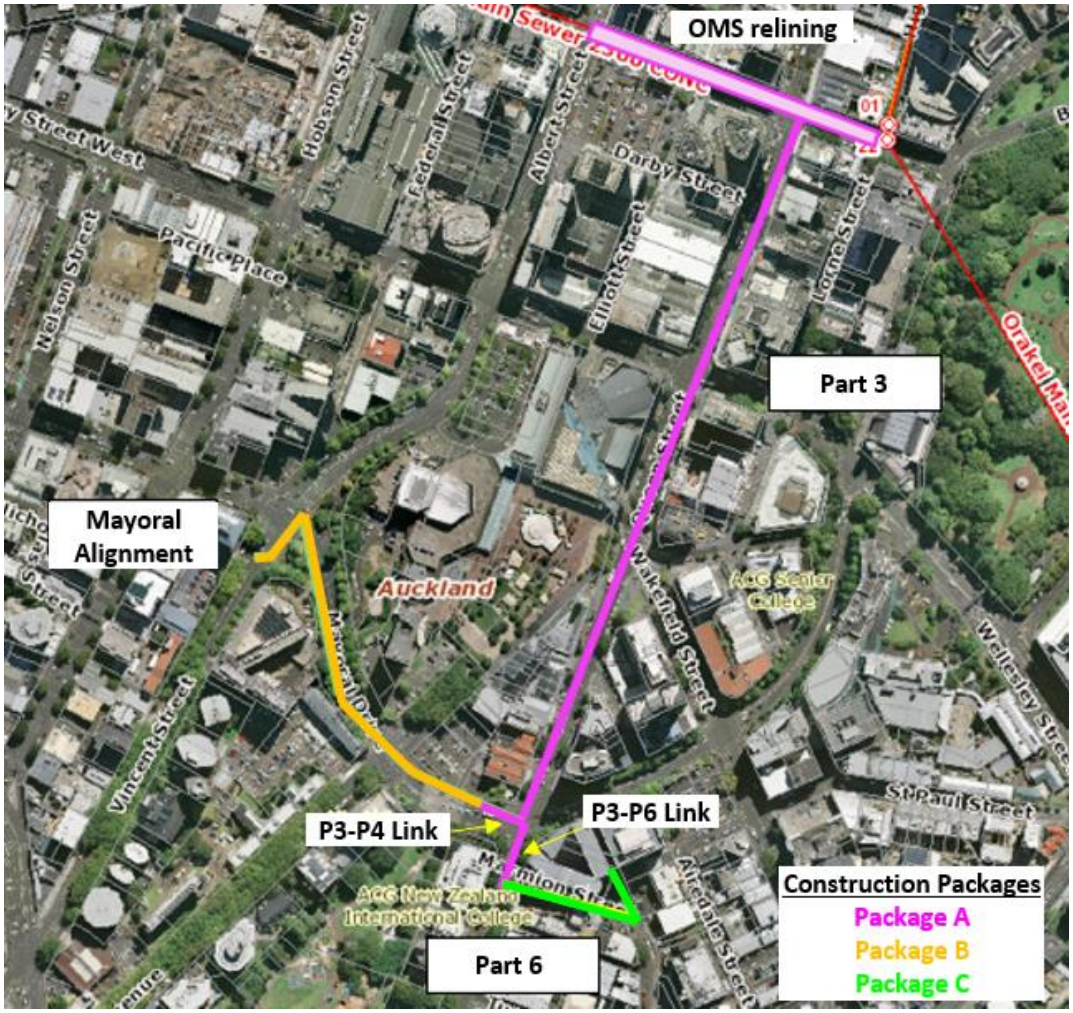

Figure 1-1: Queen Street Wastewater Diversion Programme

The Mayoral Drive alignment involves a new wastewater pipe within or adjacent to the road reserve of Mayoral Drive. The works proposed under this consent ('the Project') include a 375mm – 700mm diameter wastewater pipeline between the P4MH3 shaft within 329 Queen Street and the P1MH1 shaft within Vincent Street, along with connections to 'engineered overflow points' ('EOPs') and manholes.

1.1 PURPOSE OF THIS REPORT

WSP New Zealand Limited (WSP) has been engaged by Watercare to undertake a combined Preliminary Site Investigation (PSI) and Detailed Site Investigation (DSI) for the proposed Mayoral Drive Alignment portion of the Queen Street Programme, herein referred to as 'the Site'. An aerial plan of the Site is shown in Figure 1-1.

This combined PSI/DSI has been undertaken to assess whether:

- It is more likely than not that an activity or industry described in the Hazardous Activities and Industries List (HAIL) is being or has been undertaken on the Site.
- Determine whether the *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (NESCS) is applicable to the works.
- Determine the activity status of the proposed works under the *Auckland Unitary Plan* (AUP-OP).

It should be noted that this report supersedes the previous reporting on the sampling undertaken at Greys Avenue carpark (BH23/02 & BH23/03), reported in the Construction Support Area Addendum dated 28 September 2023 (WSP, 2023a) (an appendix of the Queen Street Wastewater Diversion – Part 3, Detailed Site Investigation, dated 18 December 2023 (WSP, 2023b)).

1.2 SCOPE OF WORKS

The scope of works for the PSI comprised:

- Desktop review of:
  - Environmental setting information, geology, and hydrogeology.
  - Historic aerial photographs available on Retrolens and Google Earth.
  - AC property files and HAIL database.
  - Previous Hazardous Activities and Industries List (HAIL) Assessments

The scope of works for the DSI comprised:

- Collection of 35 soil samples from nine locations across the site.
- Analysis of representative soil samples for potential contaminants of concern including:
  - Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc)
  - Total petroleum hydrocarbons (TPH)
  - Asbestos in soil (Semi-quantitative)
  - Polycyclic aromatic hydrocarbons (PAH)

1.3 CERTIFYING STATEMENT

This combined PSI/DSI has been undertaken in accordance with the MfE *Contaminated Land Management Guidelines No. 5: Site investigation and analysis of soils (revised 2021) (CLMG No.5)* (MfE, 2021b) and reported in accordance with the MfE *Contaminated Land Management Guidelines No. 1: Reporting on contaminated sites in New Zealand (revised 2021)* (CLMG No. 1) (MfE, 2021a).

It has been completed by an investigator and certified by a principal who meets the interpretation of a suitably qualified and experienced practitioner (SQEP) referenced in the MfE *User's Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect*

Human Health, 2012 (MfE, 2012). The investigation manager and principal certified details are provided in Table 1-1 below.

Table 1-1 Suitably Qualified and Experienced Practitioners

ITEM	DETAILS
Author	
Name	Laurence Shotliff
Job title	Environmental Scientist
Years industry experience	6
Certifier	
Name	Greg Coffin
Job title	Principal Environmental Scientist
Years industry experience	23

2 DESCRIPTION OF EXISTING ENVIRONMENT

2.1 LOCATION AND PHYSICAL ENVIRONMENT

The project is located within Auckland City Centre, on a section of Mayoral Drive between Queen Street and Vincent Street/Cook Street, along with a short extension within Vincent Street (see Figure 2-1 for approximate project area). In addition, the project works will also occur within a surface carpark at 34-38 Greys Avenue and 329 Queen Street. The CSA site will contain both a section of the proposed wastewater pipeline and the CSA for the Queen Street programme[1].

Figure 2-1: Mayoral Drive Alignment project area in orange

2.2 GEOLOGY

The institute of Geological and Nuclear Sciences Geological Map 'New Zealand Geology web map at 1:250,000 scale (Edbrooke, 2001) indicates that the Site is underlain by early Miocene sandstone and mudstone of the East Coast Bays Formation of Warkworth Subgroup. This comprises alternating sandstone and mudstone with variable volcanic content and interbedded volcaniclastic grits.

[1] The CSA at 34-38 Greys Avenue and 329 Queen Street has been established under the 'Part 3' consent and retained for the Mayoral Drive alignment construction works.

2.3 TOPOGRAPHY, SURFACE WATER AND HYDROGEOLOGY

A review of topographical contours on AC geomaps indicates the Site slopes from the northern end (Vincent Street) to the southern end (Queen Street). Vincent Street is approximately 34 metres above mean sea level (m amsl) and slopes slightly down towards the east and south. The Site slopes further down to 20 m amsl in the Greys Avenue carpark and rises again to approximately 28 m amsl at the Mayoral Drive and Queen Street intersection.

A review of catchments and hydrology on AC geomaps indicates that the part of the Site on the Greys Avenue carpark is a flood plain, with the eastern half of the carpark prone to flooding. There are multiple overland flow paths running along and across the site. Two overland flow paths run from the Vincent Street and Mayoral Drive intersection down to 100 Mayoral Drive before diverting to the north. Another overland flow path runs from Myers Park north across the site through the Greys Avenue carpark towards Aotea Centre.

3 NATURE OF WORK (ACTIVITIES) SUBJECT TO ASSESSMENT

The following is a summary of the construction activities to which the resource consent relates. For more details on the nature of the works proposed, refer to the Construction Methodology (Appendix A). The Construction Methodology has been based on a likely scenario and has been developed to provide a baseline assessment.

This Project relates to the construction of a new wastewater sewer line within/adjacent to the road corridor of Mayoral Drive, including connections to the existing wastewater network.

The Project will be constructed using a combination of trenchless pilot bore and open-cut trenching excavation, with shafts utilised along the alignment to launch and receive the pilot boring machine. An overview of the proposed construction activities is shown below as Figure 3-1.

To ensure flexibility in the consenting process, a consenting envelope approach has been adopted for all shaft dimensions and the construction compounds. The dimensions specified within the consent allow for changes through the detailed design phase.

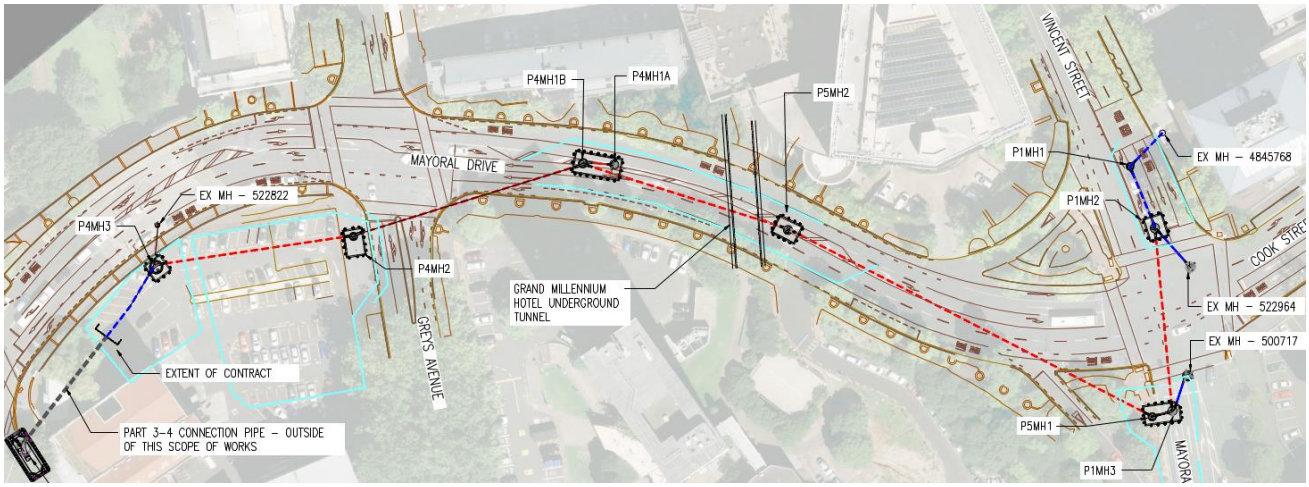

Figure 3-1: Overview of main indicative construction works (red lines are trenchless pipelines, blue are trenched pipelines)

Table 3-1 provides a high-level overview of the different construction activities and stages, which are provided in greater detail within the Construction Methodology.

Table 3-1: Overview of the different construction activities and stages

Network Utility Relocations	The existing network utilities within and around the proposed shafts will need to be relocated. The exact utilities to be diverted are yet to be confirmed, but will likely include potable water, electricity, wastewater, stormwater and communications. Open-cut progressive trenching will be utilised to relocate any utilities that are required to be relocated. New utilities will be constructed around the proposed shaft locations, and the existing utilities will be removed during shaft construction. Dewatering of the trenches may be required.

Temporary Construction Shafts	Most manhole locations on this alignment will be used as launch/reception pits for the trenchless construction method (axis/pilot bore). Six construction shafts are proposed along the Mayoral Drive alignment. The trenchless method requires shafts with maximum internal dimensions of 5.5 m x 12 m and a maximum depth of 9 m. The shafts are expected to be constructed using a 'post and panel' type methodology (subject to geotechnical investigations and shaft temporary works design). Refer to Section 3.1 of the Construction Methodology (Appendix A) for the steps to construct the temporary shafts.
Trenchless Tunnelling Works	It is proposed to construct the tunnelled sections between manholes P4MH3 (within Greys Avenue carpark) and P1MH2 (within Vincent Street, opposite the intersection with Mayoral Drive) of the wastewater pipeline using a trenchless pilot-guided boring methodology. Refer to Section 3.2 of the Construction Methodology (Appendix A) for more detail of the trenchless tunnelling methodology.
Open Cut Construction Works	Open-cut construction is proposed for two short sections of the proposed pipeline between the shafts for P4MH3 and the P3-P4 Connector Tunnel within 329 Queen Street, and between P1MH1 and the shaft within Vincent Street. Open-cut construction is also proposed for network tie-ins and connections to existing EOPs. Refer to Section 4 of the Construction Methodology (Appendix A) for more detail of the trenchless tunnelling methodology.
Construction Support Areas	To support the proposed construction activities, a primary CSA will be used within the public carpark at 38 Greys Avenue and 329 Queen Street. This CSA is already set up as part of the approved Part 3 Alignment and will also be utilised for the Part 3 – Part 4 Connector Tunnel consents. The CSA may be reconfigured to respond to the works proposed for the Project. The CSA contains site offices and welfare facilities, along with some limited site laydown and materials storage areas. The indicative site layout for the Greys Avenue CSA is shown below in Figure 3-2 which reflects the set up for Part 3 construction. Three secondary construction compounds (compounds) will be established within the road corridor of Mayoral Drive and Vincent Street to allow for the construction of shafts and to undertake tunnelling works. In addition, the Greys Avenue CSA will be extended into the footpath at Greys Avenue to accommodate the construction of P4MH2. These compounds are expected to be in place for 6 to 8 months. Temporary concrete or steel barriers with hoardings will be constructed around the perimeter of each, with access gates one or both ends. The indicative compound boundaries around the possible shaft envelopes are shown in the below figures.

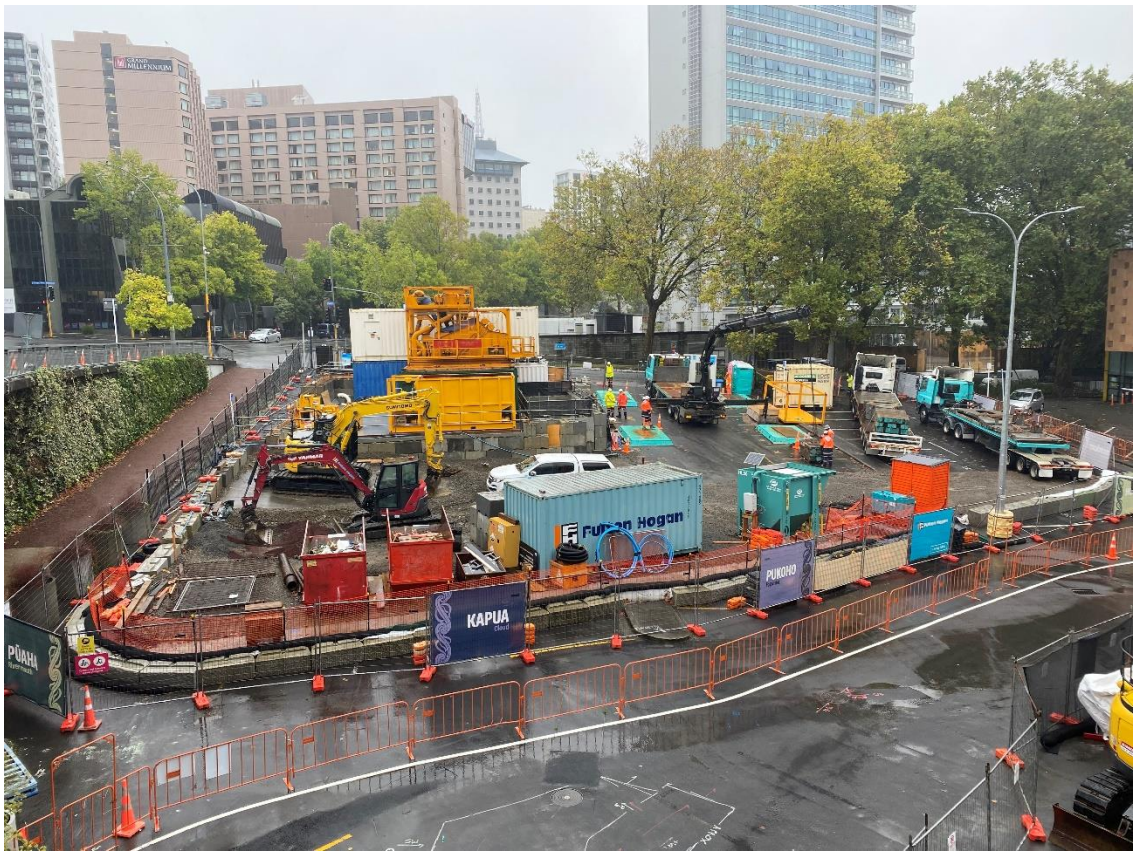

Figure 3-2: Indicative Greys Ave CSA layout (looking north-west towards Greys Ave)

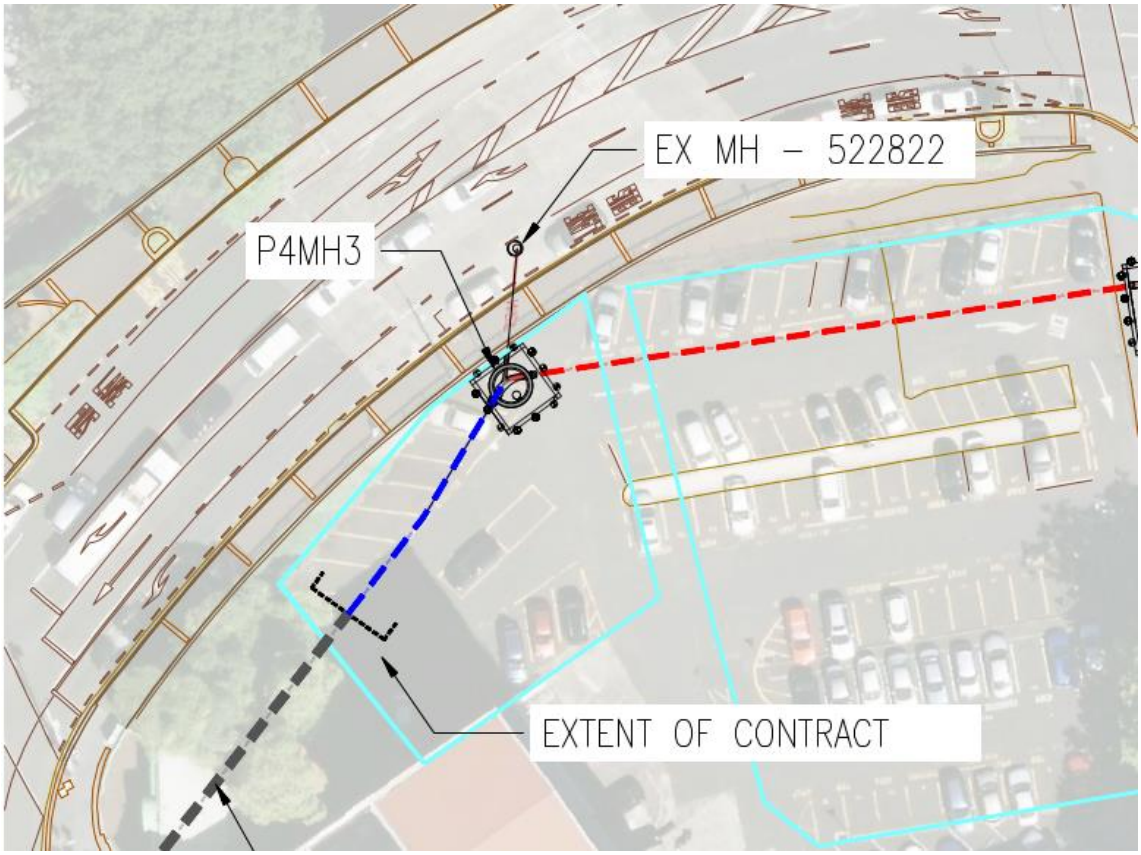

Figure 3-3: Indicative compound around P4MH3 within Greys Ave Carpark (indicative compound extents shown in light blue)

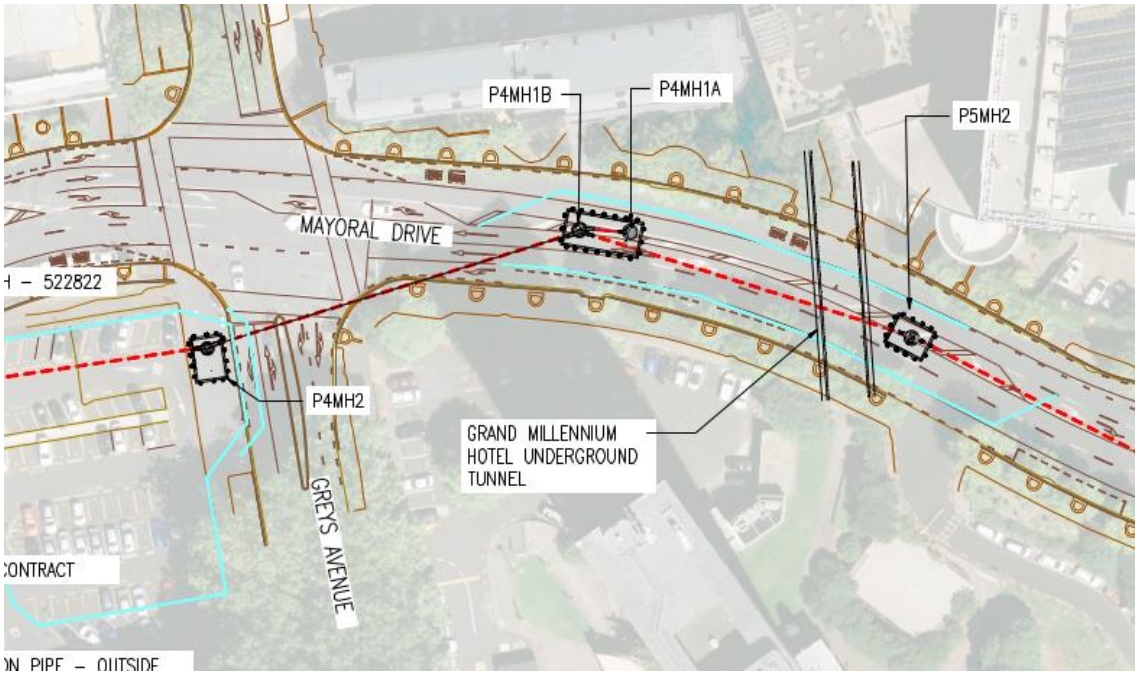

Figure 3-4: Two compounds on Mayoral Drive/Greys Ave outside 299 Queen Street, G05/1 Greys Ave and the CSA in the Greys Ave carpark

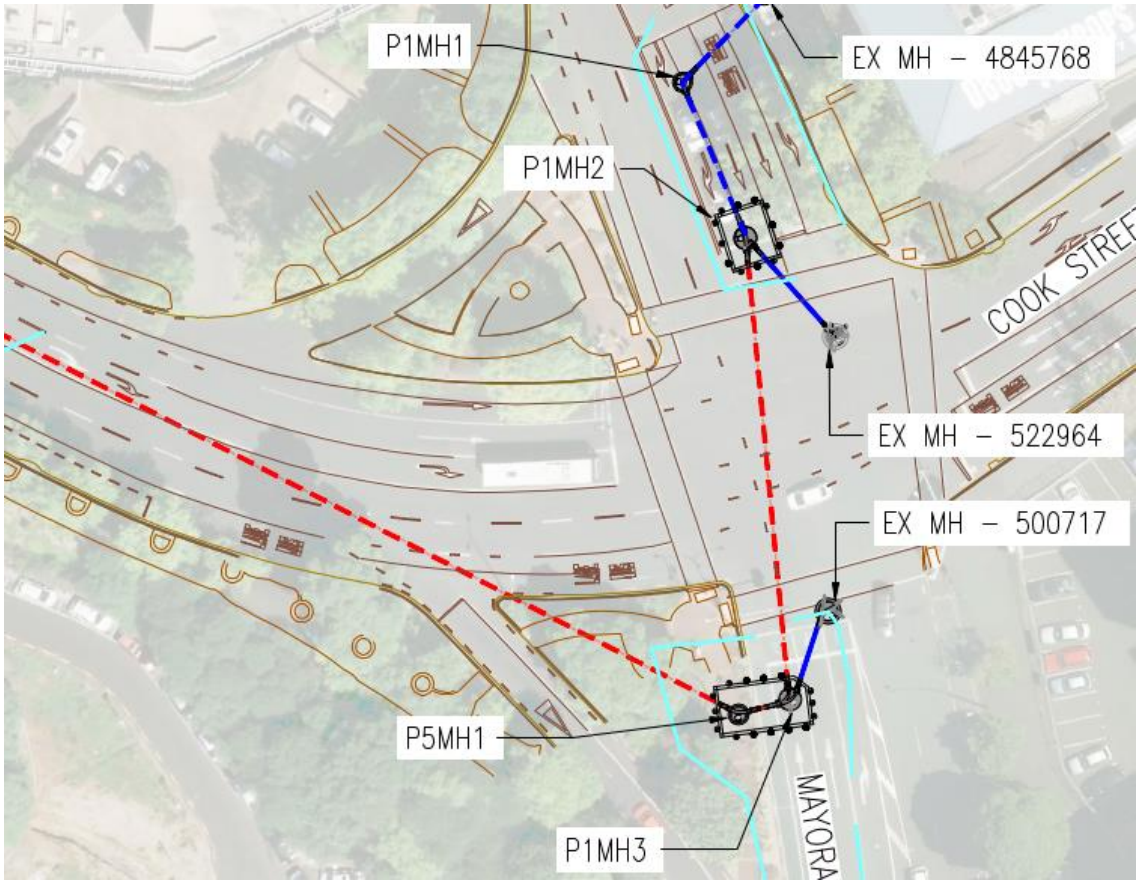

Figure 3-5: Two compounds at Cook St/Mayoral Drive/Vincent St intersection

4 DESKTOP REVIEW

4.1 HISTORICAL AERIAL PHOTOGRAPHY REVIEW

WSP reviewed historical aerial photographs for the site and surrounding area sourced on 11 May 2023 from Retrolens and AC Geomaps, dating between 1942 and 2022. A summary of observed land uses, and land use changes are described in Table 4-1 below. Copies of aerial photographs have been included in Appendix B.

Table 4-1: Summary of historical aerial review

Year (Source)	Site	Surrounding Area
1940 (Retrolens)	The alignment comprises a mixture of residential and commercial between Vincent Street and Queen Street.	Surrounding area is both residential and commercial buildings, a well-established roading network, and some minor vegetation mixed amongst the residential areas, primarily to the south of the site.
1950 (Retrolens)	No significant change	Vegetation to the south of the eastern end of the alignment has been cleared and a small number of structures are present.
1958 (Retrolens)	No significant change	Excavated land is clear, small structures have been removed.
1963 (Retrolens)	No significant change	No significant change
1975 (Retrolens)	Demolition of all buildings along the northern section of the site has occurred to develop the road network	Demolition of a number of buildings north of the site has occurred. Major changes to the layout of the road network are being undertaken. Buildings to the south have also been replaced with open public spaces.
1981 (Retrolens)	Road network to northern end of the site is complete	Road network works in the surrounding areas are complete. Large open public space created north of the site adjacent Queen Street.
1996 (AC Geomaps)	Demolition of commercial building to southern end of the site has occurred. No change along the rest of the alignment.	Infilling of high-density residential buildings to the south of the site. Construction of a large commercial building north of the site has been undertaken.
2001 (AC Geomaps)	Carpark is present where demolition of the building occurred to the southern end of the site previously.	Vegetation growth in surrounding area.

Year (Source)	Site	Surrounding Area
2011 (AC Geomaps)	No significant change.	Public space to north of the site undergoing development. Further growth of vegetation in surrounding area. Construction of new high density residential buildings adjacent southeast corner of site.
2016 (AC Geomaps)	No significant change.	Development of public space to the north completed.
2022 (AC Geomaps)	No significant change.	Construction of a new structure in the public space north of the site.

4.2 REVIEW OF PREVIOUS WSP REPORTS

WSP has previously undertaken two HAIL Assessments along the Mayoral Drive alignment. One for the northern section of the alignment (WSP, 2022a) and one for the southern section of the alignment (WSP, 2022b). A summary of these reports can be found below.

4.2.1 WSP (2022A) – QUEEN STREET WASTEWATER DIVERSION MAYORAL ALIGNMENT NORTH – DESKTOP HAIL ASSESSMENT

WSP undertook a limited desktop HAIL assessment for the northern half of the Mayoral Drive Alignment to review available evidence and determine the likelihood that any site on or within 100 metres of the alignment is on the HAIL. Five sites within and around the alignment were identified as being potential HAIL sites.

WSP recommended that a PSI and DSI be undertaken to characterise potential soil and groundwater contamination which may be encountered during soil disturbance.

4.2.2 WSP (2022B) – QUEEN STREET WASTEWATER DIVERSION MAYORAL ALIGNMENT SOUTH – DESKTOP HAIL ASSESSMENT

WSP undertook a limited desktop HAIL assessment for the southern half of the alignment, to review evidence and determine the likelihood that any site on or within 100 metres of the alignment is on the HAIL. Eight sites within and around the alignment were identified as being potential HAIL sites.

The report also reviewed two reports completed by Briton Detection and Inspection Limited (Briton). These reports identified potential voids situated below Greys Avenue carpark and identified demolition rubble in these voids in the form of concrete, timber, bricks, and other building refuse.

WSP recommended that a PSI and DSI be undertaken to characterise potential soil and groundwater contamination which may be encountered during soil disturbance.

4.3 REVIEW OF AUCKLAND COUNCIL CONTAMINATED LAND REGISTER

Site contamination enquiries were completed by WSP as part of the HAIL Assessments in August and October of 2022. The responses from AC were received by WSP on 15 August and 31 October 2022. Table 4-2 below summarises the findings of the enquiries regarding properties within 100 metres of the alignment, which may have been subject to activities and industries that fall on the HAIL. The two AC site contamination enquiry responses are attached in Appendix C.

Table 4-2: Summary of AC Contaminated Land Register Review

Site Name/Activity Type	Address	Approximate Distance from the Project Alignment	Potential HAIL Activity	Property file review required
Carpark	31-35 Cook Street	15m to the north	Unknown	Yes
Myers Park	72 Greys Avenue	80m to the south	Unknown	Yes
Wilson Parking	87 – 89 Greys Avenue	~80m to the east	Unknown	Yes
Commercial	Part Level G/144-148 Hobson Street	~100m to the north	Unknown	No
Grand Millennium Auckland	71 – 87 Mayoral Drive	50m to the Northwest	Unknown	Yes
City Garage	16 Waverley Street	100m to the Southeast	Vehicle repair shop	Yes
Queens Square Residences	438 Queen Street	50m to the Southeast	Unknown	Yes
Southern Cross Cables Limited	31 Airedale Street	100m to the East	Unknown	Yes
Housing New Zealand	34/139 Greys Avenue	100m+ to the Southwest	Unknown	Yes
Grey Avenue Apartments	95 – 113 Greys Avenue	90m to the Southwest	Unknown	Yes

Based on the distance of the HAIL site from the alignment, three property files were ordered to investigate potential HAIL activities, discussed below.

4.4 REVIEW OF AUCKLAND COUNCIL PROPERTY FILES

WSP sent a request to AC for the property files relating to 31-35 Cook Street, 71-87 Mayoral Drive, and 87-89 Greys Avenue, in October 2023. WSP received 2042 files combined across the three sites, as part of the request. WSP reviewed these files for any relevant information relating to the Site.

4.4.1 31-35 COOK STREET

The property files received for 31-35 Cook Street relate primarily to building consents and land use consents for the purpose of removing trees from site, and the installation and upgrades to the billboard. There is also a letter to AC in the 1970's from the site about the condition of a neighbouring building. In the reply letter AC state that the building has a malthoid roof. Malthoid is a bitumen-infused felt product that may contain asbestos, especially given the age of this letter from AC.

31-35 Cook Street is in relatively close proximity to the alignment (15 m north); however, given the area has been covered by hardstand since the 1940s, there is considered limited risk for asbestos to have impacted the soils at the alignment. Therefore, this site was not considered in the DSI.

4.4.2 71-87 MAYORAL DRIVE

Most of the files relate primarily to building consents, building inspections and land use consents for various developments to the hotel. A geotechnical report from 1986 was observed for the construction of the Pan Pacific Hotel. It was noted in this report that fill material was present to a depth of up to 4.3 m at the locations bored for the investigation. This was underlain by slightly weathered to highly weathered Waitemata Formation. No soil testing for contaminants was undertaken during the 1986 investigation. No other information was observed by WSP in these files to indicate potential HAIL activities.

4.4.3 87-89 GREYS AVENUE

The property files for 87-89 Greys Avenue relate primarily to building consents, building inspections and land use consents, primarily for the apartment complex at this location. There are also several expert reports assessing traffic solutions adjacent to this site. A report was observed outlining a plan to demolish an adjacent single storey carpark and construct a multi-storey storey carpark in its place. As these reports are greater than 20 years old, there is no mention of investigations for possible contaminants. Further, no mention of any HAIL activities was observed in any of the other property files assessed.

4.5 REVIEW OF GWE REPORTS

Since WSP completed the initial DSI investigation in 2023, GWE Consulting Engineers (GWE) has completed a Site Management Plan (SMP) (GWE, 2024) specifically for a temporary shaft at the eastern end of the Greys Avenue Carpark associated with the P3-P4 Connector, and a platform for a separation plant in the central area of the Greys Avenue Carpark. GWE subsequently produced a Site Validation Report (SVR) (GWE, 2025) for the excavation works associated with the separation plant platform construction.

Earthworks for the separation plant platform were undertaken from January to February of 2025, supervised by GWE and reported within the SVR. GWE reported significant building rubble in the area of the proposed platform, likely sourced from the former building demolished in-situ prior to the car park construction. The construction & demolition (C&D) material comprised timber, concrete, plaster mouldings and brickwork. Asbestos-containing material (ACM) consisting of non-friable cement board fragments was observed in the C&D material. The total area of ACM did not exceed more than 0.5 m^2.

As the C&D material was deemed geotechnically unsuitable, approximately 203 m^3 of material was cut and approximately 300 m^3 of imported fill material was brought onto site.

5 INTRUSIVE INVESTIGATION

5.1 SAMPLING DESIGN AND RATIONALE

To achieve the sampling objectives of this combined PSI/DSI, a targeted sampling pattern was adopted along the alignment designed to target key Site features where access was reasonably practical, while being guided by information obtained in the desktop review, where possible. Sampling locations were limited by surface access and were collected from borehole locations which benefited both the geotechnical investigation and the contaminated land investigation. Additionally, near-surface soil samples were limited due to the use of an Air-Vac during works and gravel sub-base material present at shallow depths not requiring analysis.

The sampling strategy undertaken was consistent with the MfE CLMG No. 5 (MfE, 2021c).

5.2 FIELDWORK

Soil sampling was undertaken at the site across multiple visits in association with the geotechnical investigation between 14 July 2023 and 25 August 2023. Service location was completed prior to the works, and an Air-Vac was used to remove the upper soil layers to a depth of approximately three metres below ground level (m bgl).

Samples were collected from nine exploratory hole locations with a total of 35 soil samples collected across various depths. Soil samples were collected by mixture of hand and hand auger using dedicated nitrile gloves by hand or from the auger head. All non-dedicated sampling equipment was decontaminated between samples using Decon-90™ to minimise the potential of cross contamination between samples.

Subsurface conditions were logged, and soil samples were placed in laboratory supplied glass and plastic sample jars, leaving minimal headspace. All samples were stored on ice in a sealed cooler and transported to the laboratory under standard chain of custody conditions.

5.3 SITE GEOLOGY

All sampling locations were within the road corridor and as such all locations had a hardstand surface layer comprising asphalt to a depth of between 0.15 and 0.2 m bgl at all locations. All locations comprised fill material underlaying the asphalt to depths up to 1.4 m bgl. This fill material was primarily sandy gravels with minor building refuse, consisting of brick, metals, and ceramics, observed within the fill in all locations. The fill was underlain by silty clays.

Borehole logs are provided in Appendix D.

5.4 LABORATORY ANALYSIS

Soil samples were submitted to Watercare Laboratory Services for analysis of determined contaminants of concern, including heavy metals, PAH, TPH and asbestos.

All samples were subcontracted to Dowdell & Associates for analysis of asbestos. Samples that produced an *asbestos detected* result were sent to Hill Laboratories (Hills) to undertake analysis

for heavy metals, TPH and PAH, while samples that produced a *no asbestos detected* result were analysed by Watercare Laboratory Services for heavy metals, TPH and PAH.

All laboratories analysed the samples as per their respective International Accreditation New Zealand (IANZ) accreditation. The analytical certificates can be found in Appendix E.

6 BASIS FOR GUIDELINE VALUES

6.1 HIERACHY OF SELECTION

This section summarises the reference source for guideline values that we have adopted for the current project and future use of the Site. The selected guideline values have been based on the MfE *Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values (Revised 2011)* (CLMG No. 2) (MfE, 2011) below:

Figure 6.1: Hierarchy of guideline values

6.2 ADOPTED ASSESSMENT CRITERIA

WSP have adopted the following guideline criteria to classify soil at the site during soil disturbance, handling, and ongoing/future site use. Table 6-1 below outlines selected criteria for handling and land use.

Table 6-1 Guideline Criteria for Soil Classification

MATRIX	SOURCE GUIDELINE	CRITERIA	ANALYTES
Human Health			
Soil	Ministry for the Environment (2011). *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health*. Publication number ME 1055, June 2011 (MfE, 2011a)	Soil Contaminant Standards (SCS) for Commercial / Industrial land use	Arsenic, cadmium, chromium, copper, lead, mercury, benzo(a)pyrene (BaP)
	National Environmental Protection Council (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013)* *	Health Investigation Levels (HIL) for commercial / industrial land use (HIL-D)	Nickel and zinc

MATRIX	SOURCE GUIDELINE	CRITERIA	ANALYTES
	Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand 1999 (Revised 2011) (MfE, 2011b)	Tier 1 Soil Acceptance Criteria for PAHs: Commercial / Industrial use, All Pathways, Silty Clay	BaP, naphthalene and pyrene
		Commercial/Industrial land use for a 'silty clay' soil type at 1-4m depth	TPH fractions C_7-C_9, C_{10}-C_{14} and C_{15}-C_{36}
	New Zealand Guidelines for Assessing and Managing Asbestos in Soil (NZGAMAS) Table 5 (BRANZ, 2024)	Soil guideline values (SGV) for commercial / industrial land use	Asbestos
Background Concentrations			
Soil	Auckland Region Background Concentrations - Volcanic (ARC, 2001)	Background concentrations	Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc
	Auckland Unitary Plan Permitted Activity Criteria (AUP-OP, 2024)	Permitted activity criteria	Arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, and BaP

* Included as NESCS does not have guideline values for the protection of human health for nickel and zinc.

Table 6-2 below outlines selected criteria for on-site soil re-use and off-site disposal.

Table 6-2: Selection Criteria for Handling and Land use Assessment

Matrix	Source Guideline	Criteria	Analytes
Soil	Auckland Region Background Concentrations (ARC, 2001)	Background concentrations (volcanic range)	Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc
	Waste Management Institute New Zealand (Waste MINZ). *Technical Guidelines for Disposal to Land Revision 3.1,* September 2023 (WasteMINZ, 2023)	Waste Acceptance Criteria for: • Class 3 landfills • Class 4 landfills • Class 5 cleanfill	Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc TPH (C_7-C_9), (C_{10}-C_{14}) and (C_{15}-C_{36}) Benzo(a)pyrene Potency Equivalency Factor (PEF)

Matrix	Source Guideline	Criteria	Analytes
	Redvale Landfill Waste Acceptance Criteria	Landfill WAC	Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc TPH (C_7-C_9), (C_{10}-C_{14}) and (C_{15}-C_{36}) Total PAH

7 QUALITY ASSESSMENT AND QUALITY CONTROL

Table 7-1 summaries the field quality program undertaken for the DSI.

Table 7-1 Summary of the field quality program

ITEM	DESCRIPTION
Environmental Consultant	The environmental consultant maintains Quality Assurance System certified to AS/NZS ISO 9001:2015. An experienced contaminated land specialist with at least three years' experience completed the field works under the supervision of a Suitably Qualified and Experienced Practitioner (SQEP).
Procedures	All work was conducted in accordance with relevant statutory health, safety and environmental (HSE) sampling guidelines, as well as standard company HSE and environmental field procedures. Standard field sampling sheets were used. Details recorded included WSP staff and contractors present, time on/off site, weather conditions, calibration records and other observations relevant to the works.
Sampling	Collection of samples was undertaken by appropriately trained and experienced personnel following WSP standard field procedures which are based on industry accepted standard practice. Chain of custody was used to ensure the integrity of samples from collection to receipt by the laboratory.
Equipment Decontamination	Decontamination was undertaken after each sampling episode where equipment used was not dedicated. Field sampling procedures conformed to WSP quality assurance/quality control (QA/QC) protocols to prevent cross contamination, preserve sample integrity, and allow for collection of a suitable data set from which to make technically sound and justifiable decisions with data of satisfactory usability.
Transportation	Samples were stored in chilled coolers on-site and during transport by the field scientist to the laboratory. Chain of custody forms were completed on-site and sent with the samples. Chain of custody forms are presented with laboratory receipts in Appendix E and include the sampler's name, date of sampling, sample matrix, sample containers and preservation used, and analysis requested. The laboratory confirmed receipt of the samples and specified the condition on delivery and the scheduled analysis.
Reporting	This report was prepared in accordance with the MfE CLMG No. 1.

8 SOIL ANALYTICAL RESULTS AND DISCUSSION

8.1 ANALYTICAL RESULTS

The following sections summarise the analytical results of the samples taken for the PSI/DSI. Tabulated results with respect to the adopted assessment criteria are provided in Table 1, attached to this report, and the laboratory reports are provided in Appendix E.

8.1.1 ASBESTOS

The asbestos in soil analysis indicates the following:

- Asbestos was detected in soil samples recovered from four of the nine locations sampled. These locations are BH23/03, BH23/05, BH23/06 and BH23/07.
- At BH23/03 (within Greys Avenue carpark), construction fill was recorded from the base of the hardstand to approximately 1.35 m bgl, containing wood, concrete, brick, rubble, debris, and steel. A sample collected from 0.5 m bgl reported trace asbestos (<0.001% w/w). A second sample collected at 0.7 m bgl, consisting of a fragment of cement sheet was confirmed to contain asbestos.
- All six samples collected at BH23/05 indicated a positive asbestos result. Of the six samples, three exceeded the guideline values of 0.001% w/w for fibrous asbestos and/or asbestos fines (FA and/or AF). The other three samples were all below the laboratory limit of detection for quantification (0.001% w/w).
- Three of the six samples collected at BH23/06 reported trace asbestos (<0.001% w/w).
- One sample collected at the surface at BH23/07 had a positive asbestos result above the SGV for FA and/or AF.

8.1.2 HEAVY METALS

The heavy metals results indicate the following:

- There were no concentrations exceeding relevant criteria in any samples collected at locations BH23/03, BH23/07, BH2308, and BH23/08B.
- Lead and mercury concentrations in sample BH23/02_0.5 exceed background concentrations.
- Lead concentrations in all samples collected at location BH23/05 except sample BH23/05_2.0 exceed the background concentration.
- Copper, lead, mercury and/or zinc concentrations in four of the six samples collected at location BH23/06 recorded exceedances of background concentrations.
- No metals concentrations exceed the human health criteria for industrial/commercial workers in any samples analysed.

8.1.3 TPH & PAH

The TPH analysis recorded no concentrations in excess of the guideline values protective of human health.

The PAH analysis also recorded no concentrations in excess of the guideline values protective of human health.

Full results are presented in the attached Table 1.

8.2 DISCUSSION

8.2.1 HUMAN HEALTH CRITERIA

Asbestos was detected in 12 samples across locations BH23/03, BH23/05, BH23/06 and BH23/07. Concentrations of FA and/or AF exceeded the SGV for commercial/industrial land use of 0.001% w/w in four of those samples (BH23/05_1.0, BH23/05_1.5, BH23/05_2.0 and BH23/07_0.8). Additionally, a bonded asbestos-containing concrete sheet was reported at BH23/03_0.7.

Based on the soil data collected during this investigation and information reported by GWE (GWE, 2025), asbestos controls are recommended for the following areas of construction during soil disturbance:

- P4MH3: Soil disturbance should be supervised by an asbestos competent person. If C&D material and/or ACM is observed, trace asbestos contamination controls should be put in place, escalating to higher controls if deemed necessary.
- P4MH2: Soil disturbance should be supervised by an asbestos competent person with trace asbestos contamination controls in place, escalating to higher controls if deemed necessary.
- P4MH1B/P4MH1A: From surface to 0.5 m bgl trace asbestos controls should be in place, from 0.5 to 3 m bgl works low level asbestos controls should be in place, with no controls required then onwards.
- P5MH2: From surface to 3 m bgl trace asbestos controls should be in place.

The requirement of an asbestos competent person at P4MH3 and P4MH2 is based on the recorded C&D material beneath the Greys Avenue carpark, which may be variable in asbestos content and require dynamic risk control.

P5MH2 has two sampling locations in its vicinity (BH23/06 and BH23/08B), trace asbestos was recorded at BH23/06 and no asbestos was recorded at BH23/08B. WSP consider following the controls for BH23/06 to be prudent, as there is considered to be a high potential to encounter asbestos containing material given the area of excavation for the shaft (5 m x 6.5 m).

The controls for P4MH1B/P4MH1A are based on the asbestos levels recorded at sampling location BH23/05.

The asbestos control levels noted above are detailed in Table 6 (*Primary mitigation control requirements for work involving asbestos*) and Table 7 (*Vehicle decontamination* requirements) of the NZGAMAS.

Concentrations of heavy metals, TPH and PAH were below the relevant human health criteria in all samples analysed.

8.2.2 BACKGROUND CRITERIA

No samples taken reported an exceedance of the Auckland background concentrations for TPH or PAH.

For heavy metals the following exceedances of the Auckland region background concentrations:

- BH23/02_0.5 and BH23/06_1.5 for lead and mercury
- BH23/06_0.5 for lead and zinc
- BH23/06_2.0 for lead and copper
- BH23/05_0.45, BH23/05_1.0, BH23/05_1.5, BH23/05_2.5, BH23/05_3.0 and BH23/06_1.0 for lead.

8.2.3 AUP CRITERIA

No samples taken reported an exceedance of the AUP permitted activity criteria for TPH or PAH.

The following samples recorded concentrations above the AUP-OP permitted activity criteria:

- For nickel: BH23/04_0.5A – 110mg/kg against the AUP-OP permitted activity soil value of 105mg/kg and an Auckland Soil Background Concertation of 320 mg/kg
- For lead: BH23/05_0.45 – 490 mg/kg against the AUP-OP permitted activity soil value of 250 mg/kg and an Auckland Soil Background Concertation of 65 mg/kg
- For zinc: BH23/06_0.5 – 1,340 mg/kg against the AUP-OP permitted activity soil value of 400 mg/kg and an Auckland Soil Background Concertation of 1,160 mg/kg

Consenting requirements based on these results are discussed in Section 10.

8.2.4 SOIL REUSE / DISPOSAL CRITERIA

Tabulated results with respect to re-use and disposal criteria are provided in Table 2, attached to this report. Based on the results, the re-use and disposal criteria for soils disturbed during construction are as follows:

Table 8-1: Soil Reuse / Disposal Options

Construction Location	Depth (m bgl)	Accepted Criteria	Contaminants
P4MH3[1]	0 – 0.5	Class 3	Heavy metals and trace asbestos
	>0.5	Class 5[2]	-
P4MH2[1]	0 – 0.5	Class 3	Heavy metals and trace asbestos
	>0.5	Class 5	-
P4MH1B/P4MH1A	0 – 0.5	Redvale Landfill (as exceeds Class 3)	Heavy metals and trace asbestos
	0.5 – 3	Class 3	Heavy metals and low-level asbestos
	>3	Class 5	-
P5MH2	0-0.5	Redvale Landfill (as exceeds Class 3)	Heavy metals and trace asbestos
	0.5-3	Class 4	
	>3	Class 5	-

Construction Location	Depth (m bgl)	Accepted Criteria	Contaminants
Works from P5MH1 westwards	-	Class 5	-

1. P4MH2 and P4MH3 are within or adjacent to Greys Avenue Carpark, which is recorded to be underlain in areas by buried C&D material containing asbestos. Therefore, where C&D material is encountered during excavation of P4MH2 or P4MH3, material should be disposed of as Class 3 with trace asbestos (<0.001 % w/w) based on the data for BH23/02 – BH23/04.
2. Note that Class 5 (Cleanfill) criteria is site dependent and acceptance of material at a cleanfill facility should be confirmed prior to works commencing.

Spoil generated from sections of trenchless construction are expected to be at sufficient depth that they will be within natural strata and so should be suitable for disposal as Class 5.

9 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is used to support the decision-making process for contaminated land management. The potential risk has been assessed qualitatively using the 'source-pathway-receptor pollutant linkage' concept, which states that for a risk to arise, each stage of the pollutant linkage must be present. For there to be an effect on receptors, there must be a contamination source and a mechanism (pathway) for contamination to affect the receptor. A CSM has been developed based on the desktop review, site inspection and results of the soil sampling investigation, summarised in Table 9-1.

Table 9-1: Conceptual Site Model

SOURCE	CONTAMINANT OF CONCERN	PATHWAY TO RECEPTORS	RECEPTORS	RISK PATHWAY STATUS	REASONING
Historic contamination associated with fill (HAIL G3: *Landfill sites.*)	Asbestos	Inhalation of dust or fibres	Construction workers	Complete	Asbestos was detected above the commercial/industrial guideline values for FA and/or AF at location BH23/05 at depths of 1.0, 1.5 and 2.0 m bgl (BH23/05_1.0, BH23/05_1.5, BH23/05_2.0), and at location BH23/07 at a depth of 0.8 m bgl (BH23/07_0.8). Additionally, asbestos cement sheet was recorded at BH23/03_0.7. GWE reported significant C&D material with ACM present within Greys Avenue Carpark.
	Heavy metals	Inhalation of dust or vapours. Ingestion or dermal contact with impacted soil, including surface soils during excavation works. Ingestion or dermal contact with impacted surface water		Incomplete	No heavy metal concentrations were reported above the human health criteria for commercial/industrial workers.
	Total Petroleum Hydrocarbons				TPH fractions were detected above the laboratory LOR in some samples, but concentrations were below adopted human health criteria.
	Polycyclic Aromatic Hydrocarbons				PAH compounds were detected above the laboratory LOR in some samples, but concentrations were below adopted human health criteria.

10 CONSENTING REQUIREMENTS

As the proposed upgrade works will require the disturbance of soils, consideration will need to be given to consenting requirements for both the NESCS and the AUP. No change in land use is proposed as part of these works.

The current soil disturbance estimates for the works are summarised below.

Open cut construction works:

- Open cut construction is proposed for two short sections of the proposed pipeline between the shafts for P4MH3 and the P3-P4 Connector Tunnel within 329 Queen Street, and between P1MH2 and the end connection EX MH - 4845768 within Vincent Street.
- Open cut construction is also proposed for network tie-ins and connections to existing EOPs.

Trenchless tunnelling works:

- It is proposed to construct the tunnelled sections between manholes P4MH3 (within Greys Avenue Carpark) and P1MH2 (within Vincent Street, opposite the intersection with Mayoral Drive) of the wastewater pipeline using a trenchless pilot-guided boring methodology. Minimal soil disposal is expected.

Temporary construction shafts:

- Six construction shafts are proposed along the Mayoral Drive alignment.
- Total earthworks volume for the shafts is approximately 1,898 m^3 (see Table 10-1 below for a breakdown).
- Additional earthworks volume due to temporary works is approximately 170 m^3, making the **total earthworks volume for the proposed works 2,068 m^3**.

Table 10-1: Summary of shaft earthworks

Manhole ID	Width (m)	Length (m)	Depth (m)	Earthworks Volume (m^3)
P4MH3	5	5	6.5	162.5
P4MH2	5	7.5	9	337.5
P4MH1	5.5	12	9	594
P5MH2	5	6.5	8.5	276
P5MH1	5	9.5	7	332.5
P1MH2	5	6	6.5	195

10.1 NESCS

Given that soil results were reported exceeding background concentrations at BH23/02, BH23/03, BH23/05, BH23/06 and BH23/07, the NESCS is considered to apply to land at and adjacent to these locations under regulation 5 (7). Without further delineation sampling, and taking a conservative approach, the NESCS is considered to apply to land up to halfway to the next adjacent sampling

location. An aerial map of areas where the NESCS is considered to apply is shown in the attached Figure 2 at the end of this document.

The proposed works are expected to exceed permitted soil disturbance volumes under regulation 8 (3) and therefore a controlled consent is required.

At locations where asbestos concentrations exceeded the soil guideline values for commercial/industrial land use criteria (at BH23/03, BH23/05 and BH23/07), a restricted discretionary consent is required under the NESCS.

10.2 AUP

Given that three samples (BH23/04_0.5A and BH23/05_0.45, and BH23/06_0.5) reported exceedances for nickel, lead and zinc, respectively, above the AUP Permitted Activity Criteria, the AUP applies to land at and adjacent to these locations.

Without further delineation sampling, and taking a conservative approach, the AUP is considered to apply to land up to halfway to the next adjacent sampling locations either side of BH23/04 and BH23/06 along the pipeline route. An aerial map of areas where the AUP is considered to apply is shown in the attached Figure 2 at the end of this document.

The total soil disturbance in areas where the AUP applies is expected to exceed the permitted activity criteria for the project of 200 m^3. Therefore, a controlled activity consent is required prior to works commencing and under Chapter E30.6.2.1 a SMP is necessary. An SMP has been developed and will be submitted with the resource consent application (Appendix F.2).

11 CONCLUSIONS

WSP has been engaged by Watercare to undertake a combined PSI and DSI for the proposed Queen Street Wastewater Diversion project within the Auckland City Centre.

This combined PSI/DSI comprised a desktop review and sampling investigation along the alignment for the proposed works. The proposed work will involve the removal of existing fill to install the new wastewater pipeline and supporting infrastructure. Sampling was undertaken to assess the risk to human health during and following soil disturbance due to potential HAIL activities within the vicinity of the proposed site works.

The PSI identified the HAIL activity HAIL G3 within the vicinity of the proposed works. HAIL G3 relates to *Landfill sites*. The Greys Avenue car park at the southern end of the alignment is a HAIL G3 activity based on previous investigations which identified demolition rubble underlying the asphalt surfacing. The rubble was reported to include concrete slabs, timber, bricks, and refuse.

Based on the above, a DSI was proposed targeting the demolition rubble at Greys Avenue and for soil disposal purposes along the alignment.

The scope of the DSI comprised:

- Collection of 35 soil samples from nine locations across the alignment.
- Analysis of representative soil samples for potential contaminants of concern including:
  - Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc).
  - TPH
  - PAH
  - Asbestos.

All investigated locations comprised fill material underlying asphalt to depths up to approximately 1.4 m bgl. The fill material was primarily sandy gravels with minor building refuse, consisting of brick, metals, and ceramics, observed within the fill in all locations. The fill was underlain by silty clays.

Based on soil results reporting an exceedance of background concentrations at BH23/02, BH23/03, BH23/05, BH23/06, and BH23/07, the NESCS is considered to apply. The proposed works are expected to exceed permitted soil disturbance volumes under regulation 8 (3) and therefore a controlled consent is required. However, at locations where asbestos SGV for commercial / industrial land use criteria were exceeded (at BH23/03, BH23/05 and BH23/07), a restricted discretionary consent is required.

With respect to the AUP, three samples (BH23/04_0.5A, BH23/05_0.45 and BH23/06_0.5) reported exceedances for nickel, lead and zinc respectively, above the AUP Permitted Activity Criteria. Therefore, the AUP is considered likely to apply to land at and adjacent to these locations. The total soil disturbance in areas where the AUP applies is expected to exceed the permitted activity criteria for the project of 200 m^3. Therefore, a controlled activity consent is required. Under Chapter E30.6.2.1, a SMP is required in this case.

Without further delineation sampling, and taking a conservative approach, the NESCS and AUP are considered to apply to land up to halfway to the next adjacent sampling location from the

locations noted above. An aerial map of areas where the NESCS and AUP are considered to apply is shown in the attached Figure 2 at the end of this document.

WSP have completed a SMP for the proposed soil disturbance works, to provide guidance on the framework of Health, Safety and Environmental risk control measures that should be enacted at the site during the works. The SMP includes an Unexpected Discovery Protocol (UDP) outlining the course of action if evidence of contaminated soils and groundwater or hazardous materials are encountered during earthworks. The SMP has been attached to the resource consent application in Appendix F.2.

11.1 RECOMMENDATIONS

Based on the findings of this assessment, it is recommended that:

- For the area of the alignment where the NESCS is considered to apply, it is unlikely that soils would be considered cleanfill material. If off-site soil disposal is required, WSP would advise seeking confirmation from the landfill operator prior to earthworks to confirm their acceptance and conditions.
- For the area of the alignment where the NESCS is not considered to apply, soil may be considered for removal as cleanfill. If off-site soil disposal is required, WSP would advise seeking confirmation from the receiving facility prior to earthworks to confirm their acceptance and conditions.
- Asbestos removal controls are recommended at the following areas of construction during soil disturbance:
  - P4MH3: Soil disturbance should be supervised by an asbestos competent person. If C&D material and/or ACM is observed, trace asbestos contamination controls should be put in place, escalating to higher controls if deemed necessary.
  - P4MH2: Soil disturbance should be supervised by an asbestos competent person with trace asbestos contamination controls in place, escalating to higher controls if deemed necessary.
  - P4MH1B/P4MH1A: From surface to 0.5 m bgl trace asbestos controls should be in place, from 0.5 to 3 m bgl works low level asbestos controls, with no controls required then onwards.
  - P5MH2: From surface to 3 m bgl trace asbestos controls should be in place.

12 REFERENCES

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13 LIMITATIONS

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Watercare Services Limited ('Client') in relation to the assessment of contaminated land for the Mayoral Drive Alignment Project of the Queen Street Wastewater Diversion Programme ('Purpose') and in accordance with the Master Services Agreement between the Client and Consultant ('Agreement').

Permitted Purpose

This Report has been prepared expressly for the purpose of Preliminary Site Investigation and Detailed Site Investigation ('Permitted Purpose'). WSP accepts no liability whatsoever for the use of the Report, in whole or in part, for any purpose other than the Permitted Purpose. Unless expressly stated otherwise, this Report has been prepared without regard to any special interest of any party other than the Client.

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The services undertaken by WSP in preparing this Report were limited to those specifically detailed in the Agreement and the Report and are subject to the scope, qualifications, assumptions and limitations set out in the Report and/or otherwise communicated to the Client. Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and/or recommendations in the Report ('Conclusions') are based in whole or in part on information provided by the Client and other parties ('Information'). The Information has not been and have not been verified by WSP and WSP accepts no liability for the reliability, adequacy, accuracy and completeness of the Information.

The data reported and Conclusions drawn by WSP in this Report are based solely on information made available to WSP at the time of preparing the Report. The passage of time; unexpected variations in ground conditions; manifestations of latent conditions; or the impact of future events (including (without limitation) changes in policy, legislation, guidelines, scientific knowledge; and changes in interpretation of policy by statutory authorities); may require further investigation or subsequent re-evaluation of the Conclusions.

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FIGURES

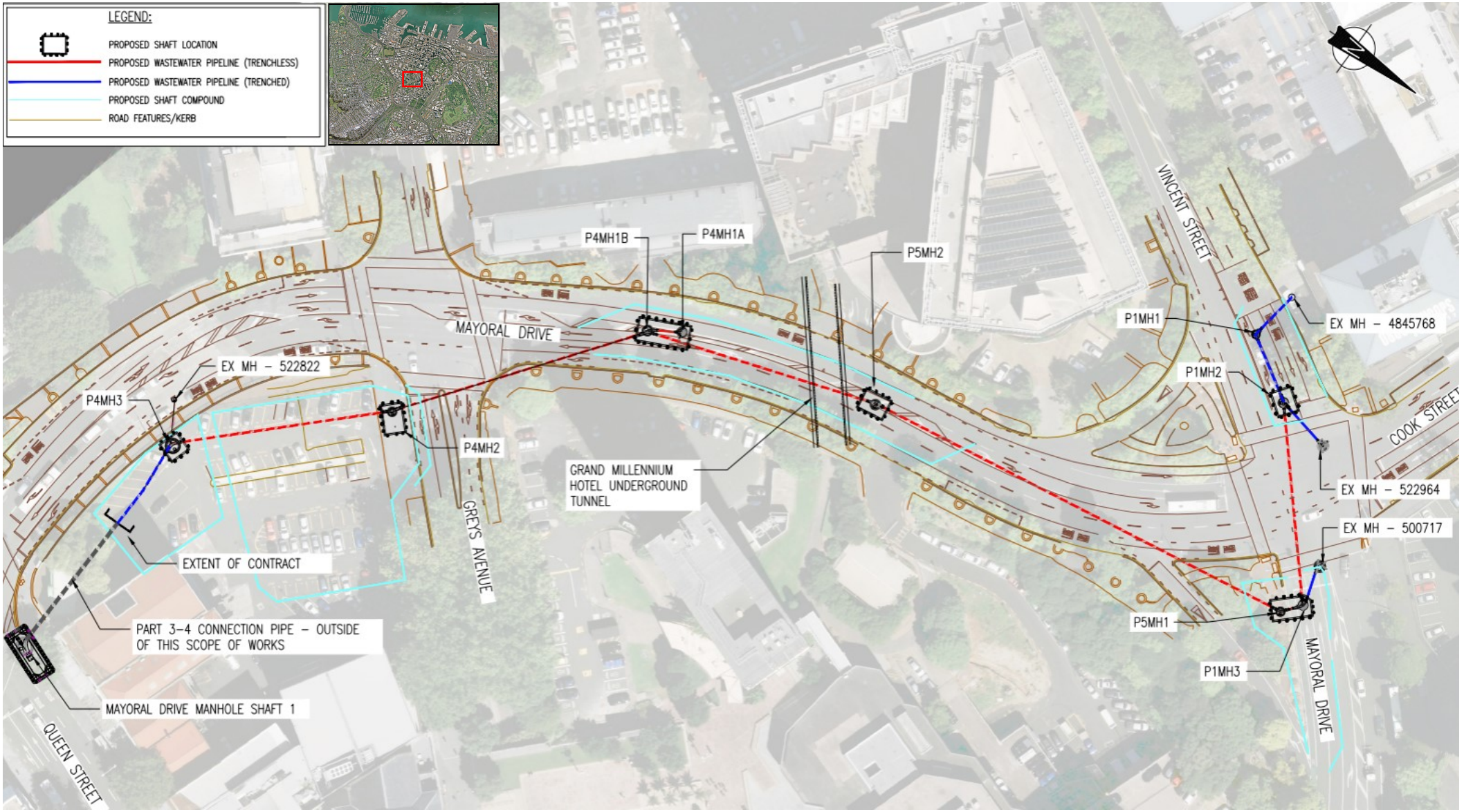

Figure 1 - Mayoral Drive Alignment Location Plan

Queen Street Wastewater Diversion Programme

Vincent Street, Mayoral Drive and Queen Street, Auckland CBD

Project Number:	Author:	Client:
W-SL001.04	L.S	Watercare
Date:	**Approved by:**	
01/05/2025	G.C	

Level 3, 100 Beaumont St, Auckland 1010 | Tel (09) 355 9500

Source: Watercare Drawing No. 2014250.XXX, dated 25/03/2025

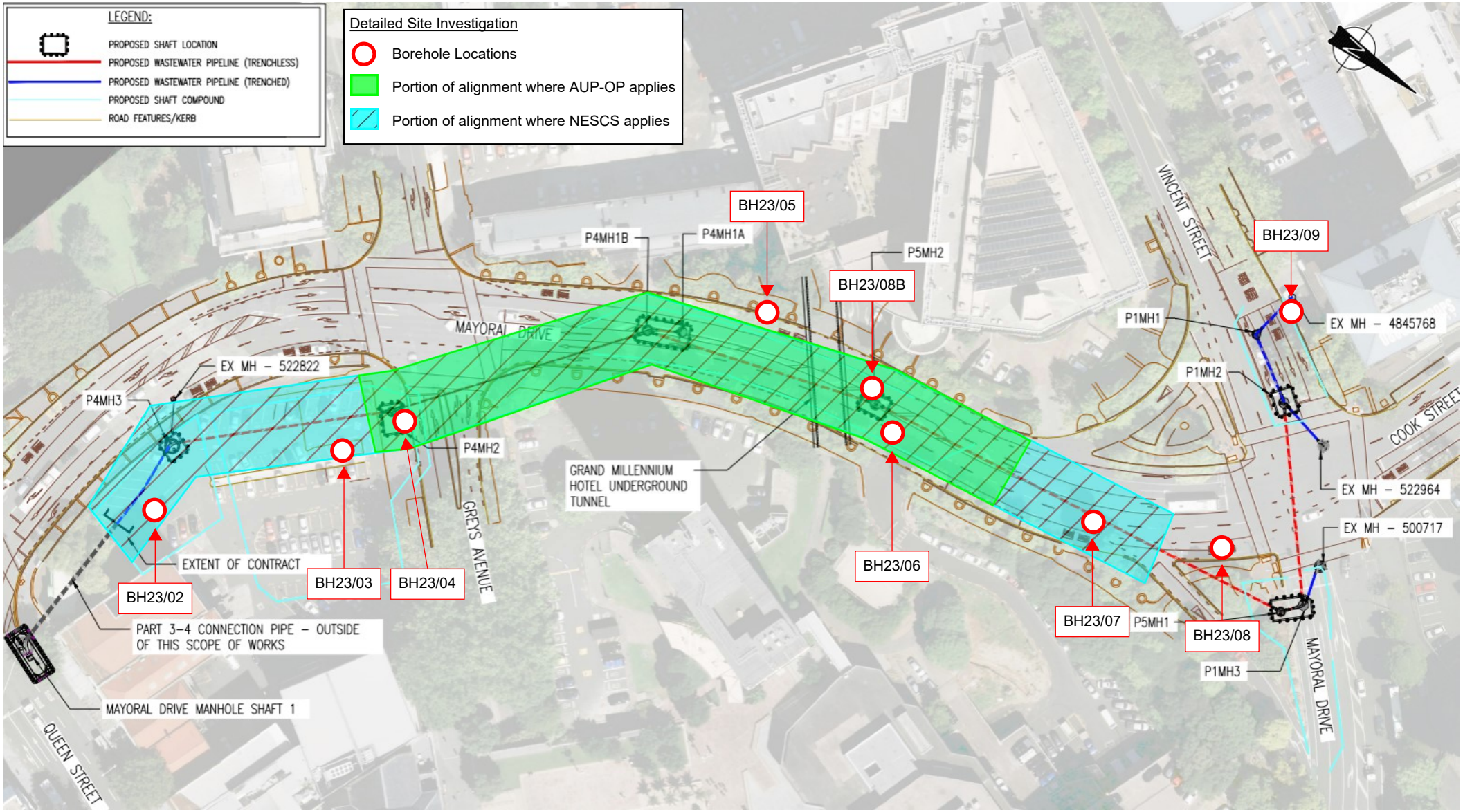

Figure 2 - Intrusive Location Plan

Queen Street Wastewater Diversion Programme

Vincent Street, Mayoral Drive and Queen Street, Auckland CBD

Project Number:	Author:	Client:
W-SL001.04	L.S	Watercare
Date:	**Approved by:**	
16/06/2025	G.C	

Level 3, 100 Beaumont St, Auckland 1010 | Tel (09) 355 9500

Source: Watercare Drawing No. 2014250.XXX, dated 25/03/2025

TABULATED ANALYTICAL RESULTS

							Asbestos					Heavy Metals								Total Petroleum Hydrocarbons								
							Asbestos Detected	NonFriable_ACM%	Asbestos as Asbestos Fines as % of Total Sample	Asbestos as Fibrous Asbestos as % of Total Sample	Asbestos from FA & AF in Soil	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	TPH C7 - C9 Fraction	TPH C10 - C14 Fraction	TPH C15 - C36 Fraction	TPH C7 - C36 Fraction	Benzo[a]pyrene Potency Equivalency Factor (TEF) NES	Benzo[a]pyrene Toxic Equivalence (TEF)	Acenaphthene	Acenaphthylene	Anthracene
							Yes/No	%w/w	% w/w	% w/w	%w/w	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg dry wt	mg/kg dry wt	mg/kg	mg/kg	mg/kg
EQL																												
Module 4, Tier 1 Commercial / Industrial, SILTY CLAY, MfE 1999																				8,800	1,900	20,000		11				
Table 1A(1) HILs Comm/Ind D Soil, NEPM 2013																		6,000	400,000					40				
SCS(health) - Commercial / industrial outdoor worker (unpaved) (MfE, 2011a)												70	1,300	6,300	10,000	3,300	4,200											
NZGAMAS - Commercial and Industrial							Yes				0.001																	
NZL Auckland Soil Background - Volcanic												12	0.65	125	90	65	0.45	320	1,160									
AUP-OP Permitted Activity Soil Acceptance Criteria												100	7.5	400	325	250	0.75	105	400	710	1,500	20,000						
Location Code	**Field ID**	**Sample Code**	**Lab Report No.**	**Lab Name**	**Depth (m bgl)**	**Date**																						
BH23/02	BH23/02_0.5	230727-138-1	518183-0	Watercare Laboratory Services	0.5	14 Jul 2023						4.7	0.51	28	58	200	0.53	62	350	<20	25	160				<0.011	0.22	0.26
	BH23/02_1.0	322423	23-105585	Dowdell Associates	1	14 Jul 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230727-138-2	518183-0	Watercare Laboratory Services								1.7	<0.1	8.7	2.6	6.5	<0.05	1.3	<7.5	<20	24	530				<0.011	<0.011	<0.011
BH23/03	BH23/03_0.5	230908-106-7	23-106749	Dowdell Associates	0.5	20 Jul 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
	BH23/03_0.7	230908-106-8	23-106750	Dowdell Associates	0.7	20 Jul 2023	Yes	N/A	N/A	N/A	N/A																	
	BH23/03_1.5	322162	23-105464	Dowdell Associates	1.5	20 Jul 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230724-124-1	518025-0	Watercare Laboratory Services								1.7	<0.092	8.1	13	5.4	<0.046	1.7	<6.9	<20	<20	32						
	BH23/03_2.0	322328	23-105538	Dowdell Associates	2	20 Jul 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230724-124-2	518025-0	Watercare Laboratory Services								1	<0.089	8.1	6.4	5.3	<0.045	1.4	7.9	<20	<20	<20						
BH23/04	BH23/04_0.2	325089	23-106745	Dowdell Associates	0.2	05 Sep 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230908-106-3	230908-106	Watercare Laboratory Services								1.1	<0.089	12	3.6	5.1	0.1	3.1	<6.7	<20	<20	110	110			<0.01	0.23	0.26
	BH23/04_0.5	325090	23-106746	Dowdell Associates	0.5	05 Sep 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230908-106-4	230908-106	Watercare Laboratory Services								1.2	<0.089	11	3.4	8.5	0.15	2.6	6.8	<20	<20	<20	<30			<0.01	<0.01	<0.01
	BH23/04_0.5A	325091	23-106747	Dowdell Associates	0.5	05 Sep 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230908-106-5	230908-106	Watercare Laboratory Services								1.1	<0.089	24	37	44	<0.044	110	31	<20	<20	470	470			<0.01	0.07	0.06
	BH23/04_1.0	325092	23-106748	Dowdell Associates	1	05 Sep 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230908-106-6	230908-106	Watercare Laboratory Services								0.97	<0.09	8.4	2.7	4.4	0.11	1.2	<6.8	<20	<20	<20	<30			<0.011	<0.011	<0.011
BH23/05	BH23/05_0.45	324316	23-106400	Dowdell Associates	0.45	25 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3357414_1	3357414	Hill Labs								4	0.24	23	37	490	0.32	35	166	<20	<20	98	104	1.92	1.90	0.111	0.079	0.36
	BH23/05_1.0	324317	23-106401	Dowdell Associates	1	25 Aug 2023	Yes	<0.001	0.0015	<0.001	0.0017																	
		3357740_1	3357740	Hill Labs								3	0.14	15	23	71	0.23	19	101	<20	<20	83	87	0.58	0.57	0.020	0.027	0.082
	BH23/05_1.5	324305	23-106389	Dowdell Associates	1.5	25 Aug 2023	Yes	<0.001	<0.001	<0.001	0.0013																	
		3357743_1	3357743	Hill Labs								5	0.29	28	51	77	0.20	35	177	<20	<20	53	<80	0.39	0.39	<0.013	0.015	0.020
	BH23/05_2.0	324306	23-106390	Dowdell Associates	2	25 Aug 2023	Yes	<0.001	0.0017	<0.001	0.0018																	
		3357749_1	3357749	Hill Labs								6	0.22	18	33	52	0.16	28	145	<20	<20	63	<80	0.36	0.36	<0.013	0.020	0.077
	BH23/05_2.5	324307	23-106391	Dowdell Associates	2.5	25 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3357753_1	3357753	Hill Labs								5	0.39	17	45	97	0.21	29	200	<20	<20	<40	<80	0.147	0.145	<0.013	<0.013	0.017
	BH23/05_3.0	324308	23-106392	Dowdell Associates	3	25 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3357756_1	3357756	Hill Labs								4	0.29	19	37	81	0.29	36	172	<20	<20	72	<80	0.43	0.43	<0.013	0.019	0.056
BH23/06	BH23/06_0.5	324054	23-106268	Dowdell Associates	0.5	21 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3353149_2	3353149	Hill Labs								4	0.38	19	47	166	0.21	21	1,340	<20	<20	52	<80	0.82	0.81	0.022	0.057	0.107
	BH23/06_1.0	324055	23-106269	Dowdell Associates	1	21 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230822-140-6	521669-0	Watercare Laboratory Services								3.3	0.51	18	34	140	0.19	34	130	<20	<20	100	100			0.19	0.17	3.1
	BH23/06_1.5	324056	23-106270	Dowdell Associates	1.5	21 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3353149_3	3353149	Hill Labs								3	0.14	19	30	89	0.51	23	99	<20	<20	67	<80	1.11	1.10	0.075	0.047	0.31
	BH23/06_2.0	324060	23-106271	Dowdell Associates	2	22 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230822-140-8	521669-0	Watercare Laboratory Services								3.6	0.19	15	120	100	0.13	29	130	<20	<20	220	220			0.11	0.04	2.1
	BH23/06_2.5	324061	23-106272	Dowdell Associates	2.5	22 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3353149_4	3353149	Hill Labs								8	0.36	16	16	39	0.12	5	64	<20	<20	<40	<80	0.39	0.39	<0.014	0.028	0.040
	BH23/06_3.0	324048	23-106263	Dowdell Associates	3	22 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230822-140-10	230822-140	Watercare Laboratory Services								1.9	<0.089	9.2	6.6	7	<0.044	0.87	9.9	<20	<20	<20	<30			<0.011	<0.011	0.05
BH23/07	BH23/07_0.8	324047	23-106262	Dowdell Associates	0.8	21 Aug 2023	Yes	<0.001	0.0054	<0.001	0.0054																	
		3353149_1	3353149	Hill Labs								3	0.11	34	60	55	0.12	93	78	<20	<20	<40	<80					
	BH23/07_1.0	324051	23-106266	Dowdell Associates	1	21 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230822-140-2	230822-140	Watercare Laboratory Services								0.41	<0.092	6	2.1	6.7	0.15	0.93	<6.9	<20	<20	<20	<30					
	BH23/07_1.5	324047	23-106262	Dowdell Associates	1.5	21 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230822-140-3	230822-140	Watercare Laboratory Services								1	<0.088	6.4	3.4	4.4	<0.044	1.3	<6.6	<20	<20	42	42					
	BH23/07_2.0	230822-140-4	230822-140	Watercare Laboratory Services	2	21 Aug 2023						0.37	<0.088	6.1	2.7	4.9	<0.044	0.51	<6.6	<20	<20	<20	<30					
BH23/08	BH23/08_1.4	324312	23-106396	Dowdell Associates	1.4	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-5	230825-115	Watercare Laboratory Services								3.4	<0.091	11	7	6.9	0.14	4.6	<6.8	<20	<20	35	35					
	BH23/08_2.0	324314	23-106398	Dowdell Associates	2	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-6	230825-115	Watercare Laboratory Services								1.4	<0.089	9.6	2.8	3.6	<0.045	1	<6.7	<20	<20	<20	<30					
	BH23/08_2.5	324315	23-106399	Dowdell Associates	2.5	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-7	230825-115	Watercare Laboratory Services								12	<0.09	13	11	5.3	<0.045	1.1	7.9	30	<20	21	50					
BH23/08B	BH23/08B_1.0	324304	23-106388	Dowdell Associates	1	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-1	230825-115	Watercare Laboratory Services								2.5	<0.091	14	5	5	0.057	4.3	7	<20	<20	32	32					
	BH23/08B_1.5	324309	23-106393	Dowdell Associates	1.5	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-2	230825-115	Watercare Laboratory Services								0.9	<0.09	11	3.2	3.9	0.082	2.1	<6.7	<20	<20	<20	<30					
	BH23/08B_2.0	324310	23-106394	Dowdell Associates	2	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-3	230825-115	Watercare Laboratory Services								11	<0.09	14	13	6.3	0.045	3	13	<20	<20	25	<30					
	BH23/08B_2.5	324311	23-106395	Dowdell Associates	2.5	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-4	230825-115	Watercare Laboratory Services								1.6	<0.089	9.7	4.5	5.9	<0.044	1.4	15	<20	<20	<20	<30					
BH23/09	BH23/09_0.5	325088	23-106744	Dowdell Associates	0.5	05 Sep 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230908-106-1	230908-106	Watercare Laboratory Services								3.6	<0.091	8.8	13	3.9	0.053	7.8	<6.8	<20	<20	100	100			<0.011	0.22	0.3
	BH23/09_1.0	230908-106-2	230908-106	Watercare Laboratory Services	1	05 Sep 2023						0.77	<0.089	7.4	14	3.5	<0.044	1.3	<6.7	<20	<20	24	<30			<0.011	<0.011	<0.011

								Polycyclic Aromatic Hydrocarbons															
								Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (upper bound)*	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Perylene	Pyrene	PAH (Sum of Common 16 PAHs - Lab Reported)	1-Methylnaphthalene	2-Methylnaphthalene	Benzo(e)pyrene	Benzo(b)fluoranthene + Benzo(j)fluoranthene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg dry wt
EQL																										
Module 4, Tier 1 Commercial / Industrial, SILTY CLAY, MfE 1999																			210			NA				
Table 1A(1) HILs Comm/Ind D Soil, NEPM 2013																							4,000				
SCS(health) - Commercial / industrial outdoor worker (unpaved) (MfE, 2011a)																											
NZGAMAS - Commercial and Industrial																											
NZL Auckland Soil Background - Volcanic																											
AUP-OP Permitted Activity Soil Acceptance Criteria																											
Location Code	**Field ID**	**Sample Code**	**Lab Report No.**	**Lab Name**	**Depth (m bgl)**	**Date**																					
BH23/02	**BH23/02_0.5**	**230727-138-1**	**518183-0**	**Watercare Laboratory Services**	**0.5**	**14 Jul 2023**		1.3	1.6	2.1	1.8	1.5	0.69	0.85	<0.011	2.3	0.12	1.3	0.15	0.91		2.4						
	BH23/02_1.0	**322423**	**23-105585**	**Dowdell Associates**	**1**	**14 Jul 2023**																					
		230727-138-2	**518183-0**	**Watercare Laboratory Services**				<0.011	<0.011	0.042	0.18	<0.011	<0.011	<0.011	<0.011	0.06	<0.011	<0.011	<0.011	<0.011		0.06						
BH23/03	**BH23/03_0.5**	**230908-106-7**	**23-106749**	**Dowdell Associates**	**0.5**	**20 Jul 2023**																					
	BH23/03_0.7	**230908-106-8**	**23-106750**	**Dowdell Associates**	**0.7**	**20 Jul 2023**																					
	BH23/03_1.5	**322162**	**23-105464**	**Dowdell Associates**	**1.5**	**20 Jul 2023**																					
		230724-124-1	**518025-0**	**Watercare Laboratory Services**																							
	BH23/03_2.0	**322328**	**23-105538**	**Dowdell Associates**	**2**	**20 Jul 2023**																					
		230724-124-2	**518025-0**	**Watercare Laboratory Services**																							
BH23/04	**BH23/04_0.2**	**325089**	**23-106745**	**Dowdell Associates**	**0.2**	**05 Sep 2023**																					
		230908-106-3	**230908-106**	**Watercare Laboratory Services**				1.5	0.75		0.93	0.43	0.39	2.0	<0.01	<0.01	1.5	0.42	0.12	0.92		2.0						
	BH23/04_0.5	**325090**	**23-106746**	**Dowdell Associates**	**0.5**	**05 Sep 2023**																					
		230908-106-4	**230908-106**	**Watercare Laboratory Services**				0.06	0.07		0.11	<0.01	<0.01	0.08	<0.01	<0.01	0.05	0.06	<0.01	0.05		0.09						
	BH23/04_0.5A	**325091**	**23-106747**	**Dowdell Associates**	**0.5**	**05 Sep 2023**																					
		230908-106-5	**230908-106**	**Watercare Laboratory Services**				0.33	0.16		0.21	0.18	0.07	0.42	<0.01	<0.01	0.35	0.16	0.04	0.12		0.44						
	BH23/04_1.0	**325092**	**23-106748**	**Dowdell Associates**	**1**	**05 Sep 2023**																					
		230908-106-6	**230908-106**	**Watercare Laboratory Services**				<0.011	<0.011		0.08	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011		<0.011						
BH23/05	**BH23/05_0.45**	**324316**	**23-106400**	**Dowdell Associates**	**0.45**	**25 Aug 2023**																					
		3357414_1	**3357414**	**Hill Labs**				1.10	1.36			0.87	0.52	1.05	0.154	2.5	0.086	0.83	<0.06	1.36	0.27	2.7	15.5	0.014	<0.012	0.76	1.25
	BH23/05_1.0	**324317**	**23-106401**	**Dowdell Associates**	**1**	**25 Aug 2023**																					
		3357740_1	**3357740**	**Hill Labs**				0.29	0.42			0.29	0.156	0.28	0.042	0.60	0.017	0.30	<0.07	0.26	0.088	0.64	4.1	<0.013	<0.013	0.25	0.38
	BH23/05_1.5	**324305**	**23-106389**	**Dowdell Associates**	**1.5**	**25 Aug 2023**																					
		3357743_1	**3357743**	**Hill Labs**				0.179	0.28			0.180	0.099	0.166	0.036	0.30	<0.013	0.174	<0.07	0.090	0.062	0.36	2.4	<0.013	<0.013	0.155	0.27
	BH23/05_2.0	**324306**	**23-106390**	**Dowdell Associates**	**2**	**25 Aug 2023**																					
		3357749_1	**3357749**	**Hill Labs**				0.20	0.26			0.162	0.102	0.188	0.028	0.57	0.024	0.174	<0.07	0.32	0.058	0.59	3.2	<0.013	<0.013	0.145	0.23
	BH23/05_2.5	**324307**	**23-106391**	**Dowdell Associates**	**2.5**	**25 Aug 2023**																					
		3357753_1	**3357753**	**Hill Labs**				0.072	0.102			0.072	0.040	0.078	0.013	0.172	<0.013	0.071	<0.07	0.102	0.023	0.185	1.1	<0.013	<0.013	0.064	0.099
	BH23/05_3.0	**324308**	**23-106392**	**Dowdell Associates**	**3**	**25 Aug 2023**																					
		3357756_1	**3357756**	**Hill Labs**				0.21	0.30			0.21	0.118	0.195	0.041	0.53	<0.013	0.21	<0.07	0.126	0.068	0.55	3.1	<0.013	<0.013	0.178	0.29
BH23/06	**BH23/06_0.5**	**324054**	**23-106268**	**Dowdell Associates**	**0.5**	**21 Aug 2023**																					
		3353149_2	**3353149**	**Hill Labs**				0.47	0.56			0.40	0.21	0.36	0.081	0.97	0.035	0.39	<0.06	0.45	0.118	1.16	6.4	<0.012	<0.012	0.34	0.62
	BH23/06_1.0	**324055**	**23-106269**	**Dowdell Associates**	**1**	**21 Aug 2023**																					
		230822-140-6	**521669-0**	**Watercare Laboratory Services**				2	2.8	3.5	2.5	2.2	1.3	2	<0.01	3.1	0.63	2.9	0.14	1.7		3.3						
	BH23/06_1.5	**324056**	**23-106270**	**Dowdell Associates**	**1.5**	**21 Aug 2023**																					
		3353149_3	**3353149**	**Hill Labs**				0.64	0.76			0.51	0.30	0.53	0.101	1.46	0.099	0.53	<0.07	1.10	0.160	1.67	9.6	<0.013	0.014	0.46	0.84
	BH23/06_2.0	**324060**	**23-106271**	**Dowdell Associates**	**2**	**22 Aug 2023**																					
		230822-140-8	**521669-0**	**Watercare Laboratory Services**				0.87	1.3	1.7	1.4	1.2	0.52	0.87	<0.01	2.1	0.3	1.4	0.07	0.71		2.2						
	BH23/06_2.5	**324061**	**23-106272**	**Dowdell Associates**	**2.5**	**22 Aug 2023**																					
		3353149_4	**3353149**	**Hill Labs**				0.20	0.26			0.20	0.104	0.167	0.040	0.43	<0.014	0.196	<0.07	0.165	0.059	0.52	2.9	<0.014	<0.014	0.168	0.30
	BH23/06_3.0	**324048**	**23-106263**	**Dowdell Associates**	**3**	**22 Aug 2023**																					
		230822-140-10	**230822-140**	**Watercare Laboratory Services**				0.08	0.08	0.12	0.07	0.09	<0.011	<0.011	<0.011	0.05	<0.011	0.14	<0.011	<0.011		0.05						
BH23/07	**BH23/07_0.8**	**324047**	**23-106262**	**Dowdell Associates**	**0.8**	**21 Aug 2023**																					
		3353149_1	**3353149**	**Hill Labs**																							
	BH23/07_1.0	**324051**	**23-106266**	**Dowdell Associates**	**1**	**21 Aug 2023**																					
		230822-140-2	**230822-140**	**Watercare Laboratory Services**																							
	BH23/07_1.5	**324047**	**23-106262**	**Dowdell Associates**	**1.5**	**21 Aug 2023**																					
		230822-140-3	**230822-140**	**Watercare Laboratory Services**																							
	BH23/07_2.0	**230822-140-4**	**230822-140**	**Watercare Laboratory Services**	**2**	**21 Aug 2023**																					
BH23/08	**BH23/08_1.4**	**324312**	**23-106396**	**Dowdell Associates**	**1.4**	**24 Aug 2023**																					
		230825-115-5	**230825-115**	**Watercare Laboratory Services**																							
	BH23/08_2.0	**324314**	**23-106398**	**Dowdell Associates**	**2**	**24 Aug 2023**																					
		230825-115-6	**230825-115**	**Watercare Laboratory Services**																							
	BH23/08_2.5	**324315**	**23-106399**	**Dowdell Associates**	**2.5**	**24 Aug 2023**																					
		230825-115-7	**230825-115**	**Watercare Laboratory Services**																							
BH23/08B	**BH23/08B_1.0**	**324304**	**23-106388**	**Dowdell Associates**	**1**	**24 Aug 2023**																					
		230825-115-1	**230825-115**	**Watercare Laboratory Services**																							
	BH23/08B_1.5	**324309**	**23-106393**	**Dowdell Associates**	**1.5**	**24 Aug 2023**																					
		230825-115-2	**230825-115**	**Watercare Laboratory Services**																							
	BH23/08B_2.0	**324310**	**23-106394**	**Dowdell Associates**	**2**	**24 Aug 2023**																					
		230825-115-3	**230825-115**	**Watercare Laboratory Services**																							
	BH23/08B_2.5	**324311**	**23-106395**	**Dowdell Associates**	**2.5**	**24 Aug 2023**																					
		230825-115-4	**230825-115**	**Watercare Laboratory Services**																							
BH23/09	**BH23/09_0.5**	**325088**	**23-106744**	**Dowdell Associates**	**0.5**	**05 Sep 2023**																					
		230908-106-1	**230908-106**	**Watercare Laboratory Services**				1.4	0.63		0.91	0.7	0.3	2.4	<0.011	<0.011	1.5	0.59	0.12	1.4		2.6						
	BH23/09_1.0	**230908-106-2**	**230908-106**	**Watercare Laboratory Services**	**1**	**05 Sep 2023**		<0.011	<0.011		0.16	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011		0.08						

							Asbestos					Heavy Metals								Total Petroleum Hydrocarbons								
							Asbestos Detected	Non-Friable_ACM%	Asbestos as Asbestos Fines as % of Total Sample	Asbestos as Fibrous Asbestos as % of Total Sample	Asbestos from FA & AF in Soil	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	TPH C7 - C9 Fraction	TPH C10 - C14 Fraction	TPH C15 - C36 Fraction	TPH C7 - C36 Fraction	Benzo[a]pyrene Potency Equivalency Factor (TEF) NES	Benzo[a]pyrene Toxic Equivalence (TEF)	Acenaphthene	Acenaphthylene	Anthracene
							Yes/No	%w/w	% w/w	% w/w	%w/w	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg dry wt	mg/kg dry wt	mg/kg	mg/kg	mg/kg
NZGAMAS - Commercial and Industrial								0.05			0.001																	
Redvale Landfill Waste Acceptance Criteria												500	100	500	2,500	500	20	150,000	50,000	500	510	20,000						
Class 3 Landfill Screening Criteria (WasteMINZ, 2023)												140	10	150	280	460	3	320	1,200					125				
Class 4 Landfill Screening Criteria (WasteMINZ, 2023)												17	0.8	150	220	160	0.7	35	190					2.8				
Class 5 Cleanfill Screening Criteria (WasteMINZ, 2023)																				110	58			2				
NZL Auckland Soil Background - Volcanic												12	0.65	125	90	65	0.45	320	1,160									
Location Code	**Field ID**	**Sample Code**	**Lab Report No.**	**Lab Name**	**Depth (m bgl)**	**Date**																						
BH23/02	BH23/02_0.5	230727-138-1	518183-0	Watercare Laboratory Services	0.5	14 Jul 2023						4.7	0.51	28	58	200	0.53	62	350	<20	25	160				<0.011	0.22	0.26
	BH23/02_1.0	322423	23-105585	Dowdell Associates	1	14 Jul 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230727-138-2	518183-0	Watercare Laboratory Services								1.7	<0.1	8.7	2.6	6.5	<0.05	1.3	<7.5	<20	24	530				<0.011	<0.011	<0.011
BH23/03	BH23/03_0.5	230908-106-7	23-106749	Dowdell Associates	0.5	20 Jul 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
	BH23/03_0.7	230908-106-8	23-106750	Dowdell Associates	0.7	20 Jul 2023	Yes	N/A	N/A	N/A	N/A																	
	BH23/03_1.5	322162	23-105464	Dowdell Associates	1.5	20 Jul 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230724-124-1	518025-0	Watercare Laboratory Services								1.7	<0.092	8.1	13	5.4	<0.046	1.7	<6.9	<20	<20	32						
	BH23/03_2.0	322328	23-105538	Dowdell Associates	2	20 Jul 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230724-124-2	518025-0	Watercare Laboratory Services								1	<0.089	8.1	6.4	5.3	<0.045	1.4	7.9	<20	<20	<20						
BH23/04	BH23/04_0.2	325089	23-106745	Dowdell Associates	0.2	05 Sep 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230908-106-3	230908-106	Watercare Laboratory Services								1.1	<0.089	12	3.6	5.1	0.1	3.1	<6.7	<20	<20	110	110			<0.01	0.23	0.26
	BH23/04_0.5	325090	23-106746	Dowdell Associates	0.5	05 Sep 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230908-106-4	230908-106	Watercare Laboratory Services								1.2	<0.089	11	3.4	8.5	0.15	2.6	6.8	<20	<20	<20	<30			<0.01	<0.01	<0.01
	BH23/04_0.5A	325091	23-106747	Dowdell Associates	0.5	05 Sep 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230908-106-5	230908-106	Watercare Laboratory Services								1.1	<0.089	24	37	44	<0.044	110	31	<20	<20	470	470			<0.01	0.07	0.06
	BH23/04_1.0	325092	23-106748	Dowdell Associates	1	05 Sep 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230908-106-6	230908-106	Watercare Laboratory Services								0.97	<0.09	8.4	2.7	4.4	0.11	1.2	<6.8	<20	<20	<20	<30			<0.011	<0.011	<0.011
BH23/05	BH23/05_0.45	324316	23-106400	Dowdell Associates	0.45	25 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3357414_1	3357414	Hill Labs								4	0.24	23	37	490	0.32	35	166	<20	<20	98	104	1.92	1.90	0.111	0.079	0.36
	BH23/05_1.0	324317	23-106401	Dowdell Associates	1	25 Aug 2023	Yes	<0.001	0.0015	<0.001	0.0017																	
		3357740_1	3357740	Hill Labs								3	0.14	15	23	71	0.23	19	101	<20	<20	83	87	0.58	0.57	0.020	0.027	0.082
	BH23/05_1.5	324305	23-106389	Dowdell Associates	1.5	25 Aug 2023	Yes	<0.001	<0.001	<0.001	0.0013																	
		3357743_1	3357743	Hill Labs								5	0.29	28	51	77	0.20	35	177	<20	<20	53	<80	0.39	0.39	<0.013	0.015	0.020
	BH23/05_2.0	324306	23-106390	Dowdell Associates	2	25 Aug 2023	Yes	<0.001	0.0017	<0.001	0.0018																	
		3357749_1	3357749	Hill Labs								6	0.22	18	33	52	0.16	28	145	<20	<20	63	<80	0.36	0.36	<0.013	0.020	0.077
	BH23/05_2.5	324307	23-106391	Dowdell Associates	2.5	25 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3357753_1	3357753	Hill Labs								5	0.39	17	45	97	0.21	29	200	<20	<20	<40	<80	0.147	0.145	<0.013	<0.013	0.017
	BH23/05_3.0	324308	23-106392	Dowdell Associates	3	25 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3357756_1	3357756	Hill Labs								4	0.29	19	37	81	0.29	36	172	<20	<20	72	<80	0.43	0.43	<0.013	0.019	0.056
BH23/06	BH23/06_0.5	324054	23-106268	Dowdell Associates	0.5	21 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3353149_2	3353149	Hill Labs								4	0.38	19	47	166	0.21	21	1,340	<20	<20	52	<80	0.82	0.81	0.022	0.057	0.107
	BH23/06_1.0	324055	23-106269	Dowdell Associates	1	21 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230822-140-6	521669-0	Watercare Laboratory Services								3.3	0.51	18	34	140	0.19	34	130	<20	<20	100	100			0.19	0.17	3.1
	BH23/06_1.5	324056	23-106270	Dowdell Associates	1.5	21 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3353149_3	3353149	Hill Labs								3	0.14	19	30	89	0.51	23	99	<20	<20	67	<80	1.11	1.10	0.075	0.047	0.31
	BH23/06_2.0	324060	23-106271	Dowdell Associates	2	22 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230822-140-8	521669-0	Watercare Laboratory Services								3.6	0.19	15	120	100	0.13	29	130	<20	<20	220	220			0.11	0.04	2.1
	BH23/06_2.5	324061	23-106272	Dowdell Associates	2.5	22 Aug 2023	Yes	<0.001	<0.001	<0.001	<0.001																	
		3353149_4	3353149	Hill Labs								8	0.36	16	16	39	0.12	5	64	<20	<20	<40	<80	0.39	0.39	<0.014	0.028	0.040
	BH23/06_3.0	324048	23-106263	Dowdell Associates	3	22 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230822-140-10	230822-140	Watercare Laboratory Services								1.9	<0.089	9.2	6.6	7	<0.044	0.87	9.9	<20	<20	<20	<30			<0.011	<0.011	0.05
BH23/07	BH23/07_0.8	324047	23-106262	Dowdell Associates	0.8	21 Aug 2023	Yes	<0.001	0.0054	<0.001	0.0054																	
		3353149_1	3353149	Hill Labs								3	0.11	34	60	55	0.12	93	78	<20	<20	<40	<80					
	BH23/07_1.0	324051	23-106266	Dowdell Associates	1	21 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230822-140-2	230822-140	Watercare Laboratory Services								0.41	<0.092	6	2.1	6.7	0.15	0.93	<6.9	<20	<20	<20	<30					
	BH23/07_1.5	324047	23-106262	Dowdell Associates	1.5	21 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230822-140-3	230822-140	Watercare Laboratory Services								1	<0.088	6.4	3.4	4.4	<0.044	1.3	<6.6	<20	<20	42	42					
	BH23/07_2.0	230822-140-4	230822-140	Watercare Laboratory Services	2	21 Aug 2023						0.37	<0.088	6.1	2.7	4.9	<0.044	0.51	<6.6	<20	<20	<20	<30					
BH23/08	BH23/08_1.4	324312	23-106396	Dowdell Associates	1.4	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-5	230825-115	Watercare Laboratory Services								3.4	<0.091	11	7	6.9	0.14	4.6	<6.8	<20	<20	35	35					
	BH23/08_2.0	324314	23-106398	Dowdell Associates	2	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-6	230825-115	Watercare Laboratory Services								1.4	<0.089	9.6	2.8	3.6	<0.045	1	<6.7	<20	<20	<20	<30					
	BH23/08_2.5	324315	23-106399	Dowdell Associates	2.5	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-7	230825-115	Watercare Laboratory Services								12	<0.09	13	11	5.3	<0.045	1.1	7.9	30	<20	21	50					
BH23/08B	BH23/08B_1.0	324304	23-106388	Dowdell Associates	1	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-1	230825-115	Watercare Laboratory Services								2.5	<0.091	14	5	5	0.057	4.3	7	<20	<20	32	32					
	BH23/08B_1.5	324309	23-106393	Dowdell Associates	1.5	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-2	230825-115	Watercare Laboratory Services								0.9	<0.09	11	3.2	3.9	0.082	2.1	<6.7	<20	<20	<20	<30					
	BH23/08B_2.0	324310	23-106394	Dowdell Associates	2	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-3	230825-115	Watercare Laboratory Services								11	<0.09	14	13	6.3	0.045	3	13	<20	<20	25	<30					
	BH23/08B_2.5	324311	23-106395	Dowdell Associates	2.5	24 Aug 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230825-115-4	230825-115	Watercare Laboratory Services								1.6	<0.089	9.7	4.5	5.9	<0.044	1.4	15	<20	<20	<20	<30					
BH23/09	BH23/09_0.5	325088	23-106744	Dowdell Associates	0.5	05 Sep 2023	No	<0.001	<0.001	<0.001	<0.001																	
		230908-106-1	230908-106	Watercare Laboratory Services								3.6	<0.091	8.8	13	3.9	0.053	7.8	<6.8	<20	<20	100	100			<0.011	0.22	0.3
	BH23/09_1.0	230908-106-2	230908-106	Watercare Laboratory Services	1	05 Sep 2023						0.77	<0.089	7.4	14	3.5	<0.044	1.3	<6.7	<20	<20	24	<30			<0.011	<0.011	<0.011

								Polycyclic Aromatic Hydrocarbons														
								Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (upper bound)*	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Perylene	Pyrene	PAH (Sum of Common 16 PAHs - Lab Reported)	1-Methylnaphthalene	2-Methylnaphthalene	Benzo(e)pyrene	Benzo[b]fluoranthene + Benzo[j]fluoranthene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg dry wt
NZGAMAS - Commercial and Industrial																										
Redvale Landfill Waste Acceptance Criteria																						200				
Class 3 Landfill Screening Criteria (WasteMINZ, 2023)																										
Class 4 Landfill Screening Criteria (WasteMINZ, 2023)																										
Class 5 Cleanfill Screening Criteria (WasteMINZ, 2023)																										
NZL Auckland Soil Background - Volcanic																										
Location Code	**Field ID**	**Sample Code**	**Lab Report No.**	**Lab Name**	**Depth (m bgl)**	**Date**																				
BH23/02	**BH23/02_0.5**	**230727-138-1**	**518183-0**	**Watercare Laboratory Services**	**0.5**	**14 Jul 2023**		1.3	1.6	2.1	1.8	1.5	0.69	0.85	<0.011	2.3	0.12	1.3	0.15	0.91		2.4					
	BH23/02_1.0	**322423**	**23-105585**	**Dowdell Associates**	**1**	**14 Jul 2023**																				
		230727-138-2	**518183-0**	**Watercare Laboratory Services**				<0.011	<0.011	0.042	0.18	<0.011	<0.011	<0.011	<0.011	0.06	<0.011	<0.011	<0.011	<0.011		0.06					
BH23/03	**BH23/03_0.5**	**230908-106-7**	**23-106749**	**Dowdell Associates**	**0.5**	**20 Jul 2023**																				
	BH23/03_0.7	**230908-106-8**	**23-106750**	**Dowdell Associates**	**0.7**	**20 Jul 2023**																				
	BH23/03_1.5	**322162**	**23-105464**	**Dowdell Associates**	**1.5**	**20 Jul 2023**																				
		230724-124-1	**518025-0**	**Watercare Laboratory Services**																						
	BH23/03_2.0	**322328**	**23-105538**	**Dowdell Associates**	**2**	**20 Jul 2023**																				
		230724-124-2	**518025-0**	**Watercare Laboratory Services**																						
BH23/04	**BH23/04_0.2**	**325089**	**23-106745**	**Dowdell Associates**	**0.2**	**05 Sep 2023**																				
		230908-106-3	**230908-106**	**Watercare Laboratory Services**				1.5	0.75		0.93	0.43	0.39	2.0	<0.01	<0.01	1.5	0.42	0.12	0.92		2.0					
	BH23/04_0.5	**325090**	**23-106746**	**Dowdell Associates**	**0.5**	**05 Sep 2023**																				
		230908-106-4	**230908-106**	**Watercare Laboratory Services**				0.06	0.07		0.11	<0.01	<0.01	0.08	<0.01	<0.01	0.05	0.06	<0.01	0.05		0.09					
	BH23/04_0.5A	**325091**	**23-106747**	**Dowdell Associates**	**0.5**	**05 Sep 2023**																				
		230908-106-5	**230908-106**	**Watercare Laboratory Services**				0.33	0.16		0.21	0.18	0.07	0.42	<0.01	<0.01	0.35	0.16	0.04	0.12		0.44					
	BH23/04_1.0	**325092**	**23-106748**	**Dowdell Associates**	**1**	**05 Sep 2023**																				
		230908-106-6	**230908-106**	**Watercare Laboratory Services**				<0.011	<0.011		0.08	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011		<0.011					
BH23/05	**BH23/05_0.45**	**324316**	**23-106400**	**Dowdell Associates**	**0.45**	**25 Aug 2023**																				
		3357414_1	**3357414**	**Hill Labs**				1.10	1.36			0.87	0.52	1.05	0.154	2.5	0.086	0.83	<0.06	1.36	0.27	2.7	15.5	0.014	<0.012	0.76	1.25
	BH23/05_1.0	**324317**	**23-106401**	**Dowdell Associates**	**1**	**25 Aug 2023**																				
		3357740_1	**3357740**	**Hill Labs**				0.29	0.42			0.29	0.156	0.28	0.042	0.60	0.017	0.30	<0.07	0.26	0.088	0.64	4.1	<0.013	<0.013	0.25	0.38
	BH23/05_1.5	**324305**	**23-106389**	**Dowdell Associates**	**1.5**	**25 Aug 2023**																				
		3357743_1	**3357743**	**Hill Labs**				0.179	0.28			0.180	0.099	0.166	0.036	0.30	<0.013	0.174	<0.07	0.090	0.062	0.36	2.4	<0.013	<0.013	0.155	0.27
	BH23/05_2.0	**324306**	**23-106390**	**Dowdell Associates**	**2**	**25 Aug 2023**																				
		3357749_1	**3357749**	**Hill Labs**				0.20	0.26			0.162	0.102	0.188	0.028	0.57	0.024	0.174	<0.07	0.32	0.058	0.59	3.2	<0.013	<0.013	0.145	0.23
	BH23/05_2.5	**324307**	**23-106391**	**Dowdell Associates**	**2.5**	**25 Aug 2023**																				
		3357753_1	**3357753**	**Hill Labs**				0.072	0.102			0.072	0.040	0.078	0.013	0.172	<0.013	0.071	<0.07	0.102	0.023	0.185	1.1	<0.013	<0.013	0.064	0.099
	BH23/05_3.0	**324308**	**23-106392**	**Dowdell Associates**	**3**	**25 Aug 2023**																				
		3357756_1	**3357756**	**Hill Labs**				0.21	0.30			0.21	0.118	0.195	0.041	0.53	<0.013	0.21	<0.07	0.126	0.068	0.55	3.1	<0.013	<0.013	0.178	0.29
BH23/06	**BH23/06_0.5**	**324054**	**23-106268**	**Dowdell Associates**	**0.5**	**21 Aug 2023**																				
		3353149_2	**3353149**	**Hill Labs**				0.47	0.56			0.40	0.21	0.36	0.081	0.97	0.035	0.39	<0.06	0.45	0.118	1.16	6.4	<0.012	<0.012	0.34	0.62
	BH23/06_1.0	**324055**	**23-106269**	**Dowdell Associates**	**1**	**21 Aug 2023**																				
		230822-140-6	**521669-0**	**Watercare Laboratory Services**				2	2.8	3.5	2.5	2.2	1.3	2	<0.01	3.1	0.63	2.9	0.14	1.7		3.3					
	BH23/06_1.5	**324056**	**23-106270**	**Dowdell Associates**	**1.5**	**21 Aug 2023**																				
		3353149_3	**3353149**	**Hill Labs**				0.64	0.76			0.51	0.30	0.53	0.101	1.46	0.099	0.53	<0.07	1.10	0.160	1.67	9.6	<0.013	0.014	0.46	0.84
	BH23/06_2.0	**324060**	**23-106271**	**Dowdell Associates**	**2**	**22 Aug 2023**																				
		230822-140-8	**521669-0**	**Watercare Laboratory Services**				0.87	1.3	1.7	1.4	1.2	0.52	0.87	<0.01	2.1	0.3	1.4	0.07	0.71		2.2					
	BH23/06_2.5	**324061**	**23-106272**	**Dowdell Associates**	**2.5**	**22 Aug 2023**																				
		3353149_4	**3353149**	**Hill Labs**				0.20	0.26			0.20	0.104	0.167	0.040	0.43	<0.014	0.196	<0.07	0.165	0.059	0.52	2.9	<0.014	<0.014	0.168	0.30
	BH23/06_3.0	**324048**	**23-106263**	**Dowdell Associates**	**3**	**22 Aug 2023**																				
		230822-140-10	**230822-140**	**Watercare Laboratory Services**				0.08	0.08	0.12	0.07	0.09	<0.011	<0.011	<0.011	0.05	<0.011	0.14	<0.011	<0.011		0.05					
BH23/07	**BH23/07_0.8**	**324047**	**23-106262**	**Dowdell Associates**	**0.8**	**21 Aug 2023**																				
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		230822-140-3	**230822-140**	**Watercare Laboratory Services**																						
	BH23/07_2.0	**230822-140-4**	**230822-140**	**Watercare Laboratory Services**	**2**	**21 Aug 2023**																				
BH23/08	**BH23/08_1.4**	**324312**	**23-106396**	**Dowdell Associates**	**1.4**	**24 Aug 2023**																				
		230825-115-5	**230825-115**	**Watercare Laboratory Services**																						
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		230825-115-6	**230825-115**	**Watercare Laboratory Services**																						
	BH23/08_2.5	**324315**	**23-106399**	**Dowdell Associates**	**2.5**	**24 Aug 2023**																				
		230825-115-7	**230825-115**	**Watercare Laboratory Services**																						
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		230825-115-1	**230825-115**	**Watercare Laboratory Services**																						
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APPENDIX A – CONSTRUCTION METHODOLOGY

Construction Methodology

Queen Street Wastewater Diversion – Package B

Contract No: CT7754

Project Manager:	Dominic Wakeland	Date:	28 November 2024
		Document No:	QSSD-CS-XXXX
		Revision:	04
		Status:	For Consenting

Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
00	08/09/23	J Gordon	D Wakeland		Draft
01	22/09/23	J Gordon	D Wakeland		For Consenting
02	15/10/24	D Wakeland	WSP Planning Team	D Wakeland	For Consenting – Updated Alignment
03	15/11/24	D Wakeland	WSP Planning Team	D Wakeland	For Consenting
04	28/11/24	C Miles (WSP)	D Wakeland	D Wakeland	For Consenting
05	15/02/25	M Gerecke	D Wakeland	D Wakeland	For Consenting

Revision Details

Revision	Details
00	Draft methodology
01	Updated as per WSP comments
02	Updated to reflect change to alignment
03	Updated to clarify items as requested by WSP Planning Team
04	Shaft sizes updated by WSP post WSL Operations/WSL/WSP/FH Mayoral Drive Workshop
05	Shaft and compound sizes updated to reflect current Package B alignment

Document Details

Document Name:	Construction Methodology
Status:	For Consenting
Document No:	QSSD-CS-XXXX
Author:	D Wakeland

Contents

1. Introduction

The purpose of this high-level construction methodology statement is to provide an understanding of how the Project (Mayoral Drive section of the Queen Street Wastewater Diversion Project) will be implemented by Fulton Hogan (FH) for consent purposes under the Resource Management Act 1991.

The Project works generally comprise the construction of a new wastewater pipe to collect flows from the north end of Vincent Street and convey them to southern of Part 3 of the project, adjacent to the intersection of Mayoral Drive and Queen Street.

The Mayoral Drive Alignment is made up of 3 sections (Part 1, Part 4 and Part 5) as shown in Figure 1 below. The scheme also includes making connections to and taking wastewater flows from several existing Engineered Overflow Points (EOPs)along the alignment.

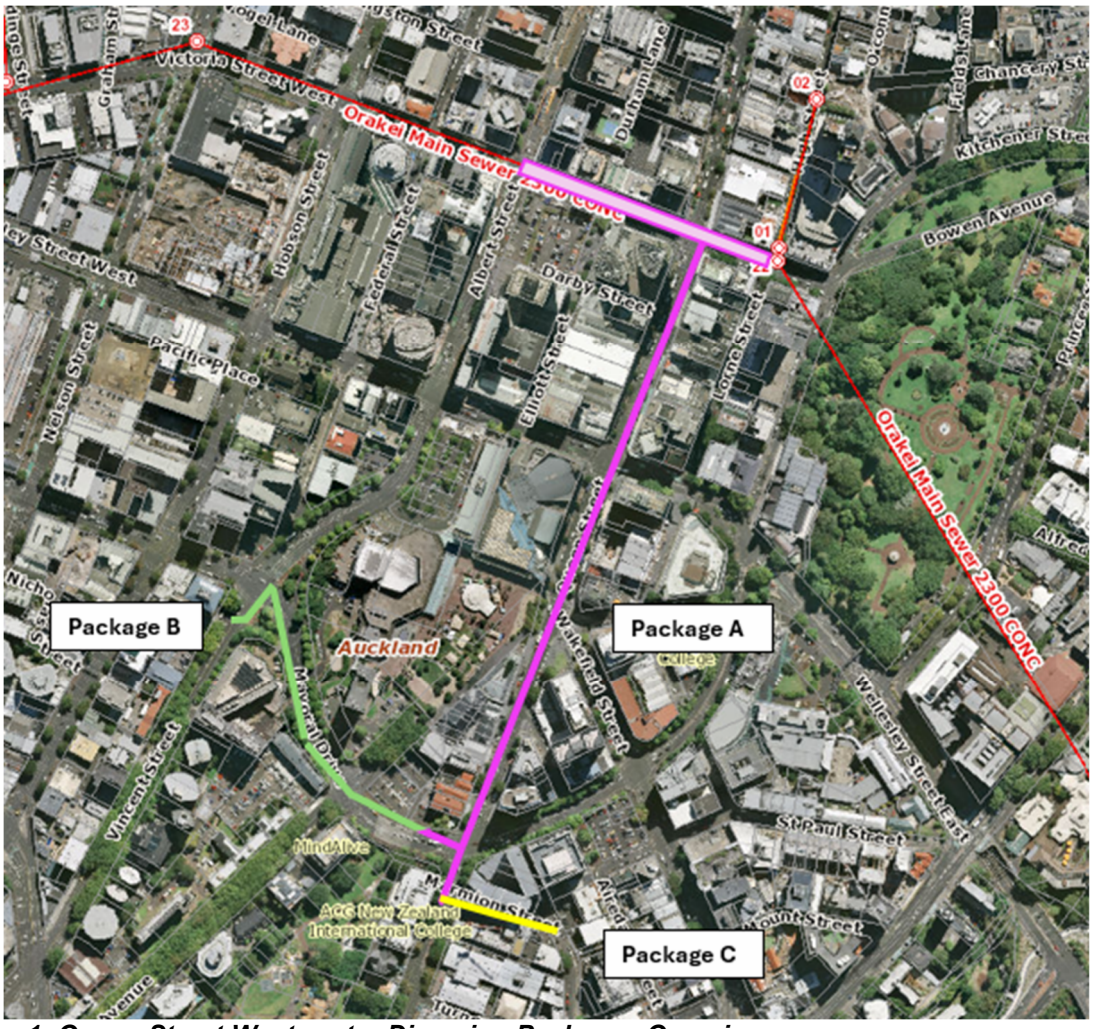


Figure 1: Queen Street Wastewater Diversion Packages Overview

This document has been created prior to issue of GFR, GIR, GBR or detailed design. Likewise, various stakeholder impacts will need to be assessed, and their constraints accommodated including assets, street trees, traffic needs, services, etc. As such, broad assumptions have been made and this methodology is subject to change as a result of new information becoming available.

This document covers the general sequencing and methodology for the construction of temporary shafts, pipelines, connections, manholes and associated works. It should be reviewed in conjunction with the FH high level construction programme (refer **Appendix A**).

2. Site Set Up and Enabling works

A construction support area (CSA) will be located within the Greys Avenue Carpark and will utilise the space previously established during the Part 3 (package A) works. Some office/cabin reconfiguration may be required (refer Figure 2 below).

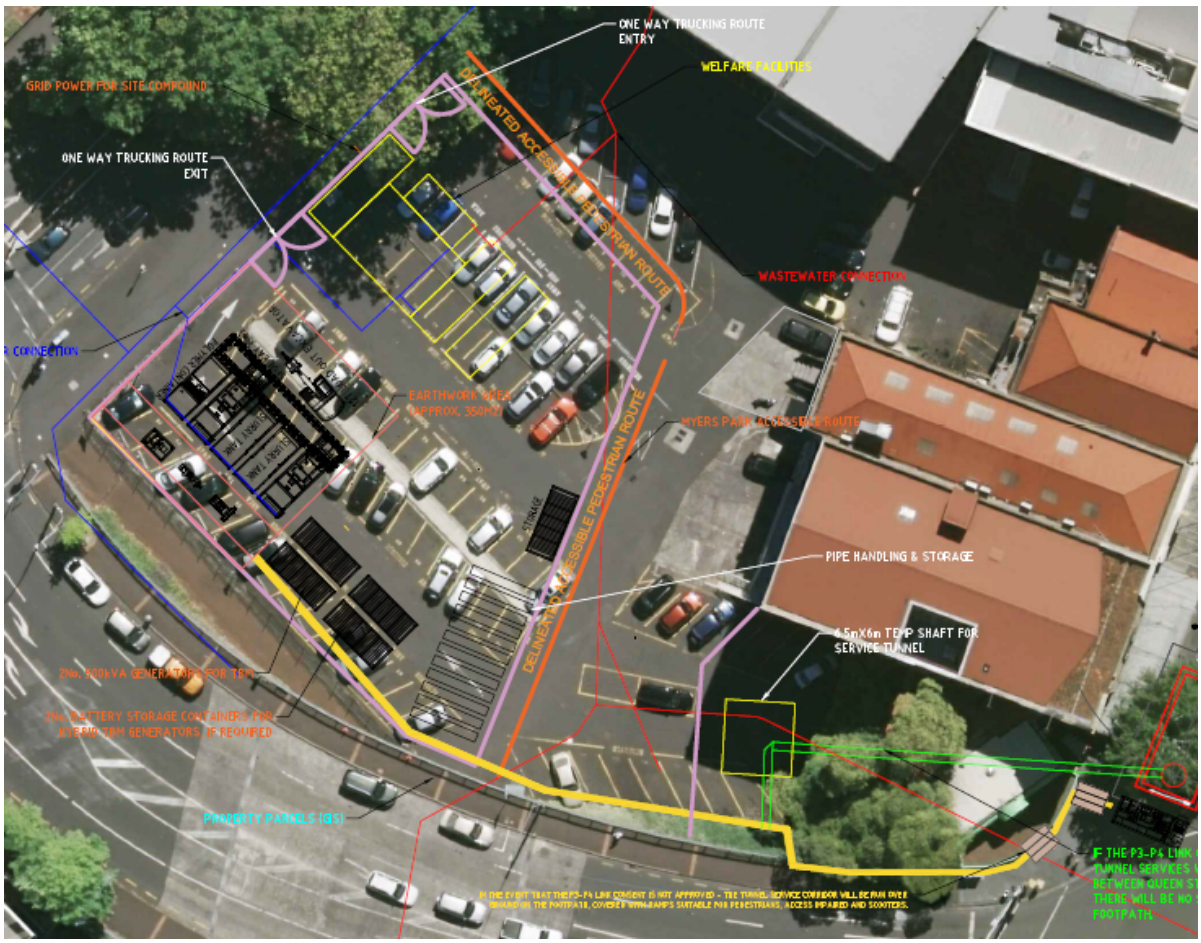


Figure 2: Layout for Construction Support Area

Limited site laydown/materials storage will be accommodated within the CSA. Most excavated materials and construction materials (pipes, aggregates, etc.) will be removed/delivered to the site on a “just-in-time” basis.

Traffic management will be setup in advance of compound construction ensuring all agreed vehicle, pedestrian and property access requirements are adhered to.

Four long-term site compounds (6 to 8 months) will be established within Mayoral Drive and Vincent St traffic lanes to allow construction of temporary shafts and tunnelling works. For these compounds, temporary steel barriers and temporary fencing/hoarding will be constructed around the perimeter of each, with access gates one or both ends. Indicative site compound layout plans are provided below and are subject to final design, traffic impact assessments and TMP’s. The traffic restrictions required to accommodate these compounds are also indicatively shown in Figures 3 and 4 below. The compound widths have been driven by the shaft temporary works requirements and the barrier protections required for these deep shafts (refer Figure 5).

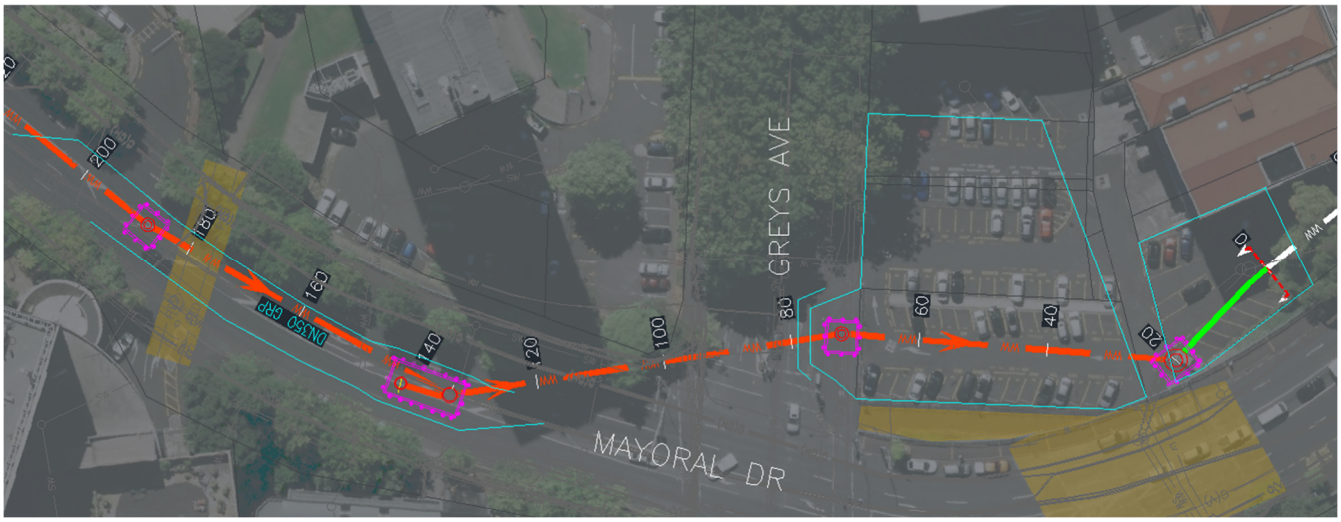


Figure 3: Two long-term compounds on Mayoral Drive/Greys Avenue (compound extents shown with blue line)

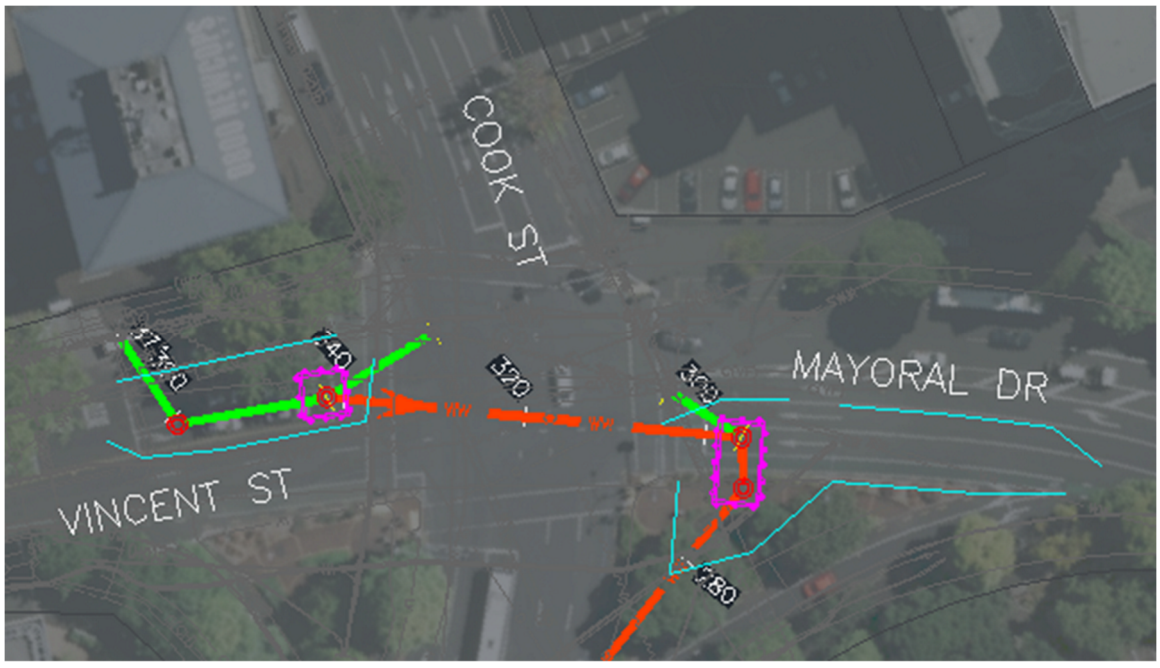


Figure 4: Two long-term compounds at Cook St/Mayoral Drive/Vincent St intersection (compound extents shown with blue lines)

General site working hours will be Monday-Saturday 7 am-6 pm. Sunday and night work will only be carried out if required by traffic management or WSL operational restrictions such as for tie-ins/connections to existing pipe work.

Heavy vehicle movements between the compounds and Greys Avenue CSA will be 40 movements per day at peak.

2.1. Utility Diversions

There will be a need for utility diversions to enable shaft construction ahead of main works start. NUOs have been engaged early in the design to assist with the diversion planning process. The depth and geotech conditions of the existing and proposed underground service diversions will guide the need for any trench shoring. Based on the diversions required, some

trenches will need to remain open longer than 10 days. Service locations will be marked out for any existing services prior to any intrusive works, and then the trench will be opened up for diversion works to begin. A hydro or air vac will be used to safely uncover all underground utilities within the trench. Dewatering may be required within the trench. Necessary utilities will be diverted, the trench will be backfilled, and area returned to its original condition.

Table 2.2.1 – Diversion Plant Summary

Activity	Plant List
Excavating trench	8-15t excavator with breaker attachment
	6-wheeler truck
	Hydro or Air Vacuum Truck
Dewatering	Submersible pump & lamella clarifier tank
	Silenced Generator 60kVA
Backfilling	6-wheeler truck
	8-15t excavator
	Plate compactor
Reinstatement	Asphalt truck, concrete truck and pump

3. Main Construction Works Overview

Construction methodologies are outlined in Figure 5 below and details for each are provided within the subsections below.

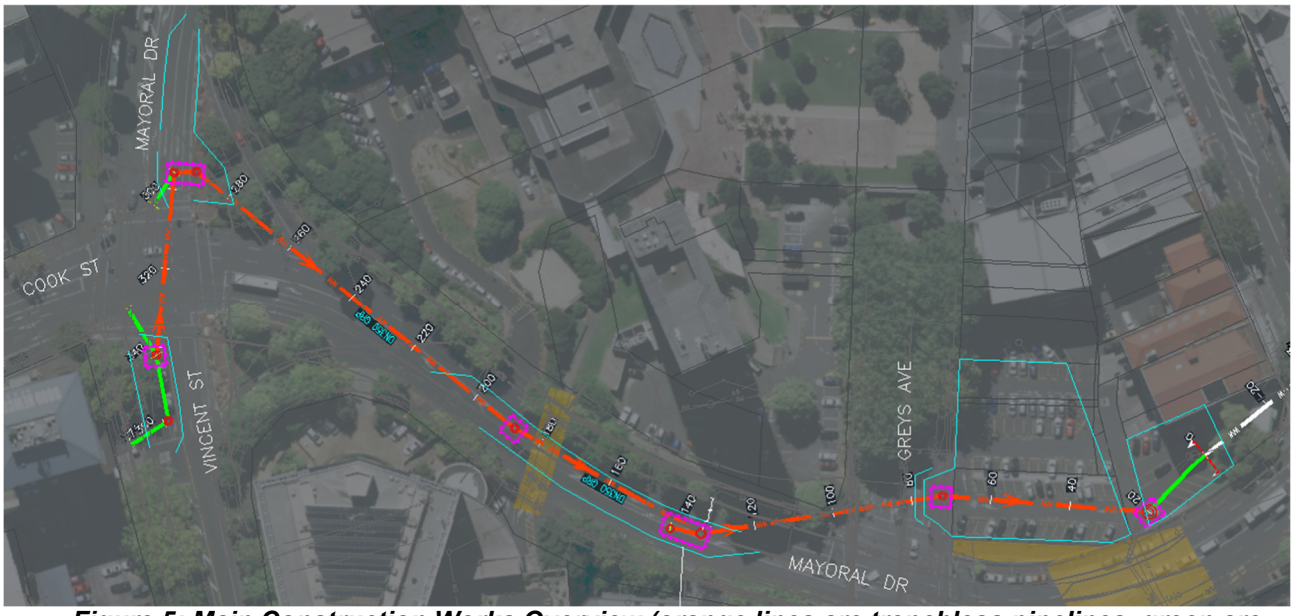


Figure 5: Main Construction Works Overview (orange lines are trenchless pipelines, green are trenched pipelines)

3.1. Shaft Construction

Most manhole locations on this alignment will be used as launch/reception pits for the trenchless construction method (axis/pilot bore). The trenchless method requires shafts with minimum internal dimensions of 4.5m x 4.5m; however, some shafts will contain two manholes and / or existing EOP infrastructure and will need to be oversized. The shoring technique required to support these shafts will be subject to geotechnical conditions and shaft temporary works design but will most likely be a post and panel-type construction method. The shaft sizes for each location are shown in Table 3.1.2 below. The basic steps required to construct temporary post and panel shafts are outlined below and in Figure 6.

- An auger attachment on a 10 – 35t excavator or small piling rig (GEAX EK60) will be used to drill 600mm dia holes. Piles will typically be drilled 4m below pipe inverts. Steel H-columns will be set into each with sand or concrete backfill. A mobile crane will likely be required to pitch and install the steel columns, depending on pile depth
- The shaft will be excavated from the top using an excavator at surface level to a depth of approximately 1m below pipe invert. Six-wheeled trucks will be used to remove spoil off site. Shaft excavations are expected to occur over 1 – 2 weeks, depending on the size and depth of the shafts.
- Steel road plates or timber lagging will be cut and installed between H-columns as the excavation advances.
- Forced air ventilation may be required using a fan at surface level with ventilation ducting into each shaft during work hours.
- The shaft base will be lined out with 300 to 500mm of aggregate and/or 100mm of blinding concrete to provide a solid and level working platform.
- If dewatering is required, a submersible pump will be used to remove water from the excavation. The water will be pumped into a clarifying tank for treatment before discharging to stormwater. The pumps will run continuously while the shaft is open (6-8 months) and will be powered by a silenced diesel generator.
- Once the shaft has been used for tunnelling, a manhole will be constructed, and the shaft reinstated.

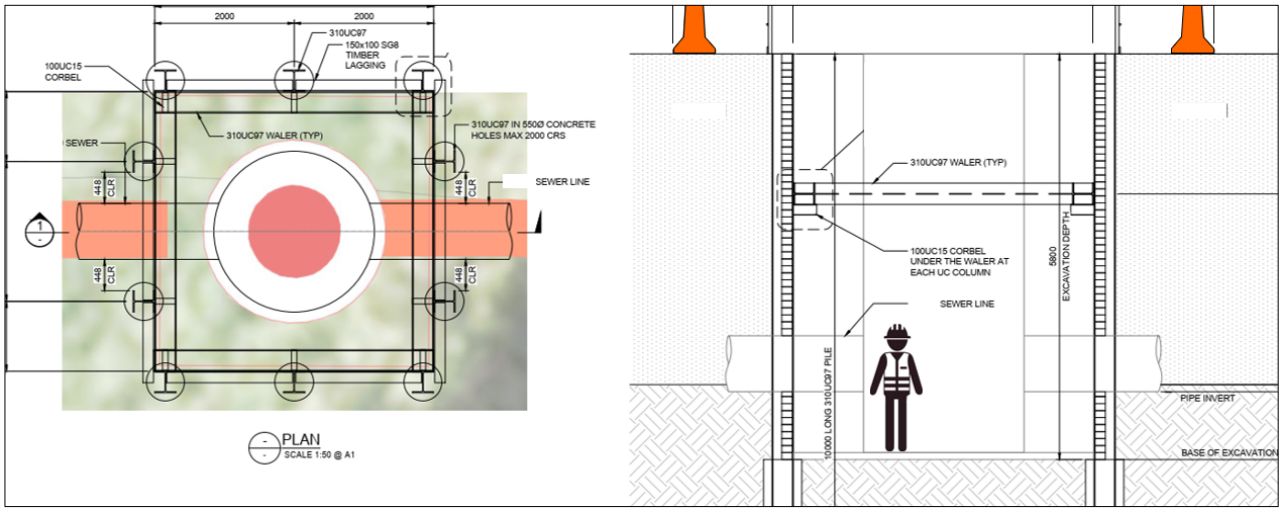


Figure 6 – Typical temporary works detail for shafts (A. O'Sullivan & Associates)

Table 3.1.1 - Shaft Plant Summary

Activity	Plant List
Drilling and installing steel posts	10 – 35t excavator/GEAX EK60, 30-35T mobile crane
Excavating shaft	20 – 35t excavator
Spoil removal	6-wheeler or artic trucks
Concrete base	Concrete truck/concrete pump truck
Dewatering	Submersible pump & lamella clarifier tank
Dewatering	Silenced Generator 60kVA
Ventilation	Fan

Table 3.1.2 - Shaft Earthworks Summary

	Shaft Details (internal dimensions)				
Manhole ID	**Width (m)**	**Length (m)**	**Depth (m)**	**Volume (m3)**	**Duration Shaft Open**
P4MH3	7	14.5	6	609	6 to 8 months
P4MH2	4.5	4.5	8.4	170	6 to 8 months
P4MH1A and B	6.5	11.2	8.3	605	6 to 8 months
P5MH2	4.5	4.5	8.1	165	6 to 8 months
P5MH1 and P1MH3	4.5	8.6	6.5	252	6 to 8 months
P1MH2	4.5	4.5	6	122	6 to 8 months

3.2. Trenchless Construction – Pilot Guided Auger Bore

Due to the pipe depths and shallow grades for this alignment, the most appropriate pipe laying methodology will be a trenchless pilot guided auger (or vacuum) bore rig. It has been assumed that this methodology will be used for the five pipe runs between P4MH3 and P1MH2.

The basic steps for this trenchless methodology are outlined below:

- Setup power pack, pump, vacuum truck, and water tank on surface adjacent to launch pit.
- Lift pilot bore rig into pit and survey into position.
- Drill pilot hole to reception pit using laser guided steering head.
- Install cutting reamer and pull back to launch pit.
- An auger (or vacuum) with sucker truck will be used to remove spoil from the drive and it will be disposed of offsite using 6-wheelers or sucker trucks. Approx wet tunnel spoil volume will be 0.3 m^3/m of DN450 pipe (0.6 m^3/m for DN700 pipe). For a DN450 pipe between P4MH4 and P1MH2, this equates to 95 m^3 (15 to 25 return six-wheeler truck trips).
- Simultaneously jack glass reinforced plastic (GRP) pipes between shafts.
- Clean up and flush drill slurry out of pipe by jetting and vacuum truck.
- CCTV inspection and low-pressure air test on completion.

It has not been decided which exact pilot bore rig will be used, therefore it should be assumed that any of the six shafts could be used as either a launch or reception shaft (or both).

Refer to Figures 7, 8 and 9 below of a typical pilot bore operation (note that exact methods vary between different machines).

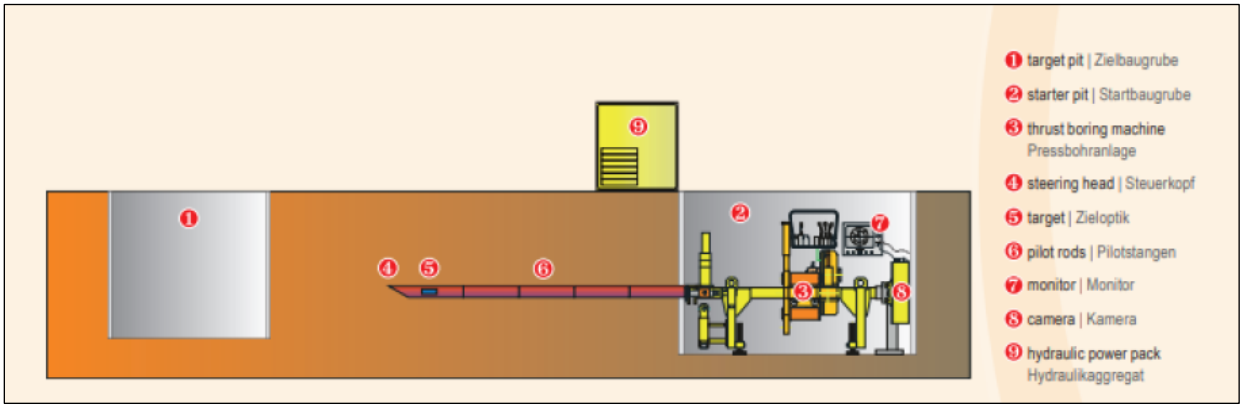


Figure 7 – Typical pilot bore – pilot process

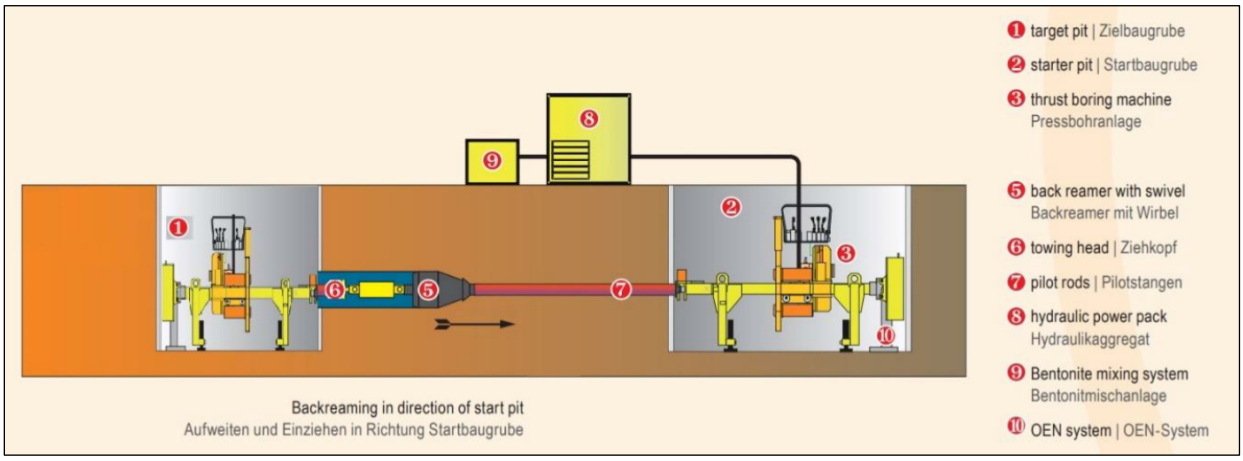


Figure 8 – Typical pilot bore – cutting back

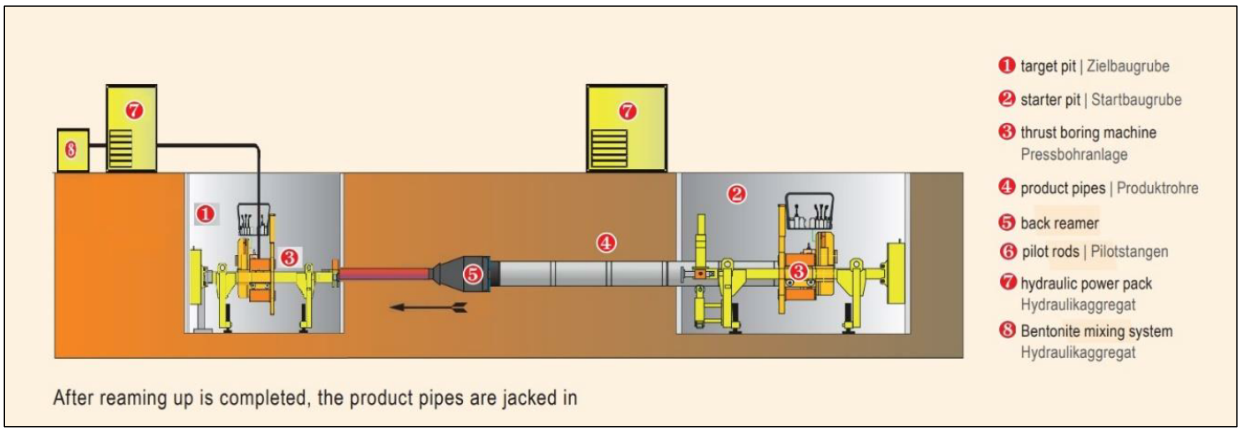


Figure 9 – Typical pilot bore – jacking pipes in

Table 3.2.1 - Tunnelling Plant Summary

Activity	**Plant List**
Pilot Boring – Launch Shafts	Crane HIAB truck
	10 – 20t excavator
	Power pack container
	Pilot boring machine
	6-wheeler or artic trucks truck (or vacuum truck)

	Tool truck
Pilot Boring – Reception Shafts	Crane HIAB truck
	10 – 20t excavator
	Power pack container
	Pilot boring machine
	Tool truck

4. Open Cut Pipe Laying & EOP Connections

For shallow or short pipe runs for existing/EOP connections, an open-cut pipe laying methodology will be used. The steps for this method are listed below:

- For any sections of pipeline outside of the temporary compounds, short-term traffic management will be setup in accordance with approved TMPs, which will likely be staged to allow only short sections of pipeline to be constructed at one time.
- Trench shields and manhole boxes will be used for all trenching over 1.5m depth, which will be most pipeline and connections (refer Figure 11 below). Approximately 10 to 25m of trench will be open at any one time for up to 4 weeks at a time. **NOTE:** *Where existing services cross the trench, the shoring method will change to a driven steel H-pile support method with vertical timbers to accommodate existing services.*
- Expected total trench volumes are:
  - $90m^3$ (P1MH2 to EX MH 522964)
  - $62m^3$ (P5MH1 to EX MH500717)
  - $71m^3$ (P1MH2 – P1MH1)
  - $38m^3$ (P1MH1 – EX MH4845867)
- The total estimated earthworks volume for open-cut trenching is $261m^3$.
- Pipe lengths and precast manholes will be delivered to site on flatbed trucks and unloaded within the site using HIAB trucks or excavators.
- A leading excavator will be used to trench to the required depths and install trench shields as the excavation advances. Wider trench boxes will be provided at manhole locations.
- Excavated materials will be cut to waste as clean, managed or contaminated fill (dependent on contamination testing results).
- If dewatering is required (to be determined by ground investigations), a submersible pump will be used to remove water from excavations. The water will be pumped into a clarifying tank for treatment before discharging to stormwater. The pumps will run continuously while the shaft is open and will be powered by a silenced diesel generator. Noise mitigation will be used such as barrier screens for overnight dewatering if required.
- Pipe bedding material will be carted to the worksite directly from source in 6 or 8-wheeled trucks, spread into the trench using an excavator and compacted using 300 to 800kg plate compactors in specified layers.
- Excavators will be used to lift pipe lengths into the trench.
- Side haunching, overlay bedding and hard fill to pavement level will be constructed as per pipe bedding material (refer to item above).

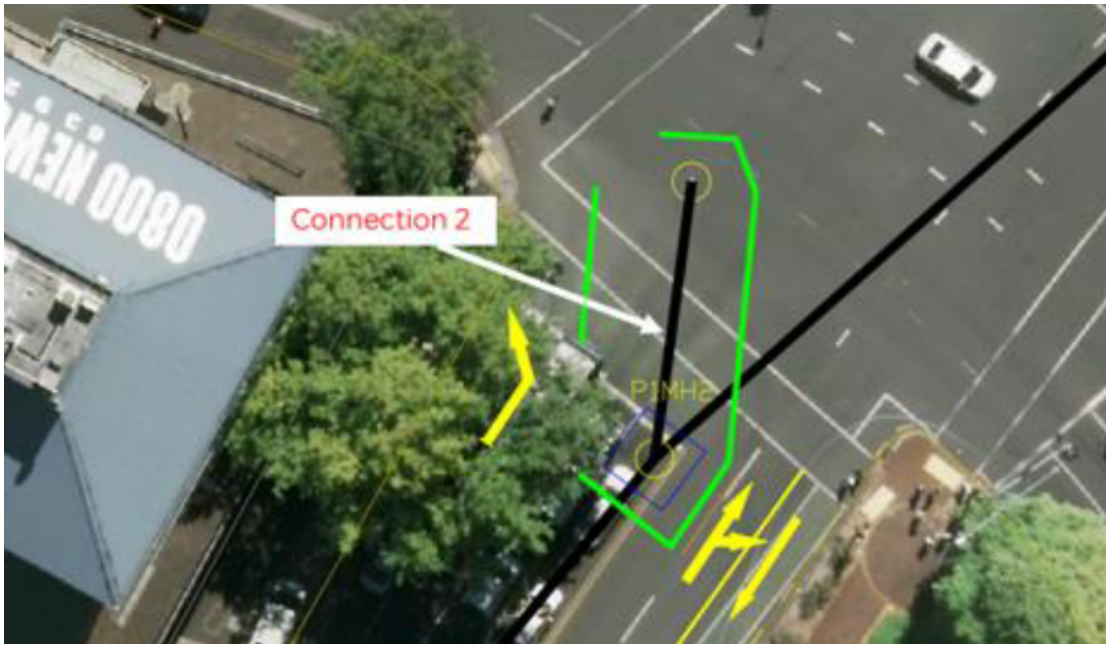


Figure 10 – Plan view of short-term TM for an EOP connection using opencut method

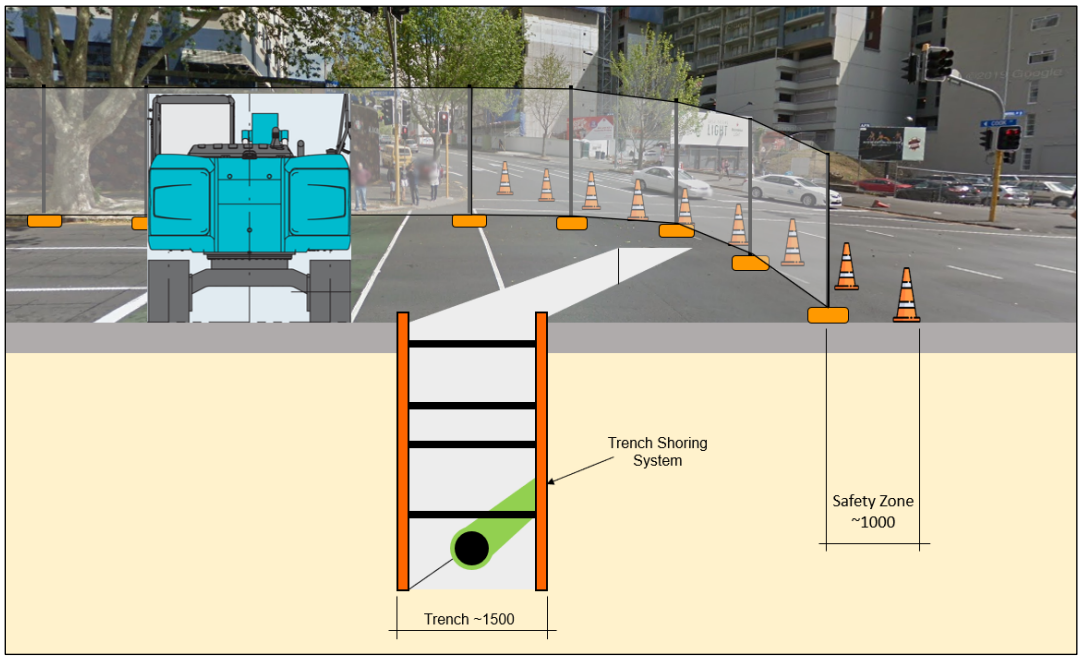


Figure 11 – Trench shoring system for EOP connection using the opencut method

Open Cut Pipe Laying Plant Summary Table

Activity	Plant List
Open cut pipe work / manholes	14 – 35t excavator
	Excavator Movax/Vibro
	Trench shoring/H-Piles
	Six-wheelers or artic trucks
	Hydro excavator
	Concrete truck
	Plate compactor

5. Manhole Construction (at shafts) and Road Pavement Reinstatement

The basic construction steps for manhole construction are detailed below.

- Form and pour concrete manhole base using concrete pump truck or excavator located adjacent to shaft. Alternatively, install a flanged precast manhole base and riser with the excavator.
- Lift in precast manhole riser sections using HIAB or excavator.
- Form and pour connection corbels on outside of precast riser using concrete pump truck or excavator located adjacent to shaft.
- Form and pour manhole benching using concrete pump truck or excavator located adjacent to shaft.
- Lift in and fix any pipe droppers within manholes.
- Backfill void between shaft and manhole with plate compacted aggregates or low strength concrete.
- Cut and abandon shaft temporary works 1.5m below road level as backfill progresses.
- Construct road pavements layers using excavator, plate compactor and vibratory roller.

Manhole and Pavement Plant Summary Table

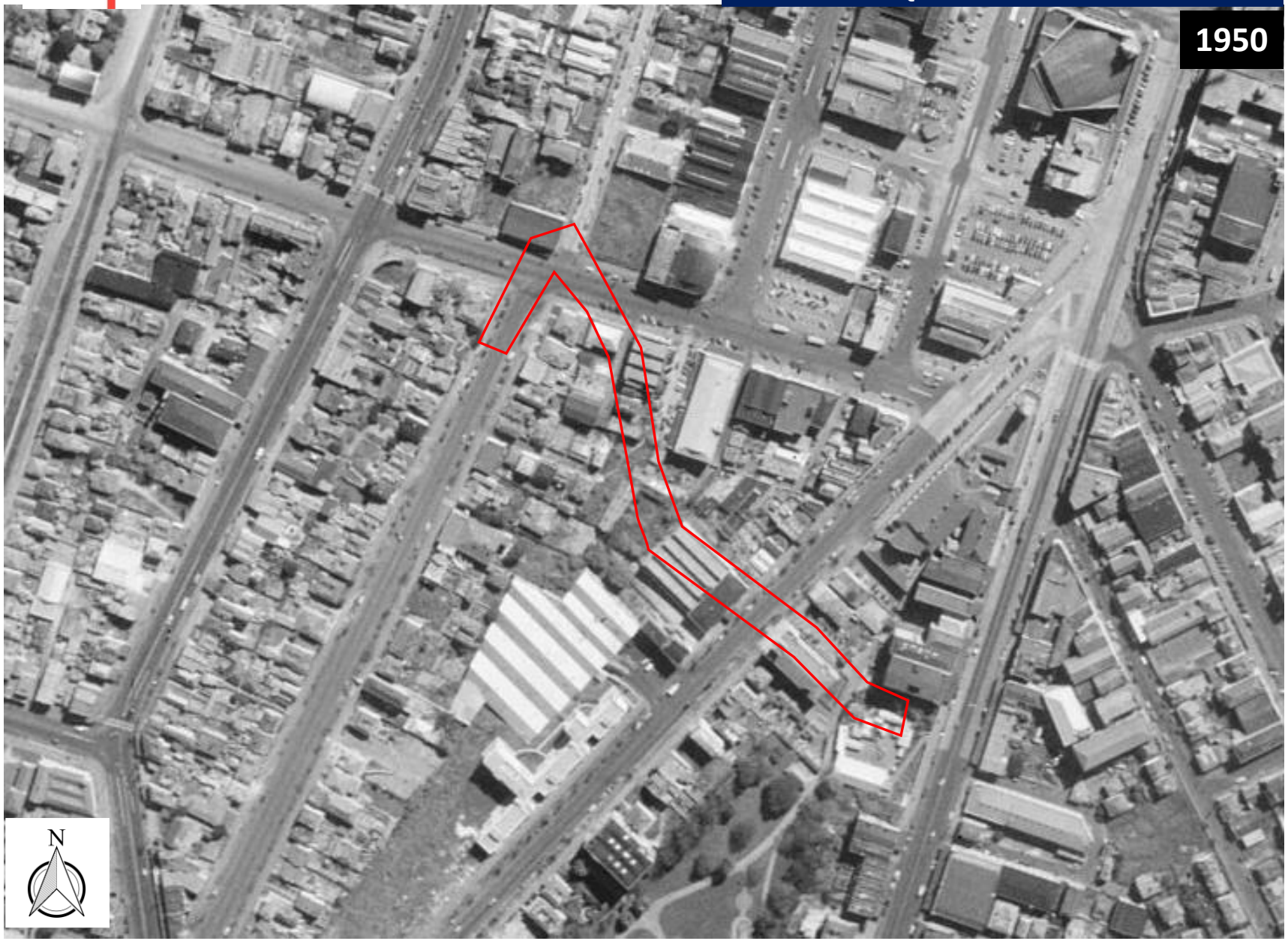
Activity	Plant List
Manholes	14 – 35t excavator
	Trench shoring/H-Piles
	Excavator Movax/Vibro
	Six-wheeler trucks
	HIAB crane
	Concrete truck
	Concrete pump truck
Road Pavement Reinstatement	14 – 35t excavator
	Plate compactor
	Vibratory roller
	Pilot boring machine
	Tool truck

6. Sequence of work & Programme Durations

Refer Appendix 1 for high level construction programme.

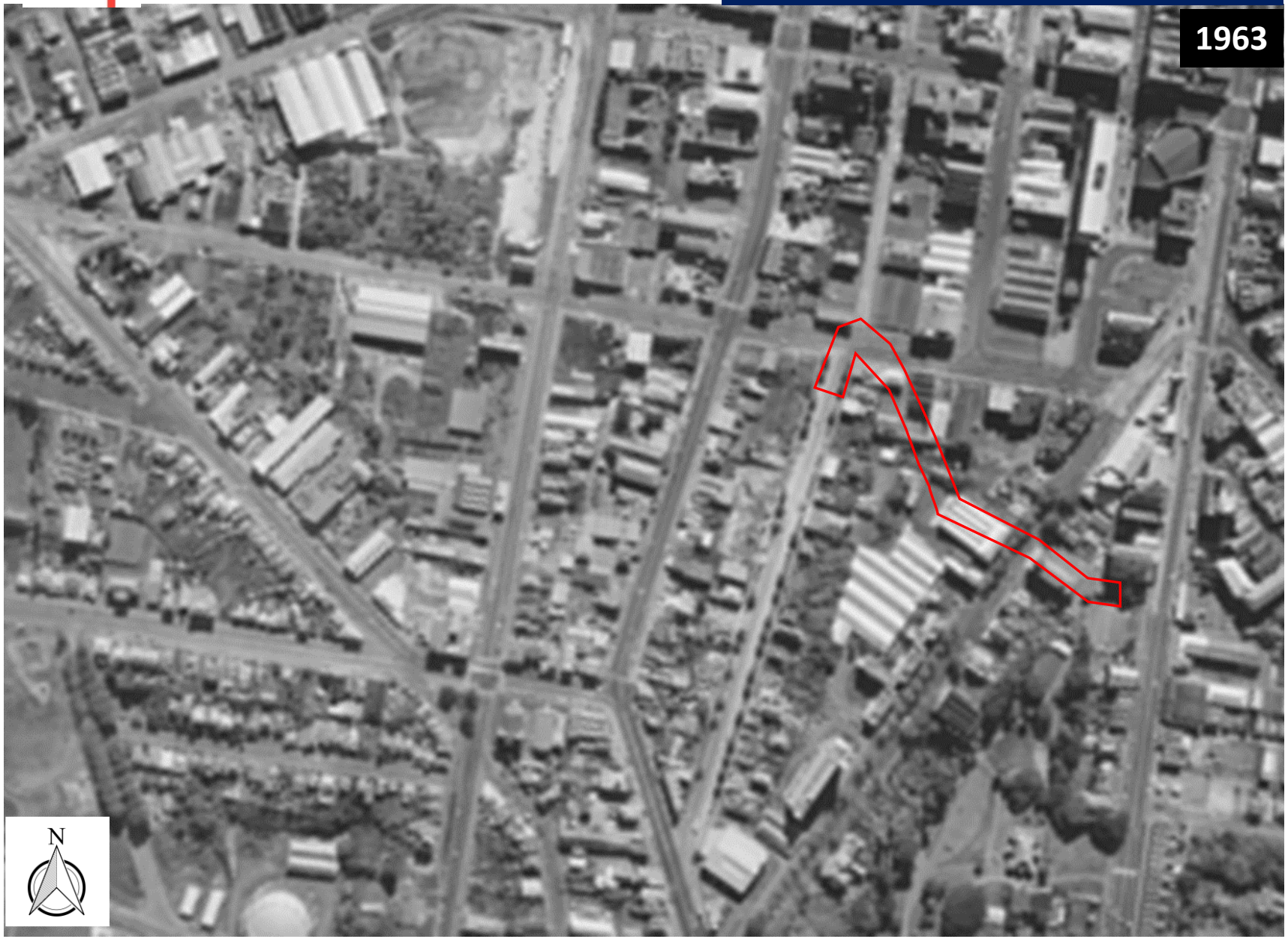
APPENDIX B - HISTORICAL AERIALS

Approximate Site Location



Approximate Site Location

Approximate Site Location



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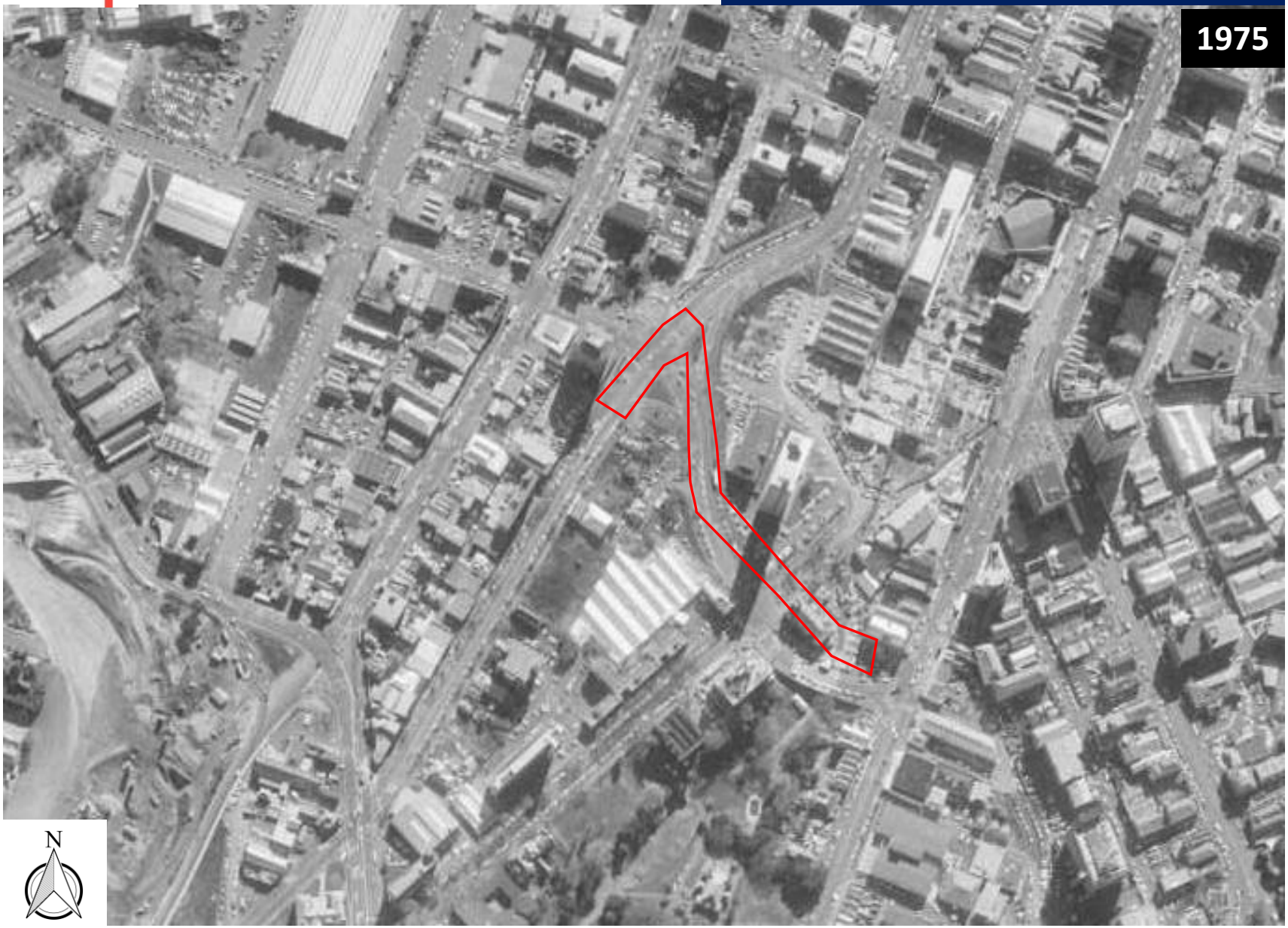

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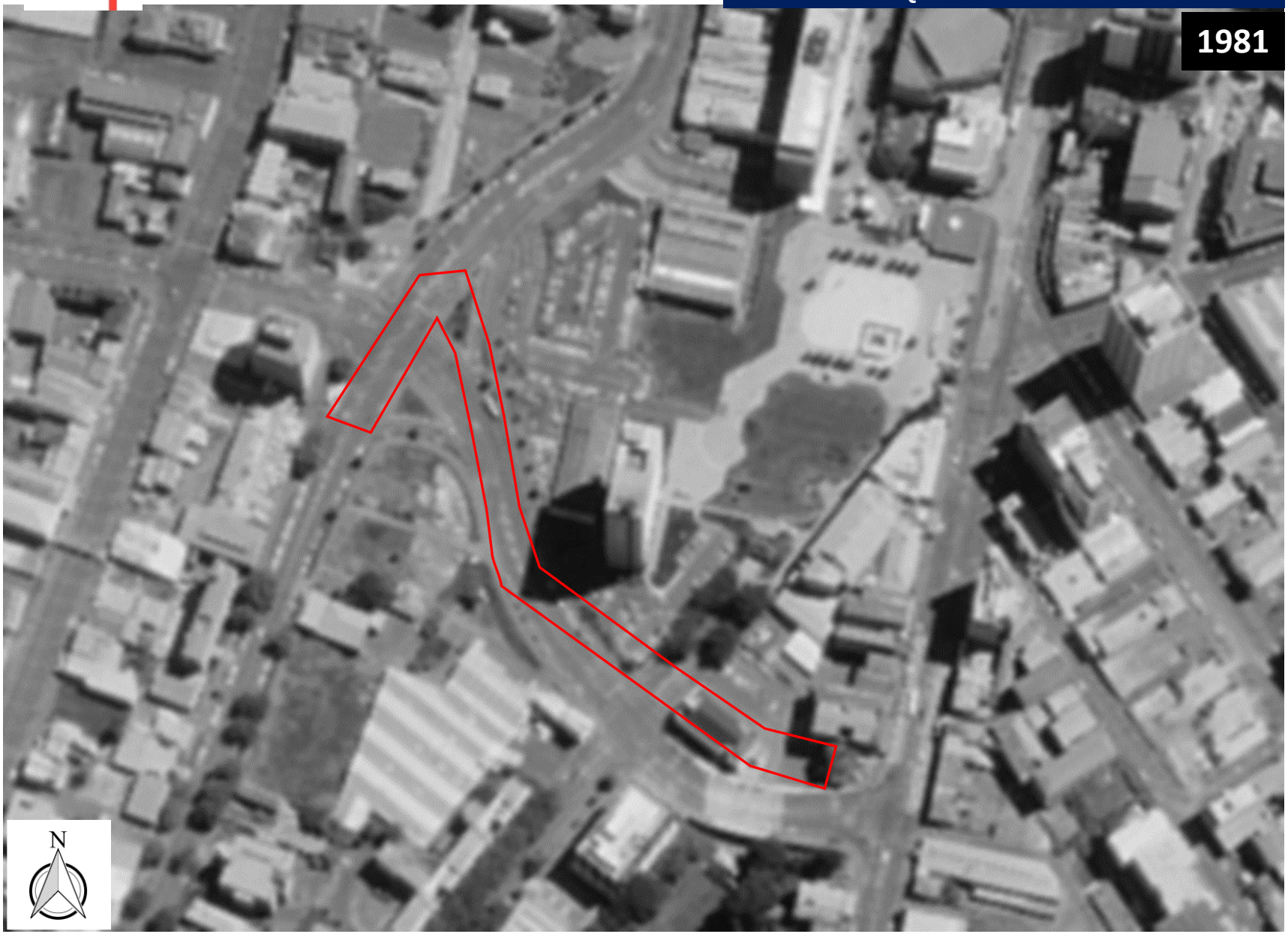

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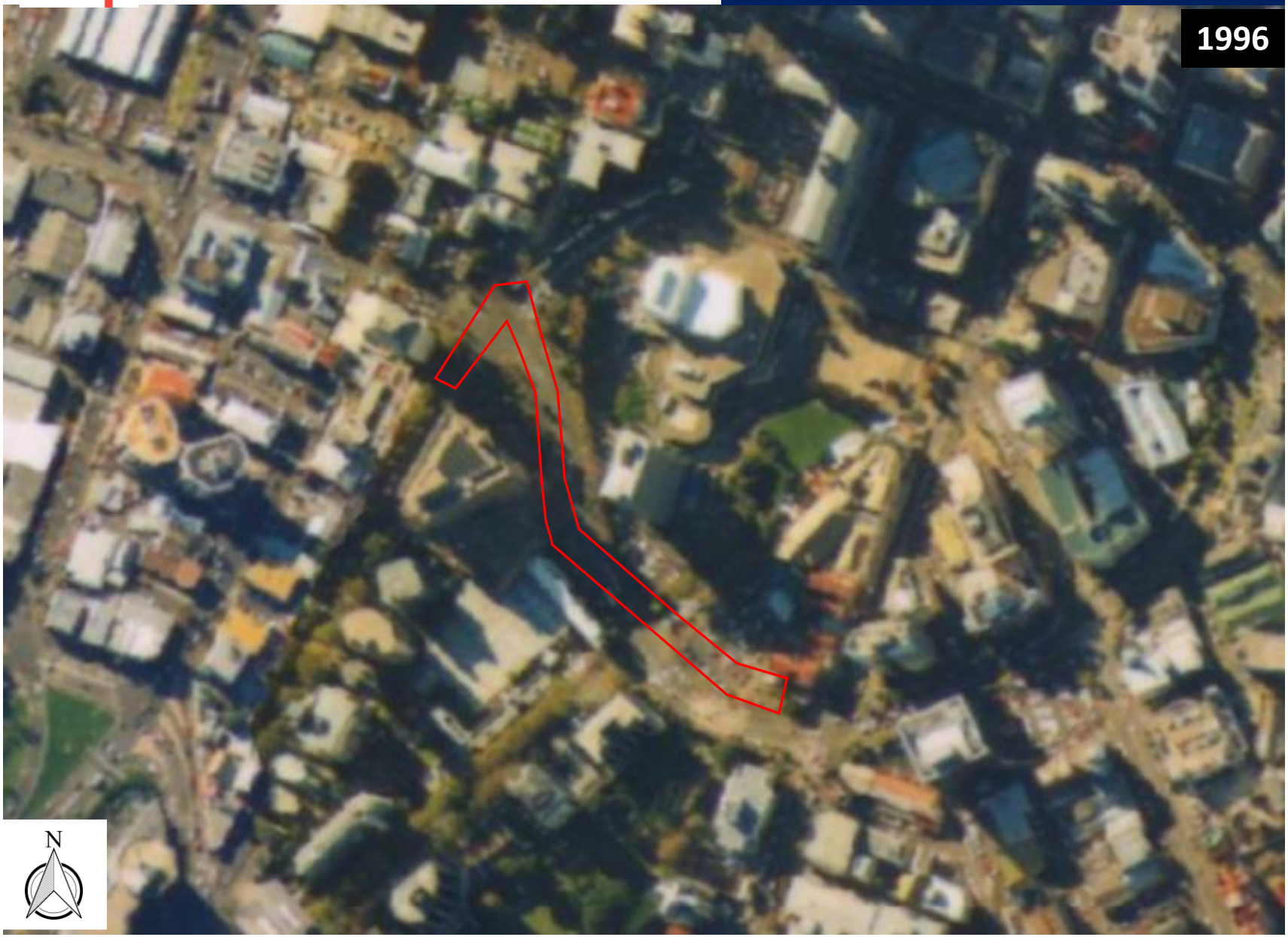
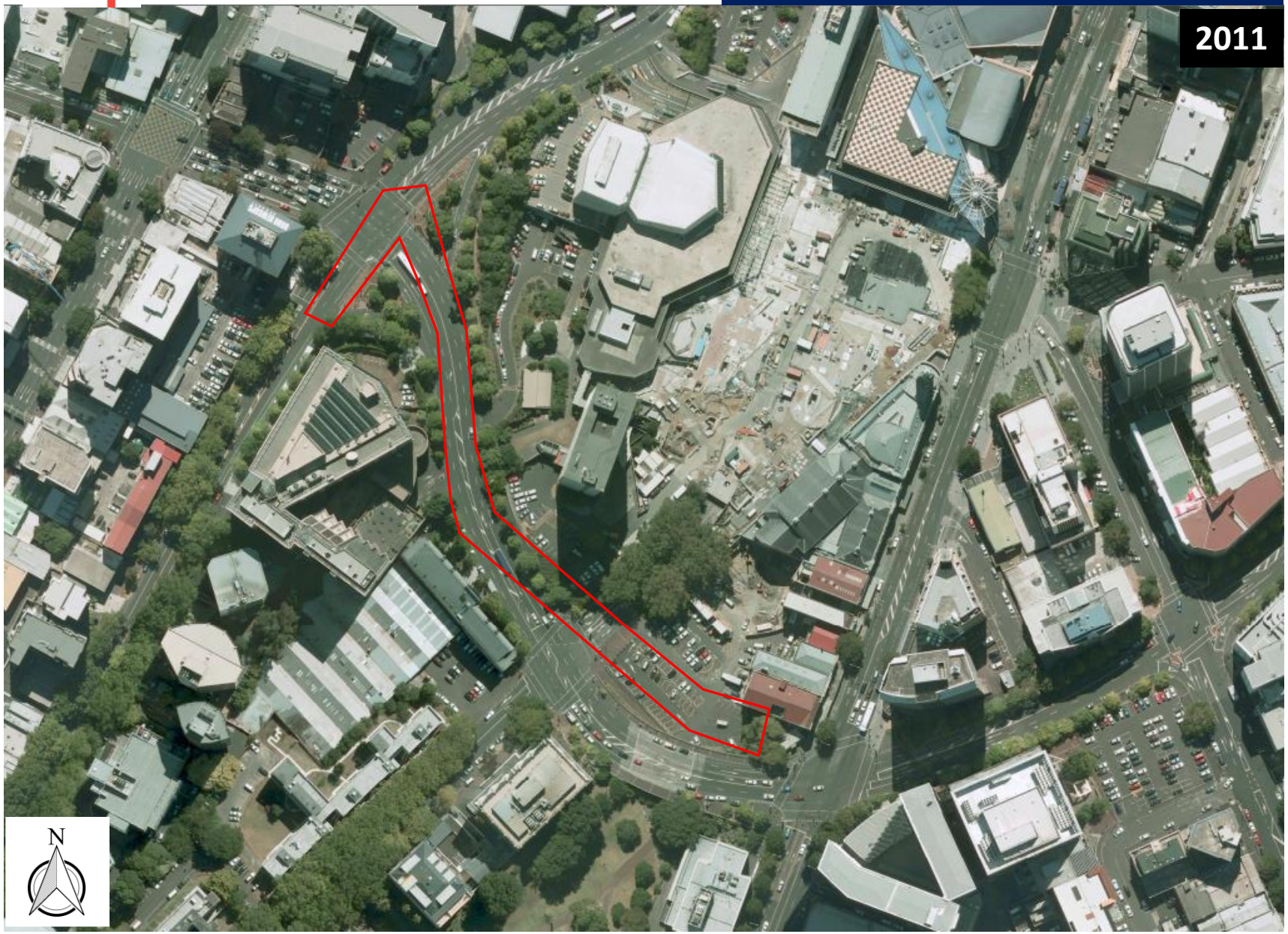
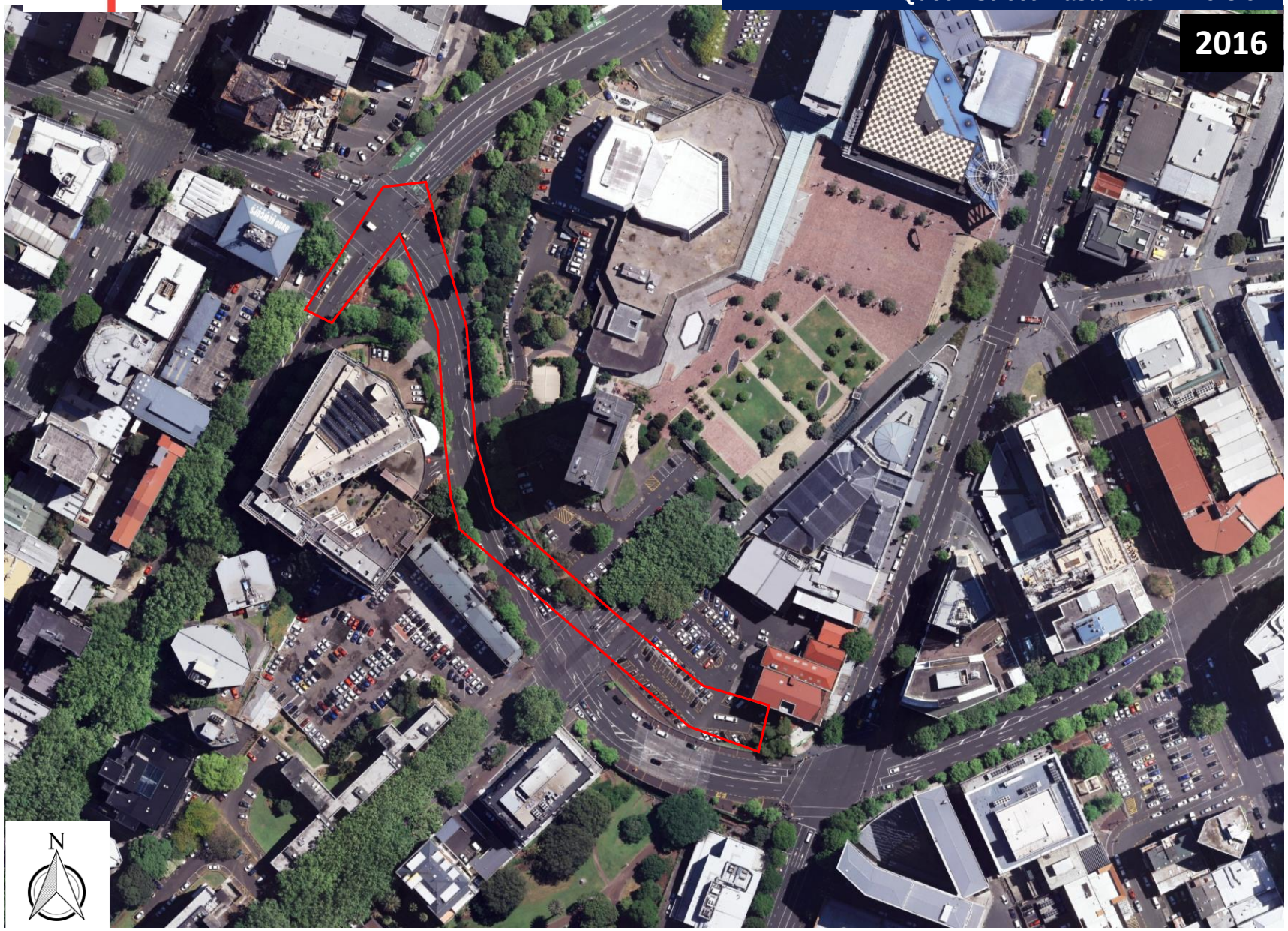


Approximate Site Location

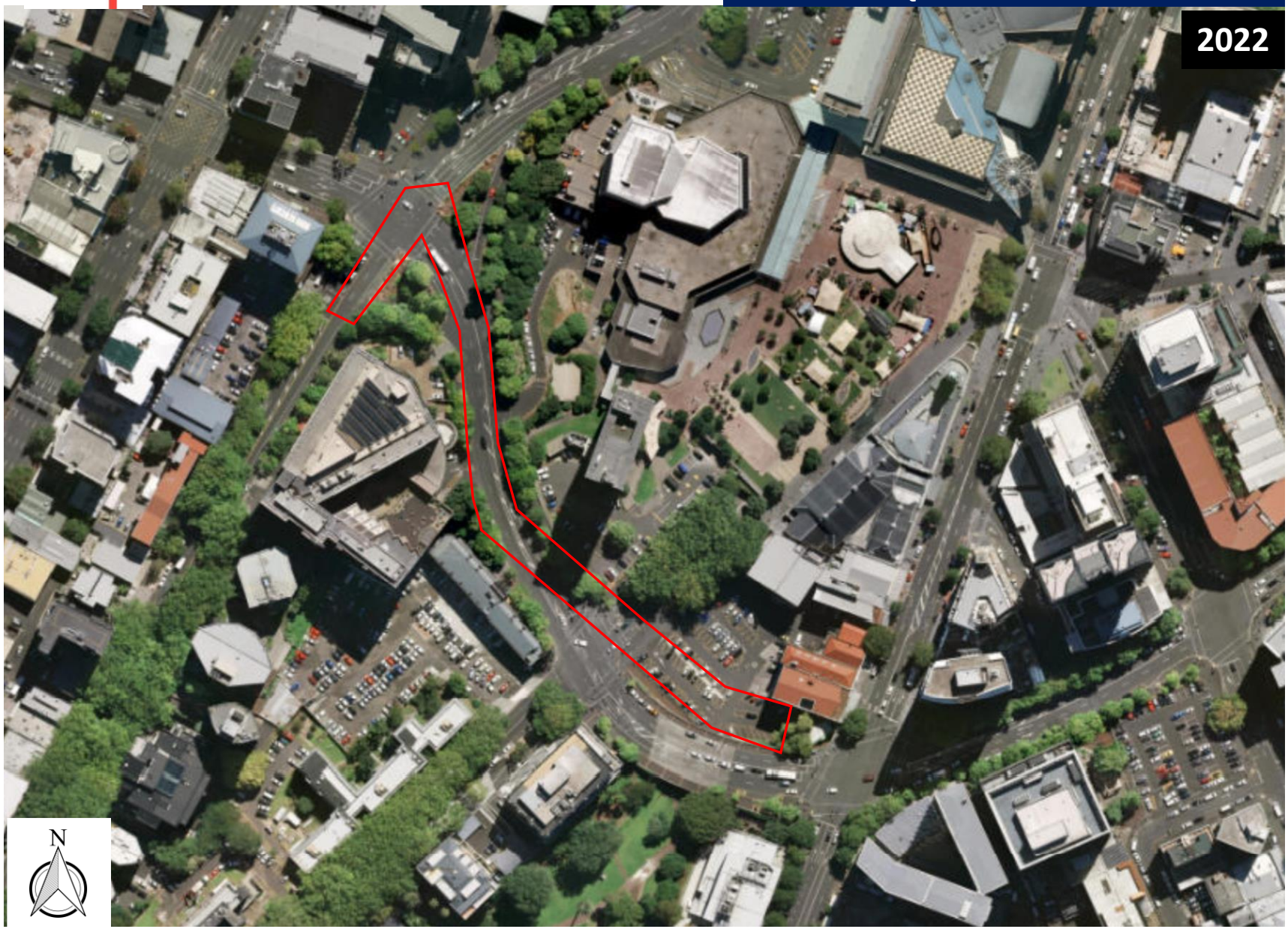
Approximate Site Location



Approximate Site Location



Approximate Site Location



Approximate Site Location

APPENDIX C – CONTAMINATED LAND ENQUIRIES

31 October 2022

WSP
100 Beaumont Street
AUCKLAND 1010

Attention: Megan Baddiley

Dear Megan

Site Contamination Enquiry – Part Mayoral Drive, Auckland Central

This letter is in response to your enquiry requesting available site contamination information within Auckland Council records for the above site. Please note this report does not constitute a site investigation report; such reports are required to be prepared by a (third-party) Suitably Qualified and Experienced Practitioner.

The following details are based on information available to the Contamination, Air & Noise Team in the Resource Consent Department. The details provided may be from former regional council information, as well as property information held by the former district/city councils. For completeness the relevant property file should also be requested to obtain all historical records and reports via 09 3010101 or online at:

https://www.aucklandcouncil.govt.nz/buying-property/order-property-report/Pages/order-property-file.aspx.

1. Hazardous Activities and Industries List (HAIL) Information

This list published by the Ministry for the Environment (MfE) comprises activities and industries that are considered likely to cause land contamination as a result of hazardous substance use, storage, and/or disposal.

Council's records indicate the following sites have possibly been subject to activities that fall within the HAIL:

- 31-35 Cook Street
- 71-87 Mayoral Drive
- 72 Greys Avenue
- 87-89 Greys Avenue
- Part Level G/144-148 Hobson Street

Please see the tab 'Property Notes From SAP' within Attachment A for more information.

Please note:

- *If you are demolishing any building that may have asbestos containing materials (ACM) in it, you have obligations under the Health and Safety at Work (Asbestos) Regulations 2016 for the management and removal of asbestos, including the need to engage a Competent Asbestos Surveyor to confirm the presence or absence of any ACM.*
- *Paints used on external parts of properties up until the mid-1970's routinely contained lead, a poison and a persistent environmental pollutant. You are advised to ensure that soils affected by old, peeling or flaking paint are assessed in relation to the proposed use of the property, including high risk use by young children.*

2. Consents and Incidents Information

The Council database was searched for records of the following activities within the specified search area:

- Pollution Incidents (including air discharges, oil or diesel spills)
- Bores
- Contaminated site and air discharges, and industrial trade process consents
- Closed Landfills
- Air quality permitted activities

While the Auckland Council has carried out the above search using its best practical endeavours, it does not warrant its completeness or accuracy and disclaims any responsibility or liability in respect of the information. If you or any other person wishes to act or to rely on this information, or make any financial commitment based upon it, it is recommended that you seek appropriate technical and/or professional advice.

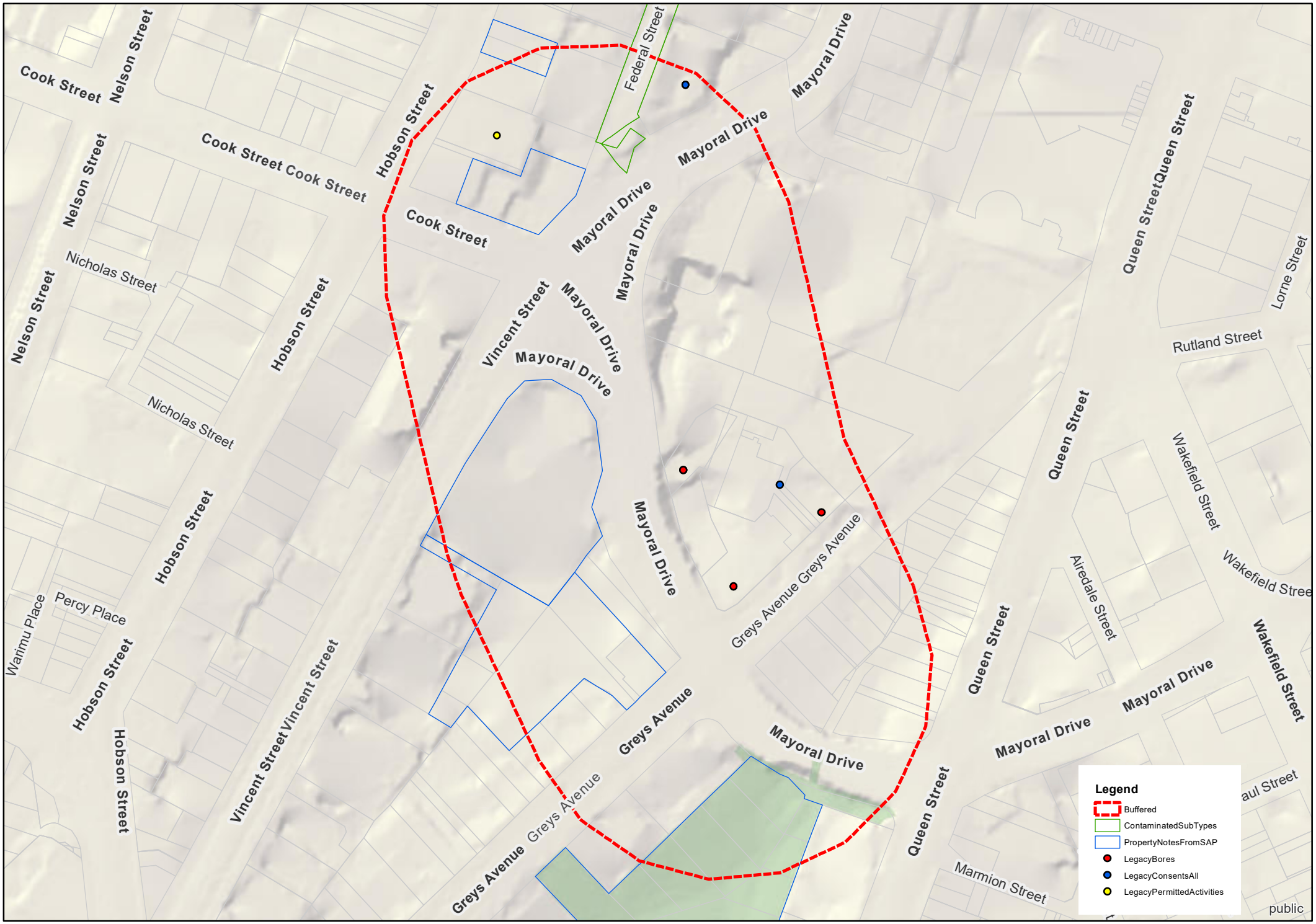
If you wish to clarify anything in this letter that relates to this site, please contact contaminatedsites@aucklandcouncil.govt.nz. Any follow up requests for information on other sites must go through the online order process.

Should you wish to request any of the files referenced above and/or listed in the attached spreadsheet for viewing, please contact the Auckland Council Call Centre on 301 0101 and note you are requesting former Auckland Regional Council records (the records department requires three working days' notice to ensure the files will be available).

Please note Auckland Council cost recovers officer's time for all site enquiries. As such an invoice for $128 for the time involved in this enquiry will follow shortly.

Yours Sincerely,

Contamination, Air and Noise Team
Specialist Unit | Resource Consents
Auckland Council


Cook Street
Nelson Street
Cook Street Cook Street
Hobson Street
Federal Street
Mayoral Drive
Queen StreetQueen Street
Lorne Street
Nicholas Street
Vincent Street
Rutland Street
Wakefield Street
Airedale Street
Percy Place
Warimu Place
Greys Avenue
Greys Avenue Greys Avenue
Vincent Street Vincent Street
Marmion Street
Legend
Buffered
ContaminatedSubTypes
PropertyNotesFromSAP
LegacyBores
LegacyConsentsAll
LegacyPermittedActivities
public

APPENDIX D – BOREHOLE LOGS

Borehole No. BH23/02

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757141 E 5919888 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	20.40 m
Location:	290 Queen Street, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
Fill	Asphalt Road - parking area.										0.00-3.00m - AIR EXCAVATION - NO RECOVERY (3.00m).							
	Gravel base - sandy fine to coarse GRAVEL; dark grey. Tightly packed, moist; gravel, well graded, sub-angular to angular greywacke (No recovery, visual assessment).										0.30-0.80m - Inferred fill material based on observation.							
	Clayey SILT, minor gravel, dark grey intermixed with grey; gravel, brick, stone.(No recovery, visual assessment).	20																
ECBF	Clayey SILT, some sand. light brown mottled grey. moist (No recovery, visual assessment).		1								0.80-3.00m - Inferred natrual ground based on observation.	VE	0		HQ Size, Triple Tube, Wireline Rotary Coring			
		18	2					RS										
	3.00-3.50m: Push Tube - sample taken (0.5m).		3									PT	100				SWL 3.12m 12/08 SWL 3.20m 15/09	
	Clayey SILT, some sand; light brown mottled brownish orange. Stiff, wet, low plasticity.				18	3// 2/3/6/7						SPT	100					
	Moderately weathered, grey, fine to medium SANDSTONE; extremely weak; sub-horizontal, moderately thick beds; poorly cemented. (silty fine to medium SAND, some clay; dense, moist; well graded).		4									HQ	100	85				
	-INTERBEDDED WITH-						EW	MW										
	Moderately weathered, grey, MUDSTONE; extremely weak; sub-horizontal, moderately thick beds (clayey SILT; very stiff, moist, low plasticity).	16																
	(50% sandstone, 50% mudstone). 4.00-4.10m - sub-horizontal black carbonaceous laminae.				31	7// 4/5/11/11						SPT	100					
												HQ	76	48				

Notes:
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started: 14/07/2023 *Finished:* 15/07/2023
Drilling Co.: DFNZ *Drilling Rig:* Truck mounted - Rig 99
Logged by: HQ *Checked by:* AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/02

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757141 E 5919888 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12 m
Project No.:	W-SL001.03	*R.L.:*	20.40 m	*Inclination:*	Vertical
Location:	290 Queen Street, Auckland CBD	*Datum:*	Auckland 1946		

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
ECBF	4.95-5.20m - becomes moderately cemented sandstone. Moderately weathered, grey, fine to medium SANDSTONE; extremely weak; sub-horizontal, moderately thick beds; poorly cemented. (silty fine to medium SAND, some clay; dense, moist; well graded). -INTERBEDDED WITH- Moderately weathered, grey, MUDSTONE; extremely weak; sub-horizontal, moderately thick beds (clayey SILT; very stiff, moist, low plasticity). (50% sandstone, 50% mudstone).*(continued)* 5.00-5.17m - sub-horizontal black carbonaceous laminae. 5.70-5.75m - sub-horizontal black carbonacoues laminae.									J72 J75	4.95-5.75m - Manual handling break and drilling induced breaks. 5.12m - J, 72°, SM, UN 5.31m - J, 75°, SM, UN	HQ	76	48	HQ Size, Triple Tube, Wireline Rotary Coring			
	5.75 - 6.00m: CORE LOSS (0.25m).		6															
	Moderately weathered, grey, fine to medium SANDSTONE; extremely weak; sub-horizontal, moderately thin to thick beds; poorly cemented. (silty fine to medium SAND, some clay; dense, moist; well graded). -INTERBEDDED WITH- Moderately weathered, grey, MUDSTONE; extremely weak; sub-horizontal, moderately thick beds (silty CLAY; very stiff, moist, low plasticity). (77% sandstone, 23% mudstone).		14		34	8// 12/6/6/10	EW	MW				SPT	100					
			7							J88	6.53m - Drilling induced breaks - sub-horizontal breaks along poorly cemented bedding planes. 7.10m - J, 88°, SL, UN	HQ	81	67				
	7.30 - 7.50m: CORE LOSS (0.20m).																	
	Slightly weathered, grey, fine to medium SANDSTONE; extremely weak; sub-horizontal, thin to moderately thick beds; moderately cemented. (silty fine to medium SAND, trace of clay; very dense, moist; well graded). -INTERBEDDED WITH- Slightly weathered, grey, MUDSTONE; extremely weak; thin to moderately thick beds (silty CLAY; hard, moist, low plasticity). (33% SANDSTONE, 67% MUDSTONE).		8		50+	8// 14/21/15 for 35mm	W	SW				SPT	100					
			12								7.95-8.35m - Manual handling break. 8.35m - Drilling induced breaks - sub-horizontal breaks along poorly cemented bedding planes. 8.50-8.95m - The sample was highly disturbed caused by attempting to retrieve it.	HQ	100	88				
	Solid Cone Penetration Testing - No recovery (0.225m).		9		50+	50 for 150mm						SC	0					
	Slightly weathered, grey, MUDSTONE; weak.																	
	Slightly weathered, grey, fine to medium SANDSTONE; weak; well cemented.											HQ	47	28				
	9.82 - 10.50m: CORE LOSS (0.68m).										9.82-10.50m - Core loss due to washed away. Depth							

Notes:
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	14/07/2023	*Finished:*	15/07/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 99
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/02

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757141 E 5919888 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	20.40 m
Location:	290 Queen Street, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m) / DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
ECBF	9.82 - 10.50m: CORE LOSS (0.68m).*(continued)*	10								checked, correct.	HQ	47	28	HQ Size, Triple Tube, Wireline Rotary Coring			
	Solid Cone Penetration Testing - No recovery (0.26m).			50+	15// 10/40 for 30mm						SC	0					
	Slightly weathered, grey, MUDSTONE; weak. -INTERBEDDED WITH- Slightly weathered, grey, fine to medium SANDSTONE; weak; well cemented. (50% sandstone, 50% mudstone).	11				W	SW			10.76-11.66m - Manual handling break and drilling induced breaks. 11.21m - J, 2°, SM, UN 11.23m - J, 3°, SM, UN	HQ	86	91				
	11.66 - 12.00m: CORE LOSS (0.34m).	12								11.66-12.00m - Core loss due to washed away. Depth checked, correct.							
	END OF BOREHOLE AT 12m - Target Depth Reached	8															
		13															
		14															
		6															

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	14/07/2023	*Finished:*	15/07/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 99
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/02

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757141 E 5919888 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12 m
Project No.:	W-SL001.03	*R.L.:*	20.40 m	*Inclination:*	Vertical
Location:	290 Queen Street, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

Photo BH23/02.1
BOX01: 0.00 - 6.75m.

Photo BH23/02.2
BOX02: 6.75 - 10.50m.

Notes:
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	14/07/2023	*Finished:*	15/07/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 99
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/02

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757141 E 5919888 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12 m
Project No.:	W-SL001.03	*R.L.:*	20.40 m	*Inclination:*	Vertical
Location:	290 Queen Street, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

Photo BH23/02.3
BOX03: 10.50 - 12.00m.

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	14/07/2023	*Finished:*	15/07/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 99
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/03

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757106 E 5919914 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	22.67 m
Location:	36-38 Greys Avenue, Auckland CBD	*Datum:*	Auckland 1946

Depth: 6.45 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m) / DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
Fill	Driveway Asphalt (0.1m).									0.00-1.35m - AIR-VACCUM EXCAVATION - No recovery (1.35m).							
	Construction fill - wood, concrete, brick, rubble, debris and reinforced steel bar (No recovery, visual assessment).	22									VE	0		HQ Size, Triple Tube, Wireline Rotary Coring			
		1															
	Concrete basement slab																
ECBF	1.45-1.75m: Environmental sampling (300 mm taken).																
	Silty CLAY; light brown mottled brownish orange. Soft, moist, low plasticity.																
	1.95-2.25m: Environmental sampling (300 mm taken).	2															
	Clayey SILT, some sand; light brown mottled brownish orange, Soft, moist, low plasticity; sand, fine.										HQ	74					
	2.60-3.00m: CORE LOSS (0.4m).	20															
	Clayey SILT, some sand; light brown mottled brownish orange, Firm, moist, low plasticity; sand, fine; sub-horizontal, thin to moderately thick beds.	3		5	1// 1/1/1/2		RS				SPT	100					
	-INTERBEDDED WITH-																
	Silty CLAY; grey. Firm, moist, low plasticity; sub-horizontal, moderately thick beds.																
	(55% clayey SILT some sand, 45% silty CLAY).	4									HQ	76					
	4.23m - carbonaceous laminae.																
	4.25-4.50m: CORE LOSS (0.25m).																
		18		6	3// 1/1/2/2	EW	HW				SPT	44					
											HQ	100					

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	21/07/2023	*Finished:*	21/07/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 99
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/03

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757106 E 5919914 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	6.45 m
Project No.:	W-SL001.03	*R.L.:*	22.67 m	*Inclination:*	Vertical
Location:	36-38 Greys Avenue, Auckland CBD	*Datum:*	Auckland 1946		

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m) / DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
ECBF	Highly weathered, grey, MUDSTONE; extremely weak; sub-horizontal, moderately thin to thick beds (silty CLAY, minor sand; grey. Firm, low plasticity, moist). -INTERBEDDED WITH- Highly weathered, grey, fine to medium SANDSTONE; extremely weak; sub-horizontal, moderately thin beds; poorly cemented (silty fine to mediumSAND, minor clay; grey. Loose; well graded). (82% sandstone, 18% mudstone).*(continued)* 5.45-5.46m - carbonaceous laminae.					EW	HW				HQ	100		HQ Size, Triple Tube, Wireline Rotary Coring			
	Moderately weathered, grey, MUDSTONE; extremely weak (silty CLAY; grey. firm to stiff, low plasticity, moist). 6.00-6.25m - becomes very stiff.	6				EW	MW			6.00m - Depth checked.							
	Moderately weathered, grey, fine SANDSTONE; extremely weak; poorly cemented (silty fine SAND, trace of clay; grey. Dense, moist; well graded).			34	5// 3/7/10/14						SPT	100					
	END OF BOREHOLE AT 6.45m - Target Depth Reached	16 7 8 14 9															

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	21/07/2023	*Finished:*	21/07/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 99
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/03

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757106 E 5919914 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	6.45 m
Project No.:	W-SL001.03	*R.L.:*	22.67 m	*Inclination:*	Vertical
Location:	36-38 Greys Avenue, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

Photo BH23/03.1
BOX01:0.00 - 4.95m.

Photo BH23/03.2
BOX02:4.95 - 6.45m.

Notes:
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	21/07/2023	*Finished:*	21/07/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 99
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/04

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757090 E 5919919 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	24.82 m
Location:	36-38 Greys Avenue, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12.415 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
Late Quaternary Alluvium/fill	Road Pavement - Asphalt.										0.00-3.00m - AIR-VACCUM EXCAVATION - No recovery (3.00m). 0.25-0.70m - Inferred fill material based on observation.							
	Gravel base - sandy fine to coarse GRAVEL; dark grey. Tightly packed, dry; gravel, well graded, sub-angular to angular greywacke (based on visual assessment).																	
	Clayey SILT, minor gravel; light brown intermixed with pale grey. Moist, gravel, fine to medium, sub-angular, gravel (No recovery, visual assessment).																SWL 0.70m 11/09	
	Clayey SILT, light brown. Moist (No recovery, visual assessment).	24	1								0.70-3.00m - Inferred natural ground based on observation.							
			2									VE	0		HQ Size, Triple Tube, Wireline Rotary Coring			
		22	3															
	Clayey SILT, minor organics, trace sand; purple brown mottled orange. Firm, moist, low plasticity; organics, decayed, amorphous; sand, fine.				6	1// 1/1/2/2						SPT	100				SWL 3.03m 12/09	
	Silty CLAY, trace sand and gravel; pale grey mottled light orange. Firm, moist, low plasticity; sand, fine; gravel, fine, subrounded, highly weatherd, extremely weak, vesicular basalt/lapilli.		4									HQ	100					
	4.50-4.95m - fine sand components are comprised of (<5%) pumice.					SV: 76/21 kPa												
	4.80-4.95m - with trace organic material, decayed, amorphous.	20			8	1// 2/1/2/3						SPT	100					
												HQ	100					

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 24/10/23

Notes:

SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	11/09/2023	*Finished:*	12/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/04

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757090 E 5919919 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	24.82 m
Location:	36-38 Greys Avenue, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12.415 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
ECBF	Silty CLAY, minor organics, trace of sand; pale grey mottled light brown. Firm, moist, low plasticity; organics, decayed amphorous; sand, fine, (<5%) pumice.*(continued)*											HQ	100		HQ Size, Triple Tube, Wireline Rotary Coring			
	Clayey SILT, trace sand; greenish grey. Firm. moist, low plasticity; sand, fine.					SV: 76/23 kPa												
	5.92-5.96m - with organic material inclusions, decayed, amorphous.		6															
	6.00- 6.50m: Push Tube - sample taken (0.5m).											PT	100					
	Clayey SILT, trace sand; greenish grey. Firm. moist, low plasticity; sand, fine.																	
	Silty CLAY; greenish grey intermixed with green, Firm. moist, low plasticity; with pockets (10-20mm) of clay.		18		8	1// 2/1/2/3						SPT	100					
	7.00- 7.50m: Push Tube - sample taken (0.3m).		7					RS				PT	60					
	Silty fine to medium SAND, trace clay; grey. Medium dense, moist; well graded; sub-horizontal, moderately thin beds.																	
	-INTERBEDDED WITH-				16	3// 2/4/5/5						SPT	100					
	Silty CLAY; grey. Stiff, moist, low plasticity; sub-horizontal, very thin beds.																	
	(90% silty fine to medium SAND, 10% silty CLAY).		8															
	Highly weathered, grey, fine to medium SANDSTONE; extremely weak; poorly cemented (silty fine to medium SAND, trace clay; medium dense, moist; well graded).																	
	Highly weathered, grey, MUDSTONE; extremely weak; (sandy SILT, some clay; very stiff, moist, low plasticity; sand, fine to medium).											HQ	100					
	8.50-8.62m - moderately inclined, wavy, parallel, carbonaceous laminations. 8.60-8.73m - material change to silty CLAY; very stiff,moist, low plasticity.																	
	Highly weathered, grey, fine to medium SANDSTONE; extremely weak; poorly cemented (silty fine to medium SAND, minor clay; medium dense, moist; well graded).		16			SV: in sand, UTP	EW	HW			8.75-8.85m - Manual handling break.							
	Highly weathered, grey, MUDSTONE; extremely weak; sub-horizontal, moderately thin to moderately thick beds (silty CLAY; very stiff, moist, low plasticity).		9		24	6// 5/5/7/7						SPT	100					
	-INTERBEDDED WITH-																	
	Highly weathered, grey, SANDSTONE; extremely weak; sub-horizontal, moderately thin beds; poorly cemented (silty fine to medium SAND, trace clay; medium dense, moist; well graded).										9.45-9.60m - Manual handling break.							
	(20% of SANDSTONE, 80% of MUDSTONE). 9.21-9.22m - sub-horizontal carbonaceous laminae. 9.35-9.37m - sub-horizontal carbonaceous laminae.											HQ	100	87				

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 24/10/23

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started: 11/09/2023
Finished: 12/09/2023
Drilling Co.: DFNZ
Drilling Rig: Truck mounted - Rig 86
Logged by: HQ
Checked by: AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/04

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757090 E 5919919 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12.415 m
Project No.:	W-SL001.03	*R.L.:*	24.82 m	*Inclination:*	Vertical
Location:	36-38 Greys Avenue, Auckland CBD	*Datum:*	Auckland 1946		

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m) / DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
ECBF	Solid Cone Penetration Testing - No core recovery (0.45m).	14		31	SV: UTP 11// 7/7/8/9	EW	HW			10.05-10.15m - Manual handling break.	HQ	100	87	HQ Size, Triple Tube, Wireline Rotary Coring			
	Moderately weathered, grey, MUDSTONE; extremely weak; sub-horizontal, moderately thin beds (silty CLAY; very stiff, moist, low plasticity). -INTERBEDDED WITH- Moderately weathered, grey, SANDSTONE; extremely weak; sub-horizontal, moderately thin to moderately thick beds; poorly cemented (silty fine to medium SAND, trace clay; medium dense, moist; well graded). (85% SANDSTONE, 15% of MUDSTONE).	11				EW	MW		12	11.07m - J, 12°, SM, UN 11.17-12.00m - Drilling induced breaks - sub-horizontal breaks along poorly cemented bedding planes.	SC	0					
	Solid Cone Penetration Testing - No core recovery (0.415m).	12		50+	22// 20/20/10 for 40mm						HQ	100	81				
	END OF BOREHOLE AT 12.415m - Target Depth Reached	12 13 14 10									SC	0					

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	11/09/2023	*Finished:*	12/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/04

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757090 E 5919919 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12.415 m
Project No.:	W-SL001.03	*R.L.:*	24.82 m	*Inclination:*	Vertical
Location:	36-38 Greys Avenue, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

Photo BH23/04.1
BOX01: 0.00 - 6.50m.

Photo BH23/04.2
BOX02: 6.50 - 9.45m.

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	11/09/2023	*Finished:*	12/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/04

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757090 E 5919919 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12.415 m
Project No.:	W-SL001.03	*R.L.:*	24.82 m	*Inclination:*	Vertical
Location:	36-38 Greys Avenue, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

Photo BH23/04.3
BOX03: 9.45 - 12.42m.

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 24/10/23

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	11/09/2023	*Finished:*	12/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/05

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757030 E 5919969 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	25.72 m
Location:	100 Mayoral Dr, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12.15 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m) / DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
Fill	Road Pavement - Asphalt.									0.00-0.30m - AIR-VACCUM EXCAVATION - No recovery (3.00m).	VE	0		HQ Size, Triple Tube, Wireline Rotary Coring			
	Gravel base - sandy fine to coarse GRAVEL, some silt; dark grey. Tightly packed, dry; gravel, well graded, sub-angular to angular greywacke (based on visual assessment).																
	Clayey SILT, some gravel and cobble; light brown intermixed greenish grey and orange. Moist; gravel, fine to coarse, angular, greywacke and basalt; cobble, angular brick (based on visual observation).									0.45-3.00m - Inferred fill material based on observation.							
		1								1.00-4.50m - Cobble size brick in fill.							
	1.10-1.50m - with some medium to coarse sand (based on visual observation).																
		24															
		2															
		3															
	Clayey SILT, minor sand and gravel; light brown intermixed grey and black. Firm, moist, low plasticity; sand fine to coarse; gravel, fine to medium, subrounded, moderately weathered, very weak, vesicular basalt.			8	1// 1/2/2/3						SPT	67					
		22															
	3.70-3.74m - cobble of brick; light brownish orange; hard.																
		4									HQ	62					
	4.00-4.10m - cobble of moderately weathered vesicular basalt; brown; very weak to weak.				SV: SV failed, basalt rock at the base of core run.												
	4.10 - 4.50m: CORE LOSS (0.40m).									4.10-4.50m - Suspect core loss due to washed away.							
	Sandy SILT, some gravel, minor clay; brown mottled orange. Very soft, moist, low plasticity; sand, fine to coarse; gravel, fine to medium, subrounded, highly weathered, extremely weak to very weak, vesicular basalt/lapilli.			0	0// 0/0/0/0					4.50-8.00m - Driller stated the material is soft.	SPT	67					
											HQ	86					

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	14/09/2023	*Finished:*	15/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/05

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757030 E 5919969 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	25.72 m
Location:	100 Mayoral Dr, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12.15 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
Late Quaternary Alluvium	4.95-6.00m - becomes wet. Sandy SILT, some gravel, minor clay; brown mottled orange. Very soft, moist, low plasticity; sand, fine to coarse; gravel, fine to medium, subrounded, highly weathered, extremely weak to very weak, vesicular basalt/lapilli. *(continued)*											HQ	86		HQ Size, Triple Tube, Wireline Rotary Coring		SWL 5.46m 14/09	
			20			SV: 31/8 kPa												
	6.00-6.90m - becomes moist to wet.		6		0	0// 0/0/0/0						SPT	44				SWL 6.34m 15/09	
	Clayey SILT; greenish grey. Very soft, moist to wet, low plasticity. 7.05-7.40m - with some gravel; light brown intermixed brownish orange; gravel, fine to medium, subrounded, extreme weak basalt/lapilli.		7									HQ	100					
	Organic SILT; black. Firm, moist, low plasticity; organic odour. 7.50 - 8.00m: Push Tube - sample taken (0.5m).		18			SV: 61/18 kPa					7.40-7.90m - Suspect 300 - 500 mm of organic SILT material.	PT	100					
	Silty CLAY, trace organics; light brown mottled brownish orange. Very soft, moist, low plasticity; organics, decayed, fibrous. 8.05-8.22m - material change to silty CLAY.		8															
ECBF	Clayey SILT; light brown mottled orange. Very soft, moist, low plasticity. 8.22-8.45m - material change to clayey SILT.				0	0// 0/0/0/0						SPT	100					
	Highly weathered, grey, fine to medium SANDSTONE; extremely weak; sub-horizontal, thin to moderately thick beds; poorly cemented (silty fine to medium SAND; dense, moist; well graded). -INTERBEDDED WITH- Highly weathered, grey, MUDSTONE; extremely weak; sub-horizontal, thin to moderately thin beds (silty CLAY; stiff, moist, low plasticity). (73% sandstone, 27% mudstone).		9			SV: UTP	EW	HW				HQ	100					
					46	4// 7/12/14/13						SPT	100					
			16				EW	SW			9.45-12.00m - The sample was disturbed while being removed from the HQ tube.	HQ	100	100				

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	14/09/2023	*Finished:*	15/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/05

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757030 E 5919969 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	25.72 m
Location:	100 Mayoral Dr, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12.15 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m) / DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
ECBF	Slightly weathered, grey, fine to medium SANDSTONE; extremely weak; sub-horizontal, moderately thin to moderately thick beds; poorly cemented (silty fine to medium SAND, trace clay; dense, moist; well graded). - INTERBEDDED WITH- Slightly weathered, grey, MUDSTONE; extremely weak; sub-horizontal, thin to moderately thin beds (silty CLAY; stiff, moist, low plasticity). (81% sandstone, 19% mudstone).*(continued)*										HQ	100	100	HQ Size, Triple Tube, Wireline Rotary Coring			
				50+	6// 17/33 for 45mm						SC	0					
	Solid Cone Penetration Testing - No core recovery (0.265m).																
	Slightly weathered, grey, fine to mediumSANDSTONE; extremely weak; sub-horizontal, moderately thin to moderately thick beds; poorly cemented (silty fine to medium SAND, trace clay; dense, moist; well graded). - INTERBEDDED WITH- Slightly weathered, grey, MUDSTONE; extremely weak; sub-horizontal, thin to moderately thin beds (silty CLAY; stiff, moist, low plasticity). (83% sandstone, 17% mudstone). 11.62-11.63m - sub-horizontal black carbonaceous laminae.	11 14				EW	SW				HQ	100	100				
	Solid Cone Penetration Testing - No core recovery (0.15m).	12									SC	0					
	END OF BOREHOLE AT 12.15m - Target Depth Reached	13 12 14		50+	50												

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started: 14/09/2023
Finished: 15/09/2023
Drilling Co.: DFNZ
Drilling Rig: Truck mounted - Rig 86
Logged by: HQ
Checked by: AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/05

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757030 E 5919969 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12.15 m
Project No.:	W-SL001.03	*R.L.:*	25.72 m	*Inclination:*	Vertical
Location:	100 Mayoral Dr, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

Photo BH23/05.1
BOX01: 0.00 - 6.45m.

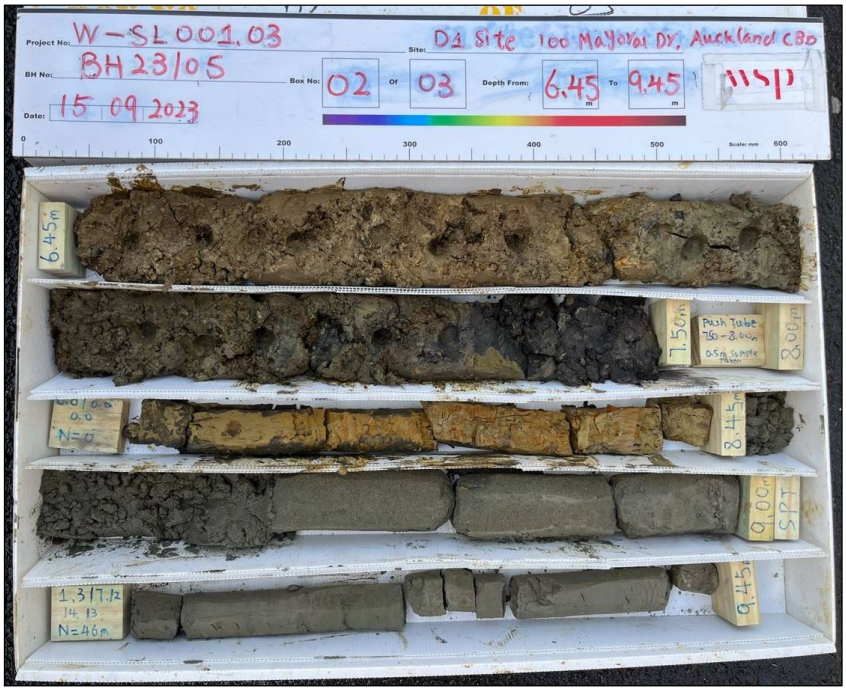


Photo BH23/05.2
BOX02: 6.45 - 9.45m.

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	14/09/2023	*Finished:*	15/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/05

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757030 E 5919969 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12.15 m
Project No.:	W-SL001.03	*R.L.:*	25.72 m	*Inclination:*	Vertical
Location:	100 Mayoral Dr, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

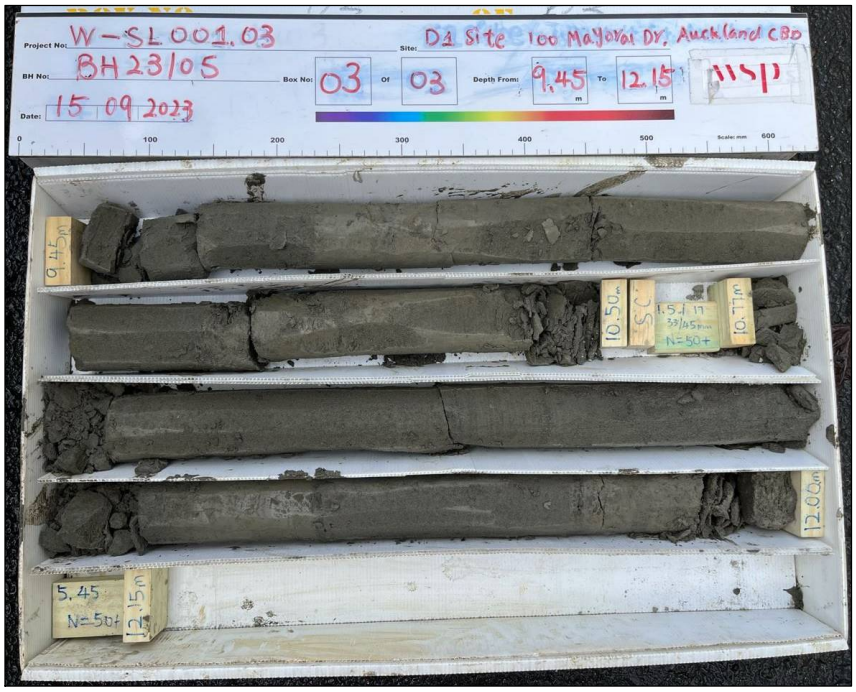


Photo BH23/05.3
BOX03: 9.45 - 12.15m.

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	14/09/2023	*Finished:*	15/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/06

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757027 E 5920017 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	27.55 m
Location:	Traffic island on Mayoral Drive, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12.075 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
Fill	Road Pavement - Asphalt										0.00-3.00m - AIR-VACCUM EXCAVATION - No recovery (3.00m).							
	Gravel base - sandy fine to coarse GRAVEL; dark grey. Tightly packed, dry; gravel, well graded, sub-angular to angular greywacke (based on visual assessment).																	
	silty CLAY; dark grey intermixed greenish grey. Moist (based on visual observation).		1								0.50-2.10m - Inferred fill material based on observation.							
			26									VE	0					
			2															
Late Quaternary Alluvium	Silty CLAY; grey. Moist (based on visual observation).										2.10-3.00m - Inferred natural ground based on observation.						SWL 2.46m 1/09	
	Silty CLAY; grey mottled light brown. Soft, moist, low plasticity.		3		3	1// 0/1/1/1						SPT	100		HQ Size, Triple Tube, Wireline Rotary Coring		SWL 3.26m 31/08	
			24															
	3.75-4.27m - becomes firm.		4									HQ	100					
	4.27-4.38m - becomes soft, with remnant of carbonaceous material. 4.38-4.50m - becomes firm.																	
ECBF	4.50-5.00m: Push Tube - sample taken (0.5m).					SV: 22/9 kPa		RS				PT	100					

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started: 31/08/2023
Finished: 1/09/2023
Drilling Co.: DFNZ
Drilling Rig: Truck mounted - Rig 99
Logged by: HQ
Checked by: AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/06

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757027 E 5920017 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	27.55 m
Location:	Traffic island on Mayoral Drive, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12.075 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m) / DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
ECBF	Sandy SILT, minor clay; grey mottled light brown. Soft, moist, low plasticity; sand, fine to medium.																
	Silty CLAY; grey. Firm, moist, low plasticity. 5.13-5.15m - subhorizontal carbonaceous laminae.	22		6	1// 2/1/1/2						SPT	100					
							RS				HQ	100					
	6.00- 6.50m: Push Tube - sample taken (0.5m).	6			SV: 18/6 kPa						PT	100					
	Silty CLAY; grey. Firm, moist, low plasticity.																
	Clayey SILT, minor sand; grey. Soft, moist, low plasticity; sand, fine to medium.			9	2// 2/2/2/3						SPT	100					
	Highly weathered, grey, MUDSTONE; extremely weak. (Silty Clay; grey. Stiff, moist, low plasticity).																
	7.00-7.50m - becomes very stiff.	7									HQ	100					
	7.50-8.15m - material change to clayey SILT; grey. Very stiff, moist, low plasticity.	20			SV: 63/27 kPa	EW	HW										
				20	7// 4/4/5/7						SPT	100					
	Moderately weathered, grey, fine to medium SANDSTONE; extremely weak; sub-horizontal, moderately thick beds; poorly cemented. (Silty fine to medium SAND, minor clay; dense, moist; well graded).	8									HQ	100	100	HQ Size, Triple Tube, Wireline Rotary Coring			
	- INTERBEDDED WITH -					EW	MW										
	Moderately weathered, grey, MUDSTONE; extremely weak; sub-horizontal, moderately thick beds (Clayey SILT; very stiff, moist , low plasticity).																
	(65% of sandstone, 35% of mudstone).																
	Solid Cone Penetration Testing - No core recovery (0.3m).	9		50+	SV: UTP 22// 23/27					9.00-10.25m - Drilling induced horizontal fractures - spin marks.	SC	0					
	Slightly weathered, grey, fine to medium SANDSTONE; very weak; moderately thin; subhorizontal beds; moderately cemented.	18				VW	SW										
	-INTERBEDDED WITH-																
	Slightly weathered, grey, MUDSTONE; very weak; Moderately thin; subhorizontal beds.										HQ	79	100				
	(18% of SANDSTONE, 82% of MUDSTONE). 9.30-9.35m - subhorizontal black carbonaceous laminations.																

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	31/08/2023	*Finished:*	1/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 99
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/06

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757027 E 5920017 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12.075 m
Project No.:	W-SL001.03	*R.L.:*	27.55 m	*Inclination:*	Vertical
Location:	Traffic island on Mayoral Drive, Auckland CBD	*Datum:*	Auckland 1946		

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m) / DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
ECBF	10.10-10.50m: CORE LOSS (0.25m).	11				VW	SW			10.25-11.76m - Drilling induced horizontal fractures - spin marks.	HQ	79	100	HQ Size, Triple Tube, Wireline Rotary Coring			
	Solid Cone Penetration Testing - No core recovery (0.12m).			50+	15 for initial 115mm						SC	0					
	Slightly weathered, grey, MUDSTONE; very weak; thin to Moderately thin; subhorizontal beds. -INTERBEDDED WITH- Slightly weathered, grey, fine to medium SANDSTONE; very weak; thin to moderately thick; subhorizontal beds; moderately cemented. (86% of SANDSTONE, 14% of MUDSTONE). 10.70-10.71m - subhorizontal black carbonaceous laminae. 10.91-10.92m - subhorizontal black carbonaceous laminae. 11.43-11.56m - becomes poorly cemented SANDSTONE. 11.56-11.74m - becomes moderately cemented SANDSTONE.	16									HQ	85	100				
	11.76-12.00m: CORE LOSS (0.24m).	12								11.76-12.00m - Supect loss due to washed away. Depth checked, correct.							
	Solid Cone Penetration Testing - No core recovery (0.075m).			50+	12 for initial 75mm												
	END OF BOREHOLE AT 12.075m - Target Depth Reached	13															
		14															
		14															

Notes:

SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	31/08/2023	*Finished:*	1/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 99
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/06

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757027 E 5920017 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12.075 m
Project No.:	W-SL001.03	*R.L.:*	27.55 m	*Inclination:*	Vertical
Location:	Traffic island on Mayoral Drive, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

Photo BH23/06.1
BOX 01: 0.00 - 6.00m.

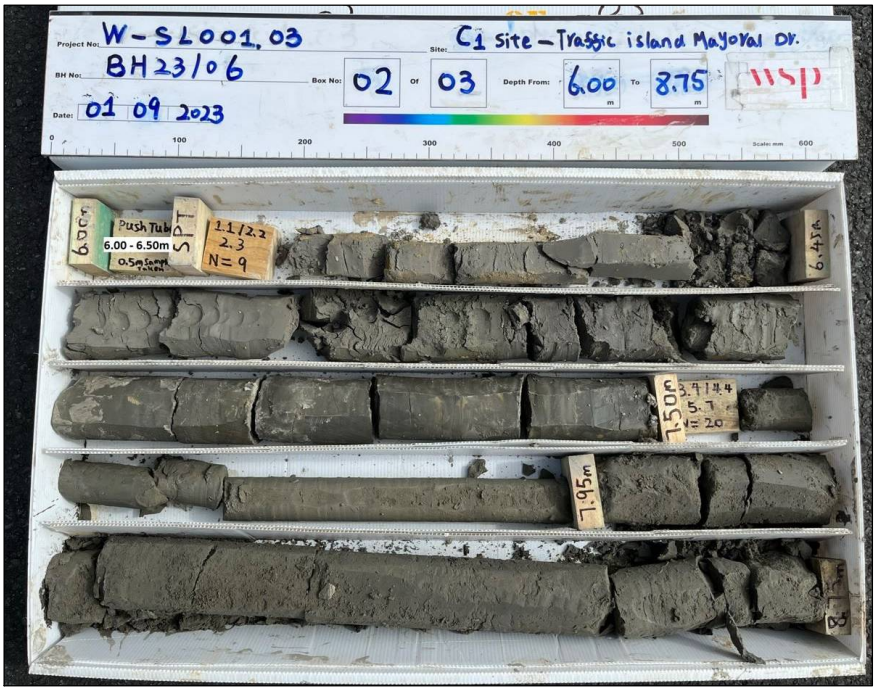


Photo BH23/06.2
BOX02: 6.00 - 8.75m.

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	31/08/2023	*Finished:*	1/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 99
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/06

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757027 E 5920017 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12.075 m
Project No.:	W-SL001.03	*R.L.:*	27.55 m	*Inclination:*	Vertical
Location:	Traffic island on Mayoral Drive, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

Photo BH23/06.3
BOX: 8.75 - 12.08m.

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	31/08/2023	*Finished:*	1/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 99
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/07

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757019 E 5920059 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	30.34 m
Location:	Traffic island on Mayoral Drive, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12.135 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
Fill	Asphalt Road - parking area.										0.00-3.00m - AIR-VACCUM EXCAVATION - No recovery (3.00m). 0.25-0.72m - Inferred fill material based on observation.							
	Gravel base - sandy fine to coarse GRAVEL; dark grey. Tightly packed, dry; gravel, well graded, sub-angular to angular greywacke (based on visual assessment).	30																
Late Quaternary Alluvium	Silty CLAY; pale grey mottled light brown. Moist (No recovery, visual assessment).		1								0.72-3.00m - Inferred natrual ground based on observation.	VE	0		HQ Size, Triple Tube, Wireline Rotary Coring		SWL 2.56m 31/08	
			2															
		28																
	Clayey SILT, trace sand; light pale grey mottled brownish orange. Soft, moist, low plasticity; sand, fine to medium.		3		4	1// 1/1/1/1						SPT	100				SWL 3.36m 31/08	
											3.45-4.50m - Driller remarks that material is too soft - poor recovery.							
	3.90 - 4.50m: CORE LOSS (0.60m).		4			SV: Sv failed, core slid up barrel.						HQ	43					
		26																
	4.50-5.00m: Push Tube - sample taken (0.16m).										4.50m - Depth checked, corrected.	PT	36					

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:

SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	30/08/2023	*Finished:*	31/08/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/07

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757019 E 5920059 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	30.34 m
Location:	Traffic island on Mayoral Drive, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12.135 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m)	DEPTH (m)	SPT 'N' VALUE	SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
Late Quaternary Alluvium	Silty CLAY; light pale brown intermixed light brownish orange. Soft, moist, low plasticity.			3	1// 1/0/1/1					5.00-5.45m - SPT sample recovered during next core run.	SPT	0		HQ Size, Triple Tube, Wireline Rotary Coring			
	5.45-5.70m - becomes light brown mottled pale grey.																
	5.72-5.78m - become firm.									5.70m - Road base gravel dropped down the hole.	HQ	100					
ECBF	Clayey SILT, minor sand; grey. Firm, moist, low plasticity; sand, fine to medium.																
	6.00-6.50m: Push Tube - sample taken (0.5m).	6			SV: 31/12 kPa						PT	100					
	Clayey SILT, minor sand; grey. Firm, moist, low plasticity; sand, fine to medium.	24		5	3// 1/1/1/2						SPT	100					
	7.50-7.90m - with some fine to medium sand.	7			SV: 46/14 kPa		RS				HQ	100					
	7.75-7.76m - sub-horizontal black carbonaceous laminae.			7	3// 1/2/2/2						SPT	100					
	Silty CLAY; grey. Firm, moist, low plasticity.	8															
	8.60-8.80m - becomes stiff.	22									HQ	100					
	Clayey SILT, some sand; grey. Firm, moist, low plasticity; sand, fine to medium. 8.88-8.91m - sub-horizontal black carbonaceous laminations.	9			SV: 69/15 kPa												
	Silty CLAY; grey. Very stiff, moist, low plasticity.			20	3// 4/4/5/7						SPT	100					
	Silty CLAY, some sand; grey. Very stiff, moist, low plasticity; sand, fine to medium.																
	Highly weathered, grey, MUDSTONE; extremely weak (silty CLAY; very stiff, moist, low plasticity). 9.55-9.85m - material change to sandy SILT; grey. Very stiff, moist, low plasticity; sand, fine to medium.					EW	HW			9.45-10.20m - Manual handling break.	HQ	100	54				

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started: 30/08/2023
Finished: 31/08/2023
Drilling Co.: DFNZ
Drilling Rig: Truck mounted - Rig 86
Logged by: HQ
Checked by: AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/07

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757019 E 5920059 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	30.34 m
Location:	Traffic island on Mayoral Drive, Auckland CBD	*Datum:*	Auckland 1946

Depth: 12.135 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m) / DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
ECBF	Highly weathered, grey, fine to medium SANDSTONE; extremely weak; poorly cemented (silty fine to medium SAND; medium dense, moist; well graded). *(continued)*	20				EW	HW		J28	10.40m - J, 28°, SM, UN	HQ	100	54	HQ Size, Triple Tube, Wireline Rotary Coring			
	Moderately weathered, grey, MUDSTONE; extremely weak (silty CLAY; very stiff, moist, low plasticity). 10.55-10.60m - material change to sandy SILT; grey. Very stiff, moist, low plasticity; sand, fine to medium. 10.60-10.85m - material change to silty CLAY; grey. Very stiff, moist, low plasticity.			37	SV: UTP 10// 7/7/9/4	EW	MW				SPT	100					
	Moderately weathered, grey, fine to medium SANDSTONE; extremely weak (silty fine to medium SAND; medium dense, moist; well graded).	11															
	Slightly weathered, grey, fine to medium SANDSTONE; very weak; sub-horizontal, moderately thin to moderatley thick beds; poorly to moderately cemented. -INTERBEDDED WITH- Slightly weathered, grey, MUDSTONE; very weak; sub-horizontal, thin beds. (95% of SANDSTONE, 5% of MUDSTONE).					VW	SW		J30	10.95-11.85m - Drilling-induced breaks - sub-horizontal breaks along poorly cemented bedding planes. 11.50m - J, 30°, RO, UN 11.77-11.80m - Manual handling break.	HQ	86	82				
	11.85 - 12.00m: CORE LOSS (0.15m).									11.85-12.00m - Core loss due to washed away.							
	Solid Cone Penetration Testing - No core recovery (0.135m).	12		50+	50 for initial 140mm						SC	0					
	END OF BOREHOLE AT 12.135m - Target Depth Reached	18															
		13															
		14															
		16															

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started: 30/08/2023
Finished: 31/08/2023
Drilling Co.: DFNZ
Drilling Rig: Truck mounted - Rig 86
Logged by: HQ
Checked by: AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/07

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757019 E 5920059 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12.135 m
Project No.:	W-SL001.03	*R.L.:*	30.34 m	*Inclination:*	Vertical
Location:	Traffic island on Mayoral Drive, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

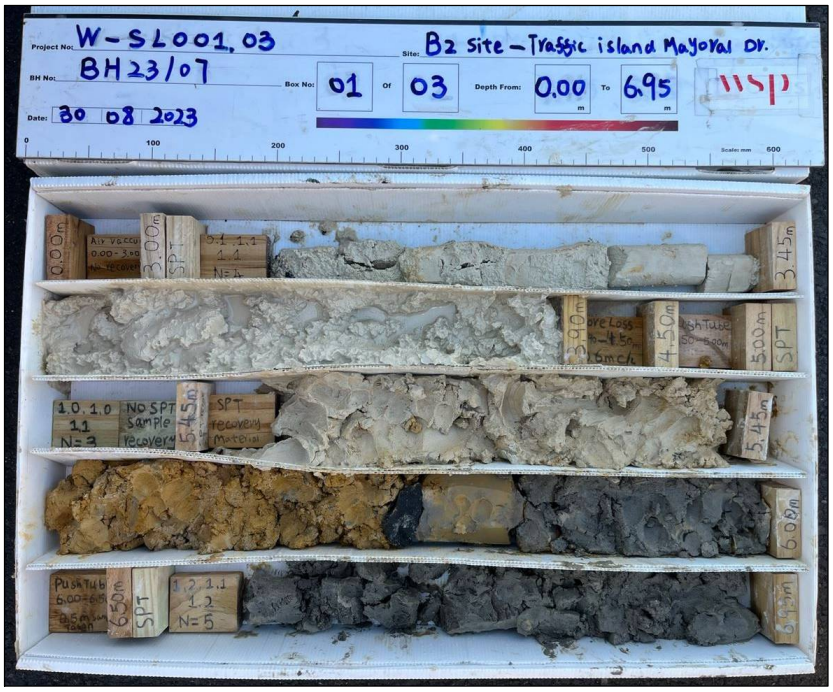


Photo BH23/07.1
BOX01: 0.00 - 6.95m.

Photo BH23/07.2
BOX02: 6.95 - 9.45m.

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

Started:	30/08/2023	*Finished:*	31/08/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/07

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757019 E 5920059 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	12.135 m
Project No.:	W-SL001.03	*R.L.:*	30.34 m	*Inclination:*	Vertical
Location:	Traffic island on Mayoral Drive, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

Photo BH23/07.3
BOX03: 9.45 - 12.14m.

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.
MUDSTONE comprises CLAYSTONE and SILTSTONE.

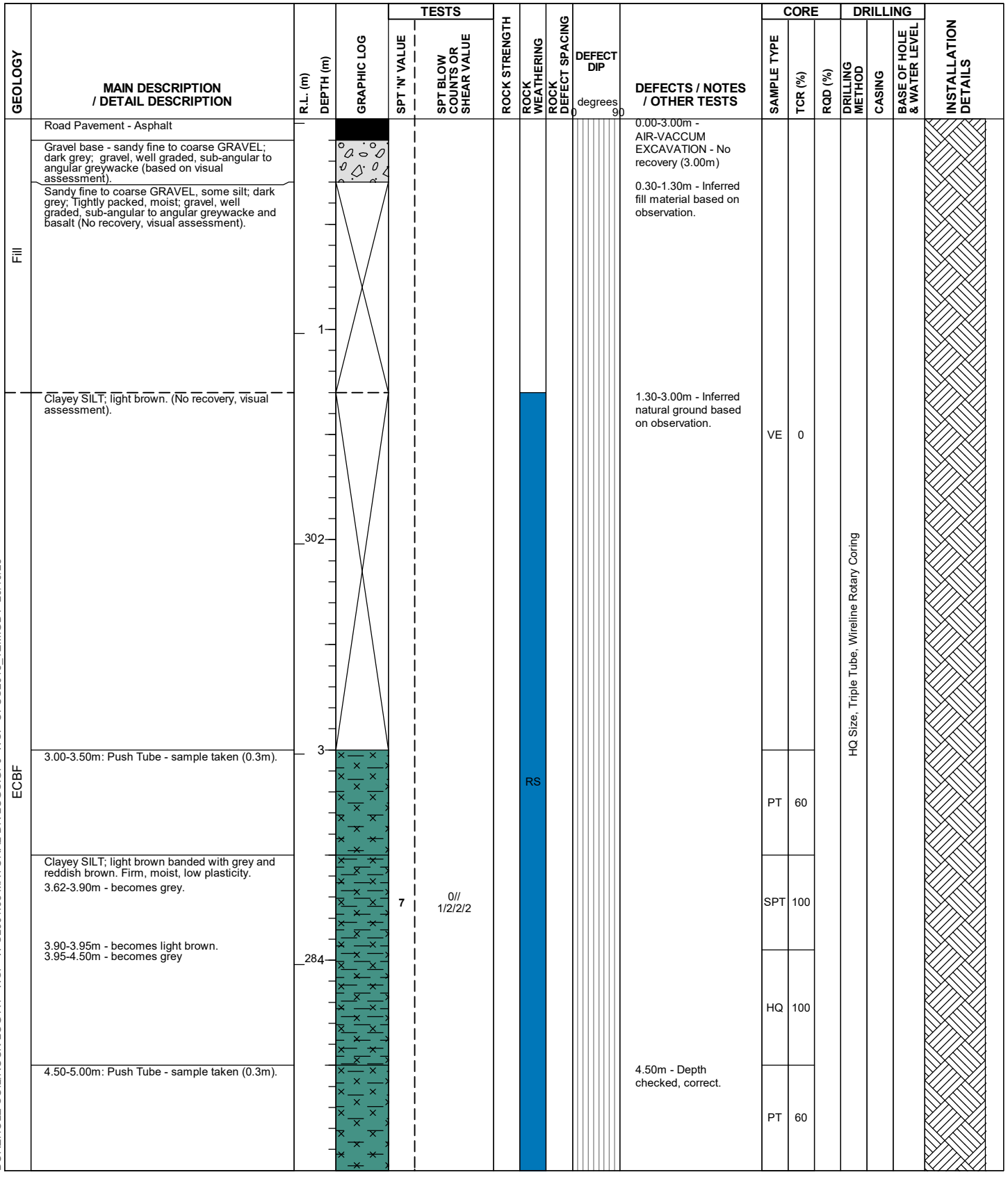
Started:	30/08/2023	*Finished:*	31/08/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/08

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757012 E 5920090 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	9 m
Project No.:	W-SL001.03	*R.L.:*	32.02 m	*Inclination:*	Vertical
Location:	Intersection between Mayoral Dr and Cook St, Auckland CBD	*Datum:*	Auckland 1946		



BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:

SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.

Started:	25/08/2023	*Finished:*	25/08/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Track mounted - Rig 79
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/08

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757012 E 5920090 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	9 m
Project No.:	W-SL001.03	*R.L.:*	32.02 m	*Inclination:*	Vertical
Location:	Intersection between Mayoral Dr and Cook St, Auckland CBD	*Datum:*	Auckland 1946		

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
ECBF	Clayey SILT, minor sand; light brown intermixed with yellowish brown. Firm, moist, low plasticity; sand, fine.				6	0// 1/1/2/2						SPT	100		HQ Size, Triple Tube, Wireline Rotary Coring			
	5.70-5.80m - becomes grey.											HQ	82					
	5.80 - 6.00m: CORE LOSS (0.20m).										5.80-6.00m - Driller remarks that the material washed away. 6.00m - Depth checked, correct.							
		26	6															
	Clayey SILT, minor sand; light brown intermixed with yellowish brown. Firm, moist, low plasticity; sand, fine.				4	0// 1/1/1/1						SPT	100					
	Clayey SILT, minor sand; grey. Soft, moist, low plasticity; sand, fine. 6.25-7.05m - with trace sand.																	
	6.45-6.75m - becomes very soft.											HQ	100					
	6.75-6.85m - sub-horizontal black carbonaceous material . 6.75-7.05m - becomes firm.																	
			7					RS										
	7.05-7.40m - with minor sand.																	
	7.40-7.50m - becomes clay SILT.																	
	7.50-7.95m - with minor sand.				5	SV: 27/10 kPa 1// 1/1/1/2						SPT	100					
	Silty CLAY; grey. Firm, moist, low plasticity.	24	8															
	Clayey SILT, minor sand; grey. Soft to firm, moist, low plasticity; sand, fine.											HQ	100				SWL 8.18m 28/08	
											8.90-9.00m - Depth checked, correct.							
	END OF BOREHOLE AT 9m - Target Depth Reached		9			SV: 22/6 kPa												

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 20/10/23

Notes:

SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.

Started:	25/08/2023	*Finished:*	25/08/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Track mounted - Rig 79
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/08

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1757012 E 5920090 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	9 m
Project No.:	W-SL001.03	*R.L.:*	32.02 m	*Inclination:*	Vertical
Location:	Intersection between Mayoral Dr and Cook St, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

Photo BH23/08.1
BOX01: 0.00 - 6.45m.

Photo BH23/08.2
BOX02: 6.45 - 9.00m.

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.

Started:	25/08/2023	*Finished:*	25/08/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Track mounted - Rig 79
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/09

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1756960 E 5920075 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	7 m
Project No.:	W-SL001.03	*R.L.:*	35.21 m	*Inclination:*	Vertical
Location:	67-101 Vincent Street, Auckland CBD	*Datum:*	Auckland 1946		

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m)	DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
Fill	Road Pavement - Asphalt. Gravel base - sandy fine to coarse GRAVEL, minor silt; dark grey. Tightly packed, dry; gravel, well graded, sub-angular to angular greywacke (based on visual assessment).										0.00-3.00m - AIR-VACCUM EXCAVATION - No recovery (3.00m).							
ECBF	Clayey SILT; light grey mottled light brown. Moist (No recovery, visual assessment).										0.50-3.00m - Inferred natural ground based on observation.							
			1														SWL 1.30m 7/09	
		34																
	1.30-3.00m - becomes grey (No recovery, visual assessment).											VE	0					
			2															
								RS										
			3															
	Clayey SILT; grey. Stiff, moist, low plasticity. 3.00-3.02m - sub-horizontal carbonaceous laminae.	32			11	1// 1/3/3/4						SPT	100		HQ Size, Triple Tube, Wireline Rotary Coring			
			4									HQ	100					
	4.25-4.50m - becomes very stiff										4.05-4.20m - Manual handling breaks.							
						SV: UTP					4.50m - Depth checked, correct.							
					14	4// 3/3/4/4					4.75-4.95m - Sample fell down hole after SPT test (recovered during next core run).	SPT	56					
												HQ	100					

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 24/10/23

Notes:

SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.

Started:	7/09/2023	*Finished:*	8/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/09

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1756960 E 5920075 N
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM
Project No.:	W-SL001.03	*R.L.:*	35.21 m
Location:	67-101 Vincent Street, Auckland CBD	*Datum:*	Auckland 1946

Depth: 7 m
Inclination: Vertical

GEOLOGY	MAIN DESCRIPTION / DETAIL DESCRIPTION	R.L. (m) / DEPTH (m)	GRAPHIC LOG	TESTS: SPT 'N' VALUE	TESTS: SPT BLOW COUNTS OR SHEAR VALUE	ROCK STRENGTH	ROCK WEATHERING	ROCK DEFECT SPACING	DEFECT DIP (degrees 0–90)	DEFECTS / NOTES / OTHER TESTS	CORE: SAMPLE TYPE	CORE: TCR (%)	CORE: RQD (%)	DRILLING: DRILLING METHOD	DRILLING: CASING	DRILLING: BASE OF HOLE & WATER LEVEL	INSTALLATION DETAILS
ECBF	Clayey SILT; grey. Stiff, moist, low plasticity. *(continued)*	30														SWL 5.28m 8/09	
	Silty fine to medium SAND, minor clay; grey. Medium dense, moist; Sand, well graded.										HQ	100		HQ Size, Triple Tube, Wireline Rotary Coring			
	Clayey SILT; grey. Stiff, moist, low plasticity.	6		11	SV: 138/39 kPa 3// 2/2/3/4		RS			6.00m - Depth checked, correct.	SPT	100					
	6.05-6.06m - sub-horizontal carbonaceous laminae. 6.15-6.20m - subhorizontal, parallel carbonaceous laminations.																
	Silty CLAY; grey. Stiff, moist, low plasticity. 6.40-6.99m - sub-horizontal, parallel carbonaceous laminations.										HQ	100					
		7								6.90-7.00m - Depth checked, correct.							
	END OF BOREHOLE AT 7m - Target Depth Reached	28															
		8															
		9															
		26															

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.

Started: 7/09/2023
Finished: 8/09/2023
Drilling Co.: DFNZ
Drilling Rig: Truck mounted - Rig 86
Logged by: HQ
Checked by: AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

Borehole No. BH23/09

Project:	Queen Street Diversions - Parts 1, 4 and 5	*Coordinates:*	1756960 E 5920075 N		
Client:	Watercare Service Limited	*Ref. Grid:*	NZTM	*Depth:*	7 m
Project No.:	W-SL001.03	*R.L.:*	35.21 m	*Inclination:*	Vertical
Location:	67-101 Vincent Street, Auckland CBD	*Datum:*	Auckland 1946		

PHOTOGRAPHS

Photo BH23/09.1
BOX01: 0.00 - 6.15m.

Photo BH23/09.2
BOX02: 6.15 - 7.00m.

BOREHOLE SOIL/ROCK LOG A4 - WSP W-SL001.03 MAYORAL DR LOGS.GPJ WSP-OPUS2018_TEM.GDT 24/10/23

Notes:
SV #: 1558, SV correction factor: 1.502. SV were taken in the end of the core barrel.
All SV values presented on the log are corrected values.
ECBF = East Coast Bays Formation.

Started:	7/09/2023	*Finished:*	8/09/2023
Drilling Co.:	DFNZ	*Drilling Rig:*	Truck mounted - Rig 86
Logged by:	HQ	*Checked by:*	AG

Logged in accordance with NZ Geotechnical Society Guidelines (2005). See attached key sheet for explanation of symbols.

Scale 1:25 @ A4

APPENDIX E – LABORATORY DOCUMENTATION

Watercare Services Limited
52 Aintree Ave, Māngere, Auckland, 2022
PO Box 107028, Auckland, 2150
T: 0800 522 365
clientsupport@water.co.nz
www.watercarelabs.co.nz

Certificate of Analysis
Laboratory Reference:230727-138

Attention:	Hinewai Hosford	*Final Report:*	**518183-0**
Client:	**WATERCARE SERVICES LTD**	*Report Issue Date:*	**03-Aug-2023**
Address:	-	*Received Date:*	**27-Jul-2023**
Client Reference:	**BH23 Samples - Queen Street pt4**	*Laboratory Activity Dates:*	**28-Jul-2023 - 02-Aug-2023**
Purchase Order:	**WW0001037.00.02.03**	*Quote Reference :*	**15842**

Please note: Note: Sample 230727-138-1&2 was received at the laboratory in the incorrect container for heavy metals testing. This may yield inaccurate results that do not reflect the sample composition at the time of sampling.

Sample Details		SOLIDS	SOLIDS
Lab Sample ID:		**230727-138-1**	**230727-138-2**
Client Sample ID:			
Sample Date/Time		14/07/2023	14/07/2023
Description:		BH23/02 - 0.5	BH23/02 - 1.0
Chemistry Detailed			
Polycyclic Aromatic Hydrocarbon Compounds (Dry Weight Basis) by Gas Chromatography-Mass Spectrometry(Screen level)			
Acenaphthene: Dry Weight Basis, Screen level	mg/kg	<0.011	<0.011
acenaphthylene: Dry Weight Basis, Screen level	mg/kg	0.22	<0.011
Anthracene: Dry Weight Basis, Screen level	mg/kg	0.26	<0.011
BAP Equivalent	mg/kg	2.1	0.042
Benzo(a)anthracene: Dry Weight Basis, Screen level	mg/kg	1.3	<0.011
Benzo(a)pyrene: Dry Weight Basis, Screen level	mg/kg	1.6	<0.011
Benzo(b)fluoranthene: Dry Weight Basis, Screen level	mg/kg	1.8	0.18
Benzo(ghi)perylene: Dry Weight Basis, Screen level	mg/kg	1.5	<0.011
Benzo(k)fluoranthene: Dry Weight Basis, Screen level	mg/kg	0.69	<0.011
Chrysene: Dry Weight Basis, Screen level	mg/kg	0.85	<0.011
Dibenzo(ah)anthracene: Dry Weight Basis, Screen level	mg/kg	<0.011	<0.011
Fluoranthene: Dry Weight Basis, Screen level	mg/kg	2.3	0.06
Fluorene: Dry Weight Basis, Screen level	mg/kg	0.12	<0.011
Indeno(1,2,3,c,d)pyrene: Dry Weight Basis, Screen level	mg/kg	1.3	<0.011
Naphthalene: Dry Weight Basis, Screen level	mg/kg	0.15	<0.011
Phenanthrene: Dry Weight Basis, Screen level	mg/kg	0.91	<0.011
Pyrene: Dry Weight Basis, Screen level	mg/kg	2.4	0.06
General Testing			
Total Solids	%	80.4	79.7
Metals			
Recoverable Metals by ICP-MS—Screen			
Arsenic (Recoverable Dry Wt.)	mg/kg	4.7	1.7
Cadmium (Recoverable Dry Wt.)	mg/kg	0.51	<0.1
Chromium (Recoverable Dry Wt.)	mg/kg	28	8.7
Copper (Recoverable Dry Wt.)	mg/kg	58	2.6

Sample Details (continued)		SOLIDS	SOLIDS
Lab Sample ID:		**230727-138-1**	**230727-138-2**
Client Sample ID:			
Sample Date/Time:		14/07/2023	14/07/2023
Description:		BH23/02 - 0.5	BH23/02 - 1.0
Metals			
Recoverable Metals by ICP-MS—Screen			
Lead (Recoverable Dry Wt.)	mg/kg	200	6.5
Mercury (Recoverable Dry Wt.)	mg/kg	0.53	<0.05
Nickel (Recoverable Dry Wt.)	mg/kg	62	1.3
Zinc (Recoverable Dry Wt.)	mg/kg	350	<7.5
Organics			
TPH			
C10-C14 (Total: Dry Weight Basis)	mg/kg	25	24
C15-C36 (Total: Dry Weight Basis)	mg/kg	160	530
C7-C9 (Total: Dry Weight Basis)	mg/kg	<20	<20
TPH-Total (Total: Dry Weight Basis)	mg/kg	190	560
Subcontracting			
Asbestos		-	Report attached *

*Results marked with * are not accredited to International Accreditation New Zealand. A dash indicates no test performed.*

Where samples have been supplied by the client, they are tested as received.

The results of analysis contained in this report relate only to the sample(s) tested. Where sample collection was performed by the laboratory, the results of analysis contained in this report relate only to the sample(s) collected.

Reference Methods

The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
Chemistry Detailed				
Polycyclic Aromatic Hydrocarbon Compounds (Dry Weight Basis) by Gas Chromatography-Mass Spectrometry(Screen level)				
Acenaphthene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
acenaphthylene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Anthracene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
BAP Equivalent	USEPA 8270	0.01 mg/kg	All	Auckland
Benzo(a)anthracene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Benzo(a)pyrene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Benzo(b)fluoranthene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Benzo(ghi)perylene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Benzo(k)fluoranthene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Chrysene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Dibenzo(ah)anthracene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Fluoranthene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Fluorene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Indeno(1,2,3,c,d)pyrene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Naphthalene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Phenanthrene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
Pyrene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	All	Auckland
General Testing				
Total Solids by Gravimetry	APHA (online edition) 2540 G	%	All	Auckland
Metals				
Recoverable Metals by ICP-MS—Screen				
Arsenic (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.2 mg/kg	All	Auckland
Cadmium (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.1 mg/kg	All	Auckland
Chromium (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.2 mg/kg	All	Auckland
Copper (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.5 mg/kg	All	Auckland
Lead (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.04 mg/kg	All	Auckland
Mercury (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.05 mg/kg	All	Auckland
Nickel (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.3 mg/kg	All	Auckland
Zinc (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	7.5 mg/kg	All	Auckland
Organics				
TPH				
C10-C14 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	All	Auckland
C15-C36 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	All	Auckland
C7-C9 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	All	Auckland
TPH-Total (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	30 mg/kg	All	Auckland

Subcontracting			
Asbestos	As per Subcontractor Method	2	See attached
Preparations			
Accelerated Solvent Extraction (ASE)	USEPA 8270	All	Auckland
Accelerated Solvent Extraction (ASE)	Extraction DCM,Gc-FID	All	Auckland
Digest for Recoverable Metals in Solids	US EPA 200.8 (1:1 Nitric:Hydrochloric Acid)	All	Auckland
Drying and Milling	US EPA 200.8	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Compliance and Projects Manager.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited .

Chandra Sharma

KTP Signatory

Anel Du Preez

KTP Signatory

John Chang

KTP Signatory

Stephen Money

KTP - Chemistry

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-105585	Certificate Issue Date:	1/08/2023
Date Received:	01/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	01/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Opus Auckland		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

The results in this certificate relate only to the samples as received. Dowdell and Associates Ltd cannot be held responsible for sampling errors or validity of results where samples have been submitted by external clients.

NOTE: This report must not be altered, or reproduced, except in full.

ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-105585**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
322423	230727-138-2 8635499 BH23/02-1.0 Soil SQ	No Asbestos Detected	As received	630.0		Weight (g)	%
			>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	0.0	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	81.4	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	81.4	Fibrous asbestos+ Asbestos fines	–	< 0.001

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

The analysis performed are in accordance with the terms set by the International Accreditation New Zealand (IANZ). The defined detection limit in AS 4964-2004 is 0.01% w/w. Any results obtained under the detection limit are not accredited.

*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

Watercare Services Limited
52 Aintree Ave, Māngere, Auckland, 2022
PO Box 107028, Auckland, 2150
T: 0800 522 365
clientsupport@water.co.nz
www.watercarelabs.co.nz

Certificate of Analysis
Laboratory Reference:230724-124

Attention:	Hinewai Hosford	*Final Report:*	**518025-0**
Client:	**WATERCARE SERVICES LTD**	*Report Issue Date:*	**01-Aug-2023**
Address:	-	*Received Date:*	**25-Jul-2023**
Client Reference:	**BH23 Samples**	*Laboratory Activity Dates:*	**26-Jul-2023 - 01-Aug-2023**
Purchase Order:	**WW0001037.00.02.03**	*Quote Reference :*	**15842**

Sample Details		SOLIDS	SOLIDS
Lab Sample ID:		**230724-124-1**	**230724-124-2**
Client Sample ID:			
Sample Date/Time		20/07/2023	20/07/2023
Description:		BH23/03 - 1.5	BH23/03 - 2.0
General Testing			
Total Solids	%	62.5	70.6
Metals			
Recoverable Metals by ICP-MS—Trace			
Arsenic (Recoverable Dry Wt.)	mg/kg	1.7	1.0
Cadmium (Recoverable Dry Wt.)	mg/kg	<0.092	<0.089
Chromium (Recoverable Dry Wt.)	mg/kg	8.1	8.1
Copper (Recoverable Dry Wt.)	mg/kg	13	6.4
Lead (Recoverable Dry Wt.)	mg/kg	5.4	5.3
Mercury (Recoverable Dry Wt.)	mg/kg	<0.046	<0.045
Nickel (Recoverable Dry Wt.)	mg/kg	1.7	1.4
Zinc (Recoverable Dry Wt.)	mg/kg	<6.9	7.9
Organics			
TPH			
C10-C14 (Total: Dry Weight Basis)	mg/kg	<20	<20
C15-C36 (Total: Dry Weight Basis)	mg/kg	32	<20
C7-C9 (Total: Dry Weight Basis)	mg/kg	<20	<20
TPH-Total (Total: Dry Weight Basis)	mg/kg	32	<30
Subcontracting			
Asbestos		Report attached *	Report attached *

*Results marked with * are not accredited to International Accreditation New Zealand. A dash indicates no test performed.*

Where samples have been supplied by the client, they are tested as received.

The results of analysis contained in this report relate only to the sample(s) tested. Where sample collection was performed by the laboratory, the results of analysis contained in this report relate only to the sample(s) collected.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Total Solids by Gravimetry	APHA (online edition) 2540 G	%	All	Auckland
Metals				
Recoverable Metals by ICP-MS—Trace				
Arsenic (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.02 mg/kg	All	Auckland
Cadmium (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.01 mg/kg	All	Auckland
Chromium (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.05 mg/kg	All	Auckland
Copper (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.05 mg/kg	All	Auckland
Lead (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.03 mg/kg	All	Auckland
Mercury (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.005 mg/kg	All	Auckland
Nickel (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.05 mg/kg	All	Auckland
Zinc (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.75 mg/kg	All	Auckland
Organics				
TPH				

Organics				
TPH				
C10-C14 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	All	Auckland
C15-C36 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	All	Auckland
C7-C9 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	All	Auckland
TPH-Total (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	30 mg/kg	All	Auckland
Subcontracting				
Asbestos	As per Subcontractor Method		All	See attached
Preparations				
Accelerated Solvent Extraction (ASE)	Extraction DCM,Gc-FID		All	Auckland
Digest for Recoverable Metals in Solids	US EPA 200.8 (1:1 Nitric:Hydrochloric Acid)		All	Auckland
Drying and Milling	US EPA 200.8		All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Compliance and Projects Manager.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited .

Chandra Sharma

KTP Signatory

Anel Du Preez

KTP Signatory

Peter Boniface

KTP Signatory

Stephen Money

KTP - Chemistry

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-105538	Certificate Issue Date:	28/07/2023
Date Received:	27/07/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	28/07/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Opus Auckland		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

The results in this certificate relate only to the samples as received. Dowdell and Associates Ltd cannot be held responsible for sampling errors or validity of results where samples have been submitted by external clients.

NOTE: This report must not be altered, or reproduced, except in full.

ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-105538**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
322328	230724-124-2 8627156 BH23/03-2.0 Soil SQ	No Asbestos Detected	As received	198.0		Weight (g)	%
			>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	0.0	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	90.3	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	90.3	Fibrous asbestos+ Asbestos fines	–	< 0.001

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

The analysis performed are in accordance with the terms set by the International Accreditation New Zealand (IANZ). The defined detection limit in AS 4964-2004 is 0.01% w/w. Any results obtained under the detection limit are not accredited.

*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

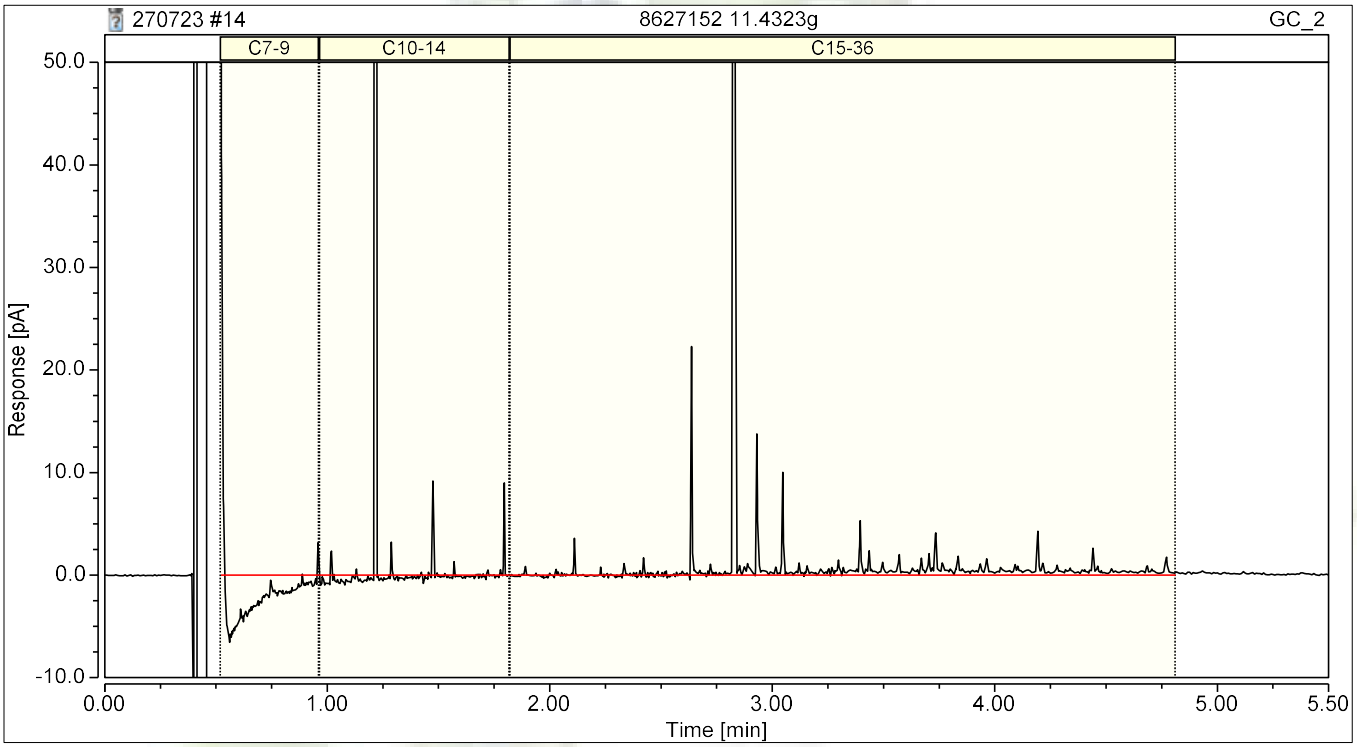
0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

Chromatogram and Results

Injection Details

Injection Name:	**8627152 11.4323g**	*Run Time (min):*	**7.42**
Vial Number:	**45**	*Injection Volume:*	**2.00**
Injection Type:	**Unknown**	*Channel:*	**GC_2**
Calibration Level:		*Wavelength:*	**n.a.**
Instrument Method:	**tph_running_agilent_H2carrier**	*Bandwidth:*	**n.a.**
Processing Method:	**OC51_TPH_soil_cal (agilent) 230706**	*Dilution Factor:*	**1.0000**
Injection Date/Time:	**28/Jul/23 02:03**	*Sample Weight:*	**1.0000**

Chromatogram



No	Peak Name	Retention time min	Area pA*min	Amount ug	Comment
1	C7-9	0.52	0.652	143.10	
2	Surrogate 1	1.22	1.691		
3	C10-14	1.22	1.589	-19.27	
4	Surrogate 2	2.83	2.558		
5	C15-36	2.83	3.840	230.18	

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-105464	Certificate Issue Date:	28/07/2023
Date Received:	27/07/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	28/07/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Opus Auckland		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

The results in this certificate relate only to the samples as received. Dowdell and Associates Ltd cannot be held responsible for sampling errors or validity of results where samples have been submitted by external clients.

NOTE: This report must not be altered, or reproduced, except in full.

ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-105464**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
322162	230724-124-1 8627153 BH23/03-1.5 Soil SQ	No Asbestos Detected	As received	132.0		Weight (g)	%
			>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	30.9	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	90.1	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	121.0	Fibrous asbestos+ Asbestos fines	–	< 0.001

ACCREDITED IANZ TESTING LABORATORY

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

The analysis performed are in accordance with the terms set by the International Accreditation New Zealand (IANZ). The defined detection limit in AS 4964-2004 is 0.01% w/w. Any results obtained under the detection limit are not accredited.

*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

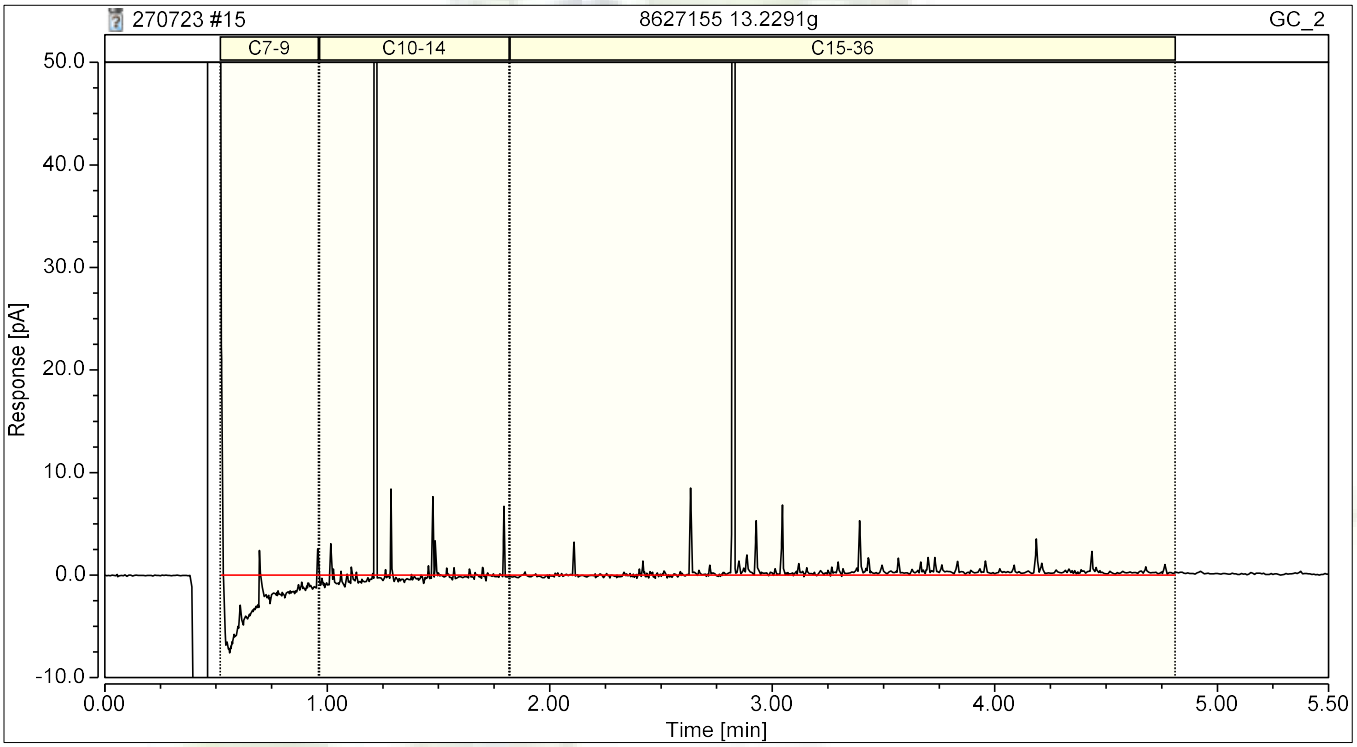
0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

Chromatogram and Results

Injection Details

Injection Name:	**8627155 13.2291g**	*Run Time (min):*	**7.42**
Vial Number:	**46**	*Injection Volume:*	**2.00**
Injection Type:	**Unknown**	*Channel:*	**GC_2**
Calibration Level:		*Wavelength:*	**n.a.**
Instrument Method:	**tph_running_agilent_H2carrier**	*Bandwidth:*	**n.a.**
Processing Method:	**OC51_TPH_soil_cal (agilent) 230706**	*Dilution Factor:*	**1.0000**
Injection Date/Time:	**28/Jul/23 02:19**	*Sample Weight:*	**1.0000**

Chromatogram



No	Peak Name	Retention time min	Area pA*min	Amount ug	Comment
1	C7-9	0.52	0.980	215.34	
2	Surrogate 1	1.22	1.902		
3	C10-14	1.22	1.813	-16.79	
4	Surrogate 2	2.83	2.937		
5	C15-36	2.83	3.817	158.00	

Watercare Services Limited
52 Aintree Ave, Māngere, Auckland, 2022
PO Box 107028, Auckland, 2150
T: 0800 522 365
clientsupport@water.co.nz
www.watercarelabs.co.nz

Certificate of Analysis
Laboratory Reference:230822-140

Attention:	Megan Baddiley	*Final Report:*	**521669-0**
Client:	**WATERCARE SERVICES LTD**	*Report Issue Date:*	**05-Sep-2023**
Address:	-	*Received Date:*	**22-Aug-2023**
Client Reference:	**Queen Street/Mayoral Dr - Part 1, 4, 5**	*Laboratory Activity Dates:*	**28-Aug-2023 - 05-Sep-2023**
Purchase Order:	**WW0001037.00.02.03**	*Quote Reference :*	**15842**

Sample Details		SOLIDS	SOLIDS	SOLIDS	SOLIDS
Lab Sample ID:		**230822-140-1**	**230822-140-2**	**230822-140-3**	**230822-140-4**
Client Sample ID:					
Sample Date/Time		21/08/2023	21/08/2023	21/08/2023	21/08/2023
Description:		BH23/07-0.8	BH23/07-1.0	BH23/07-1.5	BH23/07-2.0
General Testing					
Total Solids	%	-	72.6	72.3	70.6
Metals					
Recoverable Metals by ICP-MS—Trace					
Arsenic (Recoverable Dry Wt.)	mg/kg	-	0.41	1.0	0.37
Cadmium (Recoverable Dry Wt.)	mg/kg	-	<0.092	<0.088	<0.088
Chromium (Recoverable Dry Wt.)	mg/kg	-	6.0	6.4	6.1
Copper (Recoverable Dry Wt.)	mg/kg	-	2.1	3.4	2.7
Lead (Recoverable Dry Wt.)	mg/kg	-	6.7	4.4	4.9
Mercury (Recoverable Dry Wt.)	mg/kg	-	0.15	<0.044	<0.044
Nickel (Recoverable Dry Wt.)	mg/kg	-	0.93	1.3	0.51
Zinc (Recoverable Dry Wt.)	mg/kg	-	<6.9	<6.6	<6.6
Organics					
TPH					
C10-C14 (Total: Dry Weight Basis)	mg/kg	-	<20	<20	<20
C15-C36 (Total: Dry Weight Basis)	mg/kg	-	<20	42	<20
C7-C9 (Total: Dry Weight Basis)	mg/kg	-	<20	<20	<20
TPH-Total (Total: Dry Weight Basis)	mg/kg	-	<30	42	<30
Subcontracting					
Asbestos		Report attached *	Report attached *	Report attached *	-
Hill Laboratories Miscellaneous Test		Report attached *	-	-	-

Sample Details		SOLIDS	SOLIDS	SOLIDS	SOLIDS
Lab Sample ID:		**230822-140-5**	**230822-140-6**	**230822-140-7**	**230822-140-8**
Client Sample ID:					
Sample Date/Time		21/08/2023	21/08/2023	21/08/2023	22/08/2023
Description:		BH23/06-0.5	BH23/06-1.0	BH23/06-1.5	BH23/06-2.0
Chemistry Detailed					
Polycyclic Aromatic Hydrocarbon Compounds (Dry Weight Basis) by Gas Chromatography-Mass Spectrometry(Screen level)					
Acenaphthene: Dry Weight Basis, Screen level	mg/kg	-	0.19	-	0.11
acenaphthylene: Dry Weight Basis, Screen level	mg/kg	-	0.17	-	0.04
Anthracene: Dry Weight Basis, Screen level	mg/kg	-	3.1	-	2.1
BAP Equivalent	mg/kg	-	3.5	-	1.7
Benzo(a)anthracene: Dry Weight Basis, Screen level	mg/kg	-	2.0	-	0.87
Benzo(a)pyrene: Dry Weight Basis, Screen level	mg/kg	-	2.8	-	1.3
Benzo(b)fluoranthene: Dry Weight Basis, Screen level	mg/kg	-	2.5	-	1.4

Sample Details (continued)		SOLIDS	SOLIDS	SOLIDS	SOLIDS
Lab Sample ID:		**230822-140-5**	**230822-140-6**	**230822-140-7**	**230822-140-8**
Client Sample ID:					
Sample Date/Time:		21/08/2023	21/08/2023	21/08/2023	22/08/2023
Description:		BH23/06-0.5	BH23/06-1.0	BH23/06-1.5	BH23/06-2.0
Chemistry Detailed					
Polycyclic Aromatic Hydrocarbon Compounds (Dry Weight Basis) by Gas Chromatography-Mass Spectrometry(Screen level)					
Benzo(ghi)perylene: Dry Weight Basis, Screen level	mg/kg	-	2.2	-	1.2
Benzo(k)fluoranthene: Dry Weight Basis, Screen level	mg/kg	-	1.3	-	0.52
Chrysene: Dry Weight Basis, Screen level	mg/kg	-	2.0	-	0.87
Dibenzo(ah)anthracene: Dry Weight Basis, Screen level	mg/kg	-	<0.01	-	<0.01
Fluoranthene: Dry Weight Basis, Screen level	mg/kg	-	3.1	-	2.1
Fluorene: Dry Weight Basis, Screen level	mg/kg	-	0.63	-	0.3
Indeno(1,2,3,c,d)pyrene: Dry Weight Basis, Screen level	mg/kg	-	2.9	-	1.4
Naphthalene: Dry Weight Basis, Screen level	mg/kg	-	0.14	-	0.07
Phenanthrene: Dry Weight Basis, Screen level	mg/kg	-	1.7	-	0.71
Pyrene: Dry Weight Basis, Screen level	mg/kg	-	3.3	-	2.2
General Testing					
Total Solids	%	-	76.9	-	80.9
Metals					
Recoverable Metals by ICP-MS—Trace					
Arsenic (Recoverable Dry Wt.)	mg/kg	-	3.3	-	3.6
Cadmium (Recoverable Dry Wt.)	mg/kg	-	0.51	-	0.19
Chromium (Recoverable Dry Wt.)	mg/kg	-	18	-	15
Copper (Recoverable Dry Wt.)	mg/kg	-	34	-	120
Lead (Recoverable Dry Wt.)	mg/kg	-	140	-	100
Mercury (Recoverable Dry Wt.)	mg/kg	-	0.19	-	0.13
Nickel (Recoverable Dry Wt.)	mg/kg	-	34	-	29
Zinc (Recoverable Dry Wt.)	mg/kg	-	130	-	130
Organics					
TPH					
C10-C14 (Total: Dry Weight Basis)	mg/kg	-	<20	-	<20
C15-C36 (Total: Dry Weight Basis)	mg/kg	-	100	-	220
C7-C9 (Total: Dry Weight Basis)	mg/kg	-	<20	-	<20
TPH-Total (Total: Dry Weight Basis)	mg/kg	-	100	-	220
Subcontracting					
Asbestos		Report attached *	Report attached *	Report attached *	Report attached *
Hill Laboratories Miscellaneous Test		Report attached *	-	Report attached *	-

Sample Details		SOLIDS	SOLIDS
Lab Sample ID:		**230822-140-9**	**230822-140-10**
Client Sample ID:			
Sample Date/Time		22/08/2023	22/08/2023
Description:		BH23/06-2.5	BH23/06-3.0
Chemistry Detailed			
Polycyclic Aromatic Hydrocarbon Compounds (Dry Weight Basis) by Gas Chromatography-Mass Spectrometry(Screen level)			
Acenaphthene: Dry Weight Basis, Screen level	mg/kg	-	<0.011
acenaphthylene: Dry Weight Basis, Screen level	mg/kg	-	<0.011
Anthracene: Dry Weight Basis, Screen level	mg/kg	-	0.05
BAP Equivalent	mg/kg	-	0.12
Benzo(a)anthracene: Dry Weight Basis, Screen level	mg/kg	-	0.08
Benzo(a)pyrene: Dry Weight Basis, Screen level	mg/kg	-	0.08

Sample Details (continued)		SOLIDS	SOLIDS
Lab Sample ID:		**230822-140-9**	**230822-140-10**
Client Sample ID:			
Sample Date/Time:		22/08/2023	22/08/2023
Description:		BH23/06-2.5	BH23/06-3.0
Chemistry Detailed			
Polycyclic Aromatic Hydrocarbon Compounds (Dry Weight Basis) by Gas Chromatography-Mass Spectrometry(Screen level)			
Benzo(b)fluoranthene: Dry Weight Basis, Screen level	mg/kg	-	0.07
Benzo(ghi)perylene: Dry Weight Basis, Screen level	mg/kg	-	0.09
Benzo(k)fluoranthene: Dry Weight Basis, Screen level	mg/kg	-	<0.011
Chrysene: Dry Weight Basis, Screen level	mg/kg	-	<0.011
Dibenzo(ah)anthracene: Dry Weight Basis, Screen level	mg/kg	-	<0.011
Fluoranthene: Dry Weight Basis, Screen level	mg/kg	-	0.05
Fluorene: Dry Weight Basis, Screen level	mg/kg	-	<0.011
Indeno(1,2,3,c,d)pyrene: Dry Weight Basis, Screen level	mg/kg	-	0.14
Naphthalene: Dry Weight Basis, Screen level	mg/kg	-	<0.011
Phenanthrene: Dry Weight Basis, Screen level	mg/kg	-	<0.011
Pyrene: Dry Weight Basis, Screen level	mg/kg	-	0.05
General Testing			
Total Solids	%	-	69.2
Metals			
Recoverable Metals by ICP-MS—Trace			
Arsenic (Recoverable Dry Wt.)	mg/kg	-	1.9
Cadmium (Recoverable Dry Wt.)	mg/kg	-	<0.089
Chromium (Recoverable Dry Wt.)	mg/kg	-	9.2
Copper (Recoverable Dry Wt.)	mg/kg	-	6.6
Lead (Recoverable Dry Wt.)	mg/kg	-	7.0
Mercury (Recoverable Dry Wt.)	mg/kg	-	<0.044
Nickel (Recoverable Dry Wt.)	mg/kg	-	0.87
Zinc (Recoverable Dry Wt.)	mg/kg	-	9.9
Organics			
TPH			
C10-C14 (Total: Dry Weight Basis)	mg/kg	-	<20
C15-C36 (Total: Dry Weight Basis)	mg/kg	-	<20
C7-C9 (Total: Dry Weight Basis)	mg/kg	-	<20
TPH-Total (Total: Dry Weight Basis)	mg/kg	-	<30
Subcontracting			
Asbestos		Report attached *	Report attached *
Hill Laboratories Miscellaneous Test		Report attached *	-

*Results marked with * are not accredited to International Accreditation New Zealand. A dash indicates no test performed.*

Where samples have been supplied by the client, they are tested as received.
The results of analysis contained in this report relate only to the sample(s) tested. Where sample collection was performed by the laboratory, the results of analysis contained in this report relate only to the sample(s) collected.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
Chemistry Detailed				
Polycyclic Aromatic Hydrocarbon Compounds (Dry Weight Basis) by Gas Chromatography-Mass Spectrometry(Screen level)				
Acenaphthene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
acenaphthylene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Anthracene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
BAP Equivalent	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Benzo(a)anthracene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Benzo(a)pyrene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Benzo(b)fluoranthene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland

Chemistry Detailed				
Polycyclic Aromatic Hydrocarbon Compounds (Dry Weight Basis) by Gas Chromatography-Mass Spectrometry(Screen level)				
Benzo(ghi)perylene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Benzo(k)fluoranthene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Chrysene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Dibenzo(ah)anthracene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Fluoranthene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Fluorene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Indeno(1,2,3,c,d)pyrene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Naphthalene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Phenanthrene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
Pyrene: Dry Weight Basis, Screen level	USEPA 8270	0.01 mg/kg	6, 8, 10	Auckland
General Testing				
Total Solids by Gravimetry	APHA (online edition) 2540 G	%	2, 3, 4, 6, 8, 10	Auckland
Metals				
Recoverable Metals by ICP-MS—Trace				
Arsenic (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.02 mg/kg	2, 3, 4, 6, 8, 10	Auckland
Cadmium (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.01 mg/kg	2, 3, 4, 6, 8, 10	Auckland
Chromium (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.05 mg/kg	2, 3, 4, 6, 8, 10	Auckland
Copper (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.05 mg/kg	2, 3, 4, 6, 8, 10	Auckland
Lead (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.03 mg/kg	2, 3, 4, 6, 8, 10	Auckland
Mercury (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.005 mg/kg	2, 3, 4, 6, 8, 10	Auckland
Nickel (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.05 mg/kg	2, 3, 4, 6, 8, 10	Auckland
Zinc (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.75 mg/kg	2, 3, 4, 6, 8, 10	Auckland
Organics				
TPH				
C10-C14 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	2, 3, 4, 6, 8, 10	Auckland
C15-C36 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	2, 3, 4, 6, 8, 10	Auckland
C7-C9 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	2, 3, 4, 6, 8, 10	Auckland
TPH-Total (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	30 mg/kg	2, 3, 4, 6, 8, 10	Auckland
Subcontracting				
Asbestos	As per Subcontractor Method		1, 2, 3, 5, 6, 7, 8, 9, 10	See attached
Hill Laboratories Miscellaneous Test	As per Subcontractor Method		1, 5, 7, 9	See attached
Preparations				
Accelerated Solvent Extraction (ASE)	USEPA 8270		6, 8, 10	Auckland
Accelerated Solvent Extraction (ASE)	Extraction DCM,Gc-FID		2, 3, 4, 6, 8, 10	Auckland
Digest for Recoverable Metals in Solids	US EPA 200.8 (1:1 Nitric:Hydrochloric Acid)		2, 3, 4, 6, 8, 10	Auckland
Drying and Milling	US EPA 200.8		2, 3, 4, 6, 8, 10	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Compliance and Projects Manager.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited .

Chandra Sharma

KTP Signatory

Anel Du Preez

KTP Signatory

John Chang

KTP Signatory

Stephen Money

KTP - Chemistry

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106262	Certificate Issue Date:	28/08/2023
Date Received:	24/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	28/08/2023		
Analyst:	Navneet Kaur		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Queen Street - Mayoral Drive, Auckland 1010		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

The results in this certificate relate only to the samples as received. Dowdell and Associates Ltd cannot be held responsible for sampling errors or validity of results where samples have been submitted by external clients.

NOTE: This report must not be altered, or reproduced, except in full.

ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Navneet Kaur	Name: Navneet Kaur	
Approved By:		KTP: Stephanie Saavedra	

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106262**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
324047	8689148 230822-140-1 BH23/07-0.8 Soil	Chrysotile (White Asbestos)	As received	721.0		Weight (g)	%
			>10 mm fraction	14.9	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	171.4	Fibrous asbestos (>2 mm)	0.01210	0.0054
			<2 mm fraction (subsampled)	35.9	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	222.2	Fibrous asbestos+ Asbestos fines	0.01210	0.0054

ACCREDITED IANZ TESTING LABORATORY

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

The analysis performed are in accordance with the terms set by the International Accreditation New Zealand (IANZ). The defined detection limit in AS 4964-2004 is 0.01% w/w. Any results obtained under the detection limit are not accredited.

*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106266	Certificate Issue Date:	28/08/2023
Date Received:	24/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	28/08/2023		
Analyst:	Navneet Kaur		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Queen Street - Mayoral Drive, Auckland 1010		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

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ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Navneet Kaur	Name: Navneet Kaur	
Approved By:		KTP: Stephanie Saavedra	

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106266**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
			As received	551.0		Weight (g)	%
324051	8689151 230822-140-2 BH23/07-1.0 Soil	No Asbestos Detected	>10 mm fraction	166.6	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	150.3	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	30.2	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	347.1	Fibrous asbestos+ Asbestos fines	–	< 0.001

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

The analysis performed are in accordance with the terms set by the International Accreditation New Zealand (IANZ). The defined detection limit in AS 4964-2004 is 0.01% w/w. Any results obtained under the detection limit are not accredited.

*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
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ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106267	Certificate Issue Date:	28/08/2023
Date Received:	24/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	28/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Queen Street - Mayoral Drive, Auckland 1010		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

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Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106267**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
			As received	703.0		Weight (g)	%
324052	8689154 230822-140-3 BH23/07-1.5 Soil	No Asbestos Detected	>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	0.0	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	80.3	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	80.3	Fibrous asbestos+ Asbestos fines	–	< 0.001

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106268	Certificate Issue Date:	28/08/2023
Date Received:	24/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	28/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Queen Street - Mayoral Drive, Auckland 1010		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

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ACCREDITED IANZ TESTING LABORATORY

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Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106268**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
324054	8689159 230822-140-5 BH23/06-0.5 Soil	Chrysotile (White Asbestos)	As received	848.0		Weight (g)	%
			>10 mm fraction	32.5	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	57.7	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	78.6	Asbestos fines (<2 mm)	0.00064	< 0.001
			Total analysed	168.8	Fibrous asbestos+ Asbestos fines	0.00064	< 0.001

ACCREDITED IANZ TESTING LABORATORY

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106269	Certificate Issue Date:	28/08/2023
Date Received:	24/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	28/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Queen Street - Mayoral Drive, Auckland 1010		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

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Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106269**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
			As received	703.0		Weight (g)	%
324055	8689162 230822-140-6 BH23/06-1.0 Soil	No Asbestos Detected	>10 mm fraction	11.4	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	92.6	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	70.8	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	174.8	Fibrous asbestos+ Asbestos fines	–	< 0.001

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106270	Certificate Issue Date:	28/08/2023
Date Received:	24/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	28/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Queen Street - Mayoral Drive, Auckland 1010		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

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ACCREDITED IANZ TESTING LABORATORY

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Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106270**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
324056	8689165 230822-140-7 BH23/06-1.5 Soil	Chrysotile (White Asbestos)	As received	709.0		Weight (g)	%
			>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	83.6	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	61.5	Asbestos fines (<2 mm)	0.00012	< 0.001
			Total analysed	145.1	Fibrous asbestos+ Asbestos fines	0.00012	< 0.001

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106271	Certificate Issue Date:	28/08/2023
Date Received:	24/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	28/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Queen Street - Mayoral Drive, Auckland 1010		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

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Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106271**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
			As received	531.0		Weight (g)	%
324060	8689168 230822-140-8 BH23/06-2.0 Soil	No Asbestos Detected	>10 mm fraction	14.8	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	70.5	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	61.1	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	146.4	Fibrous asbestos+ Asbestos fines	–	< 0.001

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Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106272	Certificate Issue Date:	28/08/2023
Date Received:	24/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	28/08/2023		
Analyst:	Navneet Kaur		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Queen Street - Mayoral Drive, Auckland 1010		

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- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

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Analyst: Navneet Kaur	Name: Navneet Kaur
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106272**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
			As received	789.0		Weight (g)	%
			>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
324061	8689171 230822-140-9 BH23/06-2.5 Soil	Chrysotile (White Asbestos)	>2 mm fraction	87.8	Fibrous asbestos (>2 mm)	0.00146	< 0.001
			<2 mm fraction (subsampled)	79.2	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	167.0	Fibrous asbestos+ Asbestos fines	0.00146	< 0.001

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Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106263	Certificate Issue Date:	28/08/2023
Date Received:	24/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	28/08/2023		
Analyst:	Navneet Kaur		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	Queen Street - Mayoral Drive, Auckland 1010		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

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Analyst:	Navneet Kaur	Name: Navneet Kaur	
Approved By:		KTP: Stephanie Saavedra	

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106263**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
324048	8689174 230822-140-10 BH23/06-3.0 Soil	No Asbestos Detected	As received	705.0		Weight (g)	%
			>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	87.7	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	63.8	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	151.5	Fibrous asbestos+ Asbestos fines	–	< 0.001

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

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0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

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

Certificate of Analysis

Client:	Watercare Services Limited	**Lab No:**	3353149	SSSEP-1v1
Contact:	Mikayla Frisby	**Date Received:**	30-Aug-2023	
	PO Box 107028	**Date Reported:**	04-Sep-2023	
	Airport Oaks	**Quote No:**	126119	
	Auckland 2150	**Order No:**	410043309	
		Client Reference:	230822-140	
		Submitted By:	Mikayla Frisby	

Sample Type: Soil

Sample Name:		230822-140-1 21-Aug-2023
Lab Number:		3353149.1
Individual Tests		
Dry Matter	g/100g as rcvd	85
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	3
Total Recoverable Cadmium	mg/kg dry wt	0.11
Total Recoverable Chromium	mg/kg dry wt	34
Total Recoverable Copper	mg/kg dry wt	60
Total Recoverable Lead	mg/kg dry wt	55
Total Recoverable Mercury	mg/kg dry wt	0.12
Total Recoverable Nickel	mg/kg dry wt	93
Total Recoverable Zinc	mg/kg dry wt	78
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80

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%.	-	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
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1
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

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	1

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

Testing was completed between 30-Aug-2023 and 01-Sep-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Martin Cowell - BSc
Client Services Manager - Environmental

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

Certificate of Analysis

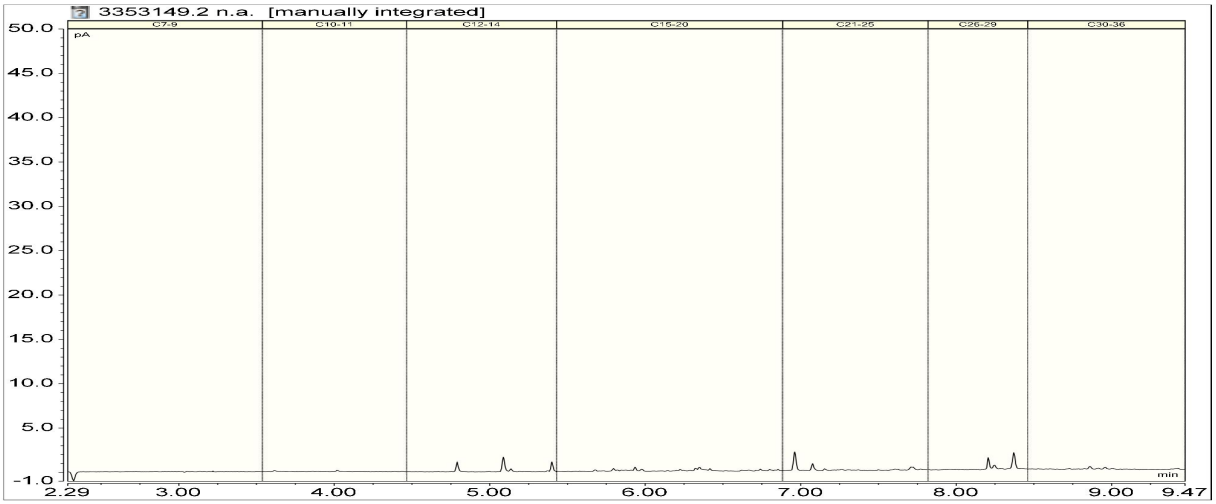
Client:	Watercare Services Limited	**Lab No:**	3353149	SSSEP-2v1
Contact:	Mikayla Frisby PO Box 107028 Airport Oaks Auckland 2150	**Date Received:**	30-Aug-2023	
		Date Reported:	04-Sep-2023	
		Quote No:	126119	
		Order No:	410043309	
		Client Reference:	230822-140	
		Submitted By:	Mikayla Frisby	

Sample Type: Soil

Sample Name:		230822-140-5 21-Aug-2023
Lab Number:		3353149.2
Individual Tests		
Dry Matter	g/100g as rcvd	80
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	4
Total Recoverable Cadmium	mg/kg dry wt	0.38
Total Recoverable Chromium	mg/kg dry wt	19
Total Recoverable Copper	mg/kg dry wt	47
Total Recoverable Lead	mg/kg dry wt	166
Total Recoverable Mercury	mg/kg dry wt	0.21
Total Recoverable Nickel	mg/kg dry wt	21
Total Recoverable Zinc	mg/kg dry wt	1,340
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	6.4
1-Methylnaphthalene	mg/kg dry wt	< 0.012
2-Methylnaphthalene	mg/kg dry wt	< 0.012
Acenaphthylene	mg/kg dry wt	0.057
Acenaphthene	mg/kg dry wt	0.022
Anthracene	mg/kg dry wt	0.107
Benzo[a]anthracene	mg/kg dry wt	0.47
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.56
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.82
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.81
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.62
Benzo[e]pyrene	mg/kg dry wt	0.34
Benzo[g,h,i]perylene	mg/kg dry wt	0.40
Benzo[k]fluoranthene	mg/kg dry wt	0.21
Chrysene	mg/kg dry wt	0.36
Dibenzo[a,h]anthracene	mg/kg dry wt	0.081
Fluoranthene	mg/kg dry wt	0.97
Fluorene	mg/kg dry wt	0.035
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.39
Naphthalene	mg/kg dry wt	< 0.06
Perylene	mg/kg dry wt	0.118
Phenanthrene	mg/kg dry wt	0.45
Pyrene	mg/kg dry wt	1.16

Sample Type: Soil		
Sample Name:		230822-140-5 21-Aug-2023
Lab Number:		3353149.2
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	52
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80

3353149.2
230822-140-5 21-Aug-2023
Client Chromatogram for TPH by FID



Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	2
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	2
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	2
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	2
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	2
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2
Total Petroleum Hydrocarbons in Soil			

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	2
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	2
C10 - C14	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	20 mg/kg dry wt	2
C15 - C36	Solvent extraction, GC-FID analysis. Tested on as received sample. In-house based on US EPA 8015.	40 mg/kg dry wt	2
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	70 mg/kg dry wt	2

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

Testing was completed between 30-Aug-2023 and 04-Sep-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Client Services Manager - Environmental

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

Certificate of Analysis

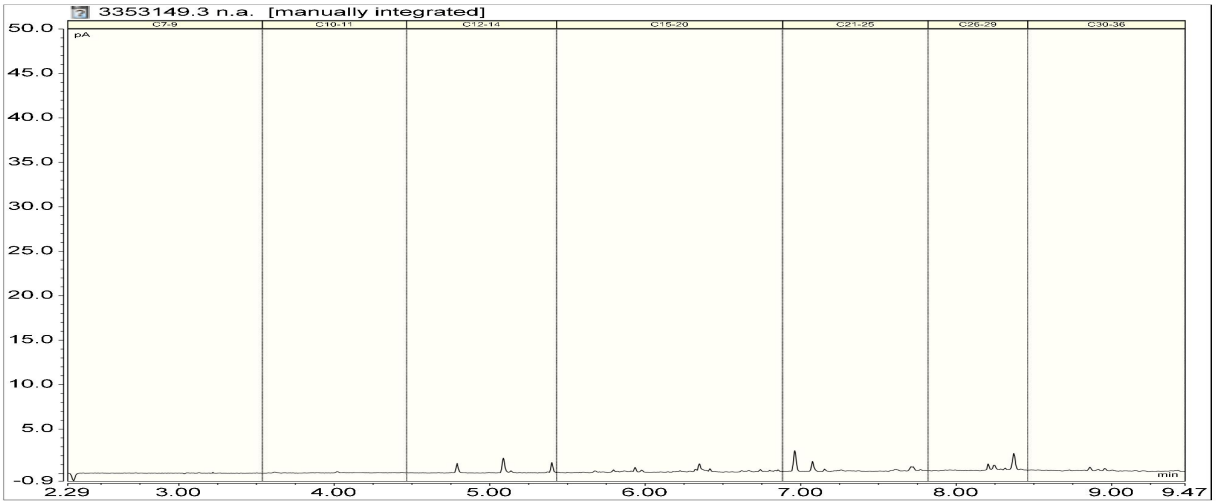
Client:	Watercare Services Limited	**Lab No:**	3353149	SSSEP-3v1
Contact:	Mikayla Frisby	**Date Received:**	30-Aug-2023	
	PO Box 107028	**Date Reported:**	04-Sep-2023	
	Airport Oaks	**Quote No:**	126119	
	Auckland 2150	**Order No:**	410043309	
		Client Reference:	230822-140	
		Submitted By:	Mikayla Frisby	

Sample Type: Soil

Sample Name:		230822-140-7 21-Aug-2023
Lab Number:		3353149.3
Individual Tests		
Dry Matter	g/100g as rcvd	79
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	3
Total Recoverable Cadmium	mg/kg dry wt	0.14
Total Recoverable Chromium	mg/kg dry wt	19
Total Recoverable Copper	mg/kg dry wt	30
Total Recoverable Lead	mg/kg dry wt	89
Total Recoverable Mercury	mg/kg dry wt	0.51
Total Recoverable Nickel	mg/kg dry wt	23
Total Recoverable Zinc	mg/kg dry wt	99
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	9.6
1-Methylnaphthalene	mg/kg dry wt	< 0.013
2-Methylnaphthalene	mg/kg dry wt	0.014
Acenaphthylene	mg/kg dry wt	0.047
Acenaphthene	mg/kg dry wt	0.075
Anthracene	mg/kg dry wt	0.31
Benzo[a]anthracene	mg/kg dry wt	0.64
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.76
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	1.11
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	1.10
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.84
Benzo[e]pyrene	mg/kg dry wt	0.46
Benzo[g,h,i]perylene	mg/kg dry wt	0.51
Benzo[k]fluoranthene	mg/kg dry wt	0.30
Chrysene	mg/kg dry wt	0.53
Dibenzo[a,h]anthracene	mg/kg dry wt	0.101
Fluoranthene	mg/kg dry wt	1.46
Fluorene	mg/kg dry wt	0.099
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.53
Naphthalene	mg/kg dry wt	< 0.07
Perylene	mg/kg dry wt	0.160
Phenanthrene	mg/kg dry wt	1.10
Pyrene	mg/kg dry wt	1.67

Sample Type: Soil		
Sample Name:		230822-140-7 21-Aug-2023
Lab Number:		3353149.3
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	67
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80

3353149.3
230822-140-7 21-Aug-2023
Client Chromatogram for TPH by FID



Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	3
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	3
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	3
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	3
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	3
TPH Oil Industry Profile + PAHscreen	Sonication extraction, GC-FID and GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8015 and US EPA 8270.	0.010 - 70 mg/kg dry wt	3
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	3
Total Petroleum Hydrocarbons in Soil			

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	3
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	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	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	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	3

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

Testing was completed between 30-Aug-2023 and 04-Sep-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Watercare Services Limited	**Lab No:**	3353149	SSSEP-4v1
Contact:	Mikayla Frisby PO Box 107028 Airport Oaks Auckland 2150	**Date Received:**	30-Aug-2023	
		Date Reported:	04-Sep-2023	
		Quote No:	126119	
		Order No:	410043309	
		Client Reference:	230822-140	
		Submitted By:	Mikayla Frisby	

Sample Type: Soil

Sample Name:		230822-140-9 21-Aug-2023
Lab Number:		3353149.4
Individual Tests		
Dry Matter	g/100g as rcvd	69
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	8
Total Recoverable Cadmium	mg/kg dry wt	0.36
Total Recoverable Chromium	mg/kg dry wt	16
Total Recoverable Copper	mg/kg dry wt	16
Total Recoverable Lead	mg/kg dry wt	39
Total Recoverable Mercury	mg/kg dry wt	0.12
Total Recoverable Nickel	mg/kg dry wt	5
Total Recoverable Zinc	mg/kg dry wt	64
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	2.9
1-Methylnaphthalene	mg/kg dry wt	< 0.014
2-Methylnaphthalene	mg/kg dry wt	< 0.014
Acenaphthylene	mg/kg dry wt	0.028
Acenaphthene	mg/kg dry wt	< 0.014
Anthracene	mg/kg dry wt	0.040
Benzo[a]anthracene	mg/kg dry wt	0.20
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.26
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.39
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.39
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.30
Benzo[e]pyrene	mg/kg dry wt	0.168
Benzo[g,h,i]perylene	mg/kg dry wt	0.20
Benzo[k]fluoranthene	mg/kg dry wt	0.104
Chrysene	mg/kg dry wt	0.167
Dibenzo[a,h]anthracene	mg/kg dry wt	0.040
Fluoranthene	mg/kg dry wt	0.43
Fluorene	mg/kg dry wt	< 0.014
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.196
Naphthalene	mg/kg dry wt	< 0.07
Perylene	mg/kg dry wt	0.059
Phenanthrene	mg/kg dry wt	0.165
Pyrene	mg/kg dry wt	0.52

Sample Type: Soil		
Sample Name:		230822-140-9 21-Aug-2023
Lab Number:		3353149.4
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80

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%.	-	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	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
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 with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	4
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

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

Testing was completed between 30-Aug-2023 and 04-Sep-2023. For completion dates of individual analyses please contact the laboratory.

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Martin Cowell - BSc
Client Services Manager - Environmental

Watercare Services Limited
52 Aintree Ave, Māngere, Auckland, 2022
PO Box 107028, Auckland, 2150
T: 0800 522 365
clientsupport@water.co.nz
www.watercarelabs.co.nz

Certificate of Analysis
Laboratory Reference:230825-115

Attention:	Megan Baddiley	*Final Report:*	**522156-0**
Client:	**WATERCARE SERVICES LTD**	*Report Issue Date:*	**09-Sep-2023**
Address:	**-**	*Received Date:*	**25-Aug-2023**
Client Reference:	**Queen Street - Contaminated Land Assessment**	*Laboratory Activity Dates:*	**31-Aug-2023 - 08-Sep-2023**
Purchase Order:	**WW0001037.00.02.03**	*Quote Reference :*	**15842**

Sample Details		SOLIDS	SOLIDS	SOLIDS	SOLIDS
Lab Sample ID:		**230825-115-1**	**230825-115-2**	**230825-115-3**	**230825-115-4**
Client Sample ID:					
Sample Date/Time		24/08/2023	24/08/2023	24/08/2023	24/08/2023
Description:		BH23/08B-1.0	BH23/08B-1.5	BH23/08B-2.0	BH23/08B-2.5
General Testing					
Total Solids	%	69.7	66.5	64.9	67.0
Metals					
Recoverable Metals by ICP-MS—Trace					
Arsenic (Recoverable Dry Wt.)	mg/kg	2.5	0.9	11	1.6
Cadmium (Recoverable Dry Wt.)	mg/kg	<0.091	<0.09	<0.09	<0.089
Chromium (Recoverable Dry Wt.)	mg/kg	14	11	14	9.7
Copper (Recoverable Dry Wt.)	mg/kg	5.0	3.2	13	4.5
Lead (Recoverable Dry Wt.)	mg/kg	5.0	3.9	6.3	5.9
Mercury (Recoverable Dry Wt.)	mg/kg	0.057	0.082	0.045	<0.044
Nickel (Recoverable Dry Wt.)	mg/kg	4.3	2.1	3.0	1.4
Zinc (Recoverable Dry Wt.)	mg/kg	7.0	<6.7	13	15
Organics					
TPH					
C10-C14 (Total: Dry Weight Basis)	mg/kg	<20	<20	<20	<20
C15-C36 (Total: Dry Weight Basis)	mg/kg	32	<20	25	<20
C7-C9 (Total: Dry Weight Basis)	mg/kg	<20	<20	<20	<20
TPH-Total (Total: Dry Weight Basis)	mg/kg	32	<30	<30	<30
Subcontracting					
Asbestos		Report attached *	Report attached *	Report attached *	Report attached *

Sample Details		SOLIDS	SOLIDS	SOLIDS	SOLIDS
Lab Sample ID:		**230825-115-5**	**230825-115-6**	**230825-115-7**	**230825-115-8**
Client Sample ID:					
Sample Date/Time		24/08/2023	24/08/2023	24/08/2023	25/08/2023
Description:		BH23/08-1.4	BH23/08-2.0	BH23/08-2.5	BH23/05-0.45
General Testing					
Total Solids	%	66.5	73.5	74.0	-
Metals					
Recoverable Metals by ICP-MS—Trace					
Arsenic (Recoverable Dry Wt.)	mg/kg	3.4	1.4	12	-
Cadmium (Recoverable Dry Wt.)	mg/kg	<0.091	<0.089	<0.09	-
Chromium (Recoverable Dry Wt.)	mg/kg	11	9.6	13	-
Copper (Recoverable Dry Wt.)	mg/kg	7.0	2.8	11	-
Lead (Recoverable Dry Wt.)	mg/kg	6.9	3.6	5.3	-
Mercury (Recoverable Dry Wt.)	mg/kg	0.14	<0.045	<0.045	-
Nickel (Recoverable Dry Wt.)	mg/kg	4.6	1.0	1.1	-
Zinc (Recoverable Dry Wt.)	mg/kg	<6.8	<6.7	7.9	-
Organics					
TPH					
C10-C14 (Total: Dry Weight Basis)	mg/kg	<20	<20	<20	-
C15-C36 (Total: Dry Weight Basis)	mg/kg	35	<20	21	-

Sample Details (continued)		SOLIDS	SOLIDS	SOLIDS	SOLIDS
Lab Sample ID:		**230825-115-5**	**230825-115-6**	**230825-115-7**	**230825-115-8**
Client Sample ID:					
Sample Date/Time:		24/08/2023	24/08/2023	24/08/2023	25/08/2023
Description:		BH23/08-1.4	BH23/08-2.0	BH23/08-2.5	BH23/05-0.45
Organics					
TPH					
C7-C9 (Total: Dry Weight Basis)	mg/kg	<20	<20	30	-
TPH-Total (Total: Dry Weight Basis)	mg/kg	35	<30	50	-
Subcontracting					
Asbestos		Report attached *	Report attached *	Report attached *	Report attached *
Hill Laboratories Miscellaneous Test		-	-	-	Report attached *

Sample Details	SOLIDS	SOLIDS	SOLIDS	SOLIDS
Lab Sample ID:	**230825-115-9**	**230825-115-10**	**230825-115-11**	**230825-115-12**
Client Sample ID:				
Sample Date/Time	25/08/2023	25/08/2023	25/08/2023	25/08/2023
Description:	BH23/05-1.0	BH23/05-1.5	BH23/05-2.0	BH23/05-2.5
Subcontracting				
Asbestos	Report attached *	Report attached *	Report attached *	Report attached *
Hill Laboratories Miscellaneous Test	Report attached *	Report attached *	Report attached *	Report attached *

Sample Details	SOLIDS
Lab Sample ID:	**230825-115-13**
Client Sample ID:	
Sample Date/Time	25/08/2023
Description:	BH23/05-3.0
Subcontracting	
Asbestos	Report attached *
Hill Laboratories Miscellaneous Test	Report attached *

*Results marked with * are not accredited to International Accreditation New Zealand. A dash indicates no test performed.*

Where samples have been supplied by the client, they are tested as received.

The results of analysis contained in this report relate only to the sample(s) tested. Where sample collection was performed by the laboratory, the results of analysis contained in this report relate only to the sample(s) collected.

Reference Methods

The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Total Solids by Gravimetry	APHA (online edition) 2540 G	%	1, 2, 3, 4, 5, 6, 7	Auckland
Metals				
Recoverable Metals by ICP-MS—Trace				
Arsenic (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.02 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
Cadmium (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.01 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
Chromium (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.05 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
Copper (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.05 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
Lead (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.03 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
Mercury (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.005 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
Nickel (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.05 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
Zinc (Recoverable Dry Wt.)	APHA (online edition) 3125 B by ICPMS	0.75 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
Organics				
TPH				
C10-C14 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
C15-C36 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
C7-C9 (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	20 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
TPH-Total (Total: Dry Weight Basis)	Extraction DCM,Gc-FID	30 mg/kg	1, 2, 3, 4, 5, 6, 7	Auckland
Subcontracting				
Asbestos	As per Subcontractor Method		All	See attached
Hill Laboratories Miscellaneous Test	As per Subcontractor Method		8, 9, 10, 11, 12, 13	See attached
Preparations				
Accelerated Solvent Extraction (ASE)	Extraction DCM,Gc-FID		1, 2, 3, 4, 5, 6, 7	Auckland
Digest for Recoverable Metals in Solids	US EPA 200.8 (1:1 Nitric:Hydrochloric Acid)		1, 2, 3, 4, 5, 6, 7	Auckland

Preparations			
Drying and Milling	US EPA 200.8	1, 2, 3, 4, 5, 6, 7	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Compliance and Projects Manager.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited .

Chandra Sharma

KTP Signatory

Anel Du Preez

KTP Signatory

John Chang

KTP Signatory

Stephen Money

KTP - Chemistry

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106400	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

The results in this certificate relate only to the samples as received. Dowdell and Associates Ltd cannot be held responsible for sampling errors or validity of results where samples have been submitted by external clients.

NOTE: This report must not be altered, or reproduced, except in full.

ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106400**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
324316	8697968 230825-115-8 BH23/05-0.45 Soil	Chrysotile (White Asbestos) Crocidolite (Blue Asbestos)	As received	622.0		Weight (g)	%
			>10 mm fraction	17.7	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	116.9	Fibrous asbestos (>2 mm)	0.00157	< 0.001
			<2 mm fraction (subsampled)	62.1	Asbestos fines (<2 mm)	0.00033	< 0.001
			Total analysed	196.7	Fibrous asbestos+ Asbestos fines	0.00190	< 0.001

ACCREDITED IANZ TESTING LABORATORY

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

The analysis performed are in accordance with the terms set by the International Accreditation New Zealand (IANZ). The defined detection limit in AS 4964-2004 is 0.01% w/w. Any results obtained under the detection limit are not accredited.

*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106401	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Priya Subbaiah		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

The results in this certificate relate only to the samples as received. Dowdell and Associates Ltd cannot be held responsible for sampling errors or validity of results where samples have been submitted by external clients.

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ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Name: Priya Subbaiah
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106401**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
324317	8697970 230825-115-9 BH23/05-1.0 Soil	Chrysotile (White Asbestos)	As received	767.0		Weight (g)	%
			>10 mm fraction	18.4	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	142.3	Fibrous asbestos (>2 mm)	0.00302	0.0015
			<2 mm fraction (subsampled)	43.1	Asbestos fines (<2 mm)	0.00054	< 0.001
			Total analysed	203.8	Fibrous asbestos+ Asbestos fines	0.00356	0.0017

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

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106398	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Priya Subbaiah		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

The results in this certificate relate only to the samples as received. Dowdell and Associates Ltd cannot be held responsible for sampling errors or validity of results where samples have been submitted by external clients.

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ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Name: Priya Subbaiah
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106398**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
			As received	656.0		Weight (g)	%
324314	8697964 230825-115-6 BH23/08-2.0 Soil	No Asbestos Detected	>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	44.4	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	85.5	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	129.9	Fibrous asbestos+ Asbestos fines	–	< 0.001

ACCREDITED IANZ TESTING LABORATORY

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106399	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

The results in this certificate relate only to the samples as received. Dowdell and Associates Ltd cannot be held responsible for sampling errors or validity of results where samples have been submitted by external clients.

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ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106399**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
			As received	755.0		Weight (g)	%
324315	8697966 230825-115-7 BH23/08-2.5 Soil	No Asbestos Detected	>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	0.0	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	81.9	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	81.9	Fibrous asbestos+ Asbestos fines	–	< 0.001

ACCREDITED IANZ TESTING LABORATORY

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

The analysis performed are in accordance with the terms set by the International Accreditation New Zealand (IANZ). The defined detection limit in AS 4964-2004 is 0.01% w/w. Any results obtained under the detection limit are not accredited.

*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106396	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

The results in this certificate relate only to the samples as received. Dowdell and Associates Ltd cannot be held responsible for sampling errors or validity of results where samples have been submitted by external clients.

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ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106396**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
			As received	679.0		Weight (g)	%
324312	8697962 230825-115-5 BH23/08-1.4 Soil	No Asbestos Detected	>10 mm fraction	6.3	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	44.3	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	79.1	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	129.7	Fibrous asbestos+ Asbestos fines	–	< 0.001

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

The analysis performed are in accordance with the terms set by the International Accreditation New Zealand (IANZ). The defined detection limit in AS 4964-2004 is 0.01% w/w. Any results obtained under the detection limit are not accredited.

*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106395	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

The results in this certificate relate only to the samples as received. Dowdell and Associates Ltd cannot be held responsible for sampling errors or validity of results where samples have been submitted by external clients.

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ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106395**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
			As received	638.0		Weight (g)	%
324311	8697960 230825-115-4 BH23/08B-2.5 Soil	No Asbestos Detected	>10 mm fraction	6.1	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	18.8	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	80.4	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	105.3	Fibrous asbestos+ Asbestos fines	–	< 0.001

ACCREDITED IANZ TESTING LABORATORY

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

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106394	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

The results in this certificate relate only to the samples as received. Dowdell and Associates Ltd cannot be held responsible for sampling errors or validity of results where samples have been submitted by external clients.

NOTE: This report must not be altered, or reproduced, except in full.

ACCREDITED IANZ TESTING LABORATORY

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

Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106394**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
324310	8697958 230825-115-3 BH23/08B-2.0 Soil	No Asbestos Detected	As received	714.0		Weight (g)	%
			>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	18.9	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	79.3	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	98.2	Fibrous asbestos+ Asbestos fines	–	< 0.001

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

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106392	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Priya Subbaiah		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

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ACCREDITED IANZ TESTING LABORATORY

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Analyst:	Name: Priya Subbaiah
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106392**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
324308	8697978 230825-115-13 BH23/05-3.0 Soil	Chrysotile (White Asbestos)	As received	623.0		Weight (g)	%
			>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	168.2	Fibrous asbestos (>2 mm)	0.00124	< 0.001
			<2 mm fraction (subsampled)	44.2	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	212.4	Fibrous asbestos+ Asbestos fines	0.00124	< 0.001

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106393	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Priya Subbaiah		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

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Analyst:	Name: Priya Subbaiah
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106393**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
			As received	696.0		Weight (g)	%
			>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
324309	8697956 230825-115-2 BH23/08B-1.5 Soil	No Asbestos Detected	>2 mm fraction	135.6	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	44.8	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	180.4	Fibrous asbestos+ Asbestos fines	–	< 0.001

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106390	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Priya Subbaiah		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

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ACCREDITED IANZ TESTING LABORATORY

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Analyst:	Name: Priya Subbaiah
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106390**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
324306	8697974 230825-115-11 BH23/05-2.0 Soil	Chrysotile (White Asbestos) Amosite (Brown Asbestos)	As received	689.0		Weight (g)	%
			>10 mm fraction	16.7	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	126.4	Fibrous asbestos (>2 mm)	0.00355	0.0017
			<2 mm fraction (subsampled)	64.4	Asbestos fines (<2 mm)	0.00025	< 0.001
			Total analysed	207.5	Fibrous asbestos+ Asbestos fines	0.00380	0.0018

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106391	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

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Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106391**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
324307	8697976 230825-115-12 BH23/05-2.5 Soil	Chrysotile (White Asbestos)	As received	565.0		Weight (g)	%
			>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	76.2	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	77.3	Asbestos fines (<2 mm)	0.00069	< 0.001
			Total analysed	153.5	Fibrous asbestos+ Asbestos fines	0.00069	< 0.001

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106389	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Priya Subbaiah		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

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ACCREDITED IANZ TESTING LABORATORY

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Analyst:	Name: Priya Subbaiah
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106389**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
324305	8697972 230825-115-10 BH23/05-1.5 Soil	Chrysotile (White Asbestos)	As received	560.0		Weight (g)	%
			>10 mm fraction	30.1	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	97.3	Fibrous asbestos (>2 mm)	0.00113	< 0.001
			<2 mm fraction (subsampled)	63.5	Asbestos fines (<2 mm)	0.00129	< 0.001
			Total analysed	190.9	Fibrous asbestos+ Asbestos fines	0.00242	0.0013

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*** Semi quantitative results are not IANZ accredited

Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

ASBESTOS IDENTIFICATION CERTIFICATE

Job Number:	23-106388	Certificate Issue Date:	31/08/2023
Date Received:	29/08/2023		
No of Samples:	1		
Sampled By:	Client		
Obtained:	Submitted by client		
Date Analysed:	30/08/2023		
Analyst:	Stephanie Saavedra		
Method:	AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples		
Client:	Watercare Laboratory Services		
Client Address:	52 Aintree Avenue, Airport Oaks, Mangere 2022		
Client Ref No:	410043304		
Contact:	Sample Reception		
Site Address:	WSL Major Project 230825-115, Queen Street - Contaminated Land Assessment		

Samples are analysed in accordance with *AS 4964 (2004) Method for the Qualitative Identification of Asbestos in Bulk Samples* . This method includes:

- Low Powered Stereomicroscopy
- Polarised Light Microscopy
- Dispersion Staining

Trace analysis is performed on homogenous and non-homogenous samples as required in the above method. Detection Limit: 0.1g/kg.

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Analyst:	Name: Stephanie Saavedra
Approved By:	KTP: Stephanie Saavedra

0800 369 335
info@dal.kiwi
www.dowdellassociates.co.nz
Unit Q 20 Cain Road Penrose Auckland

Job number: **23-106388**

Laboratory Reference	Sample Ref/ Description	Result	Weight (g)		Asbestos Weight (g) and as % of Total Sample (% w/w) ***		
			As received	598.0		Weight (g)	%
324304	8697954 230825-115-1 BH23/08B-1.0 Soil	No Asbestos Detected	>10 mm fraction	0.0	ACM (>10 mm)	–	< 0.001
			>2 mm fraction	89.1	Fibrous asbestos (>2 mm)	–	< 0.001
			<2 mm fraction (subsampled)	80.2	Asbestos fines (<2 mm)	–	< 0.001
			Total analysed	169.3	Fibrous asbestos+ Asbestos fines	–	< 0.001

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Soil asbestos investigation criteria

0.001% w/w asbestos for fibrous asbestos and/or asbestos fines- All site uses
0.01% w/w asbestos for ACM- Residential use
0.04% w/w asbestos for ACM- High density residential
0.02% w/w asbestos for ACM- Recreational areas
0.05% w/w asbestos for ACM- Commercial and industrial
Source: New Zealand Guideline for Assessing and Managing Asbestos in Soil; November 2017

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

Certificate of Analysis

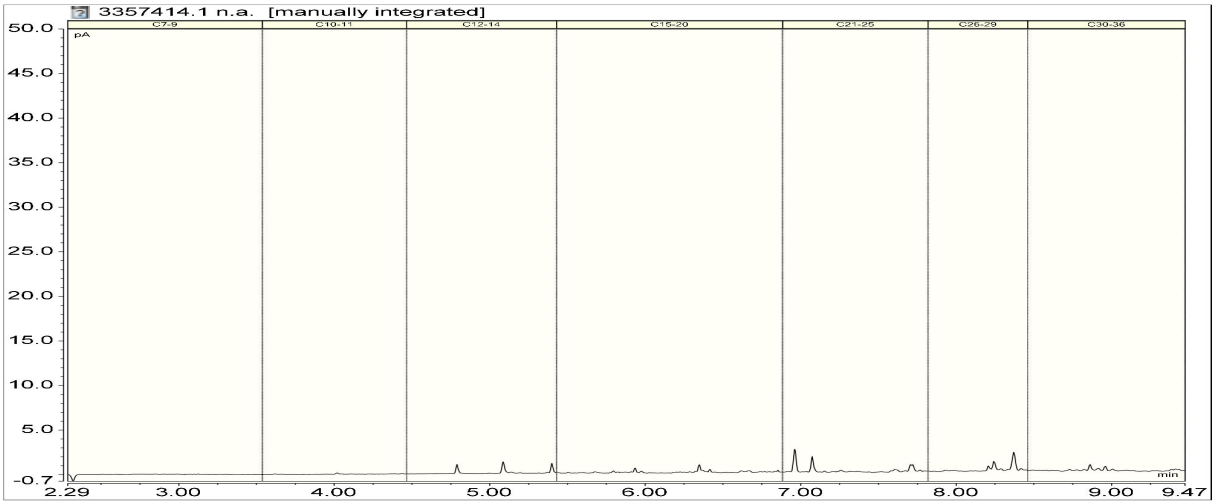
Client:	Watercare Services Limited	**Lab No:**	3357414 SPv1
Contact:	Mikayla Frisby PO Box 107028 Airport Oaks Auckland 2150	**Date Received:**	05-Sep-2023
		Date Reported:	07-Sep-2023
		Quote No:	126119
		Order No:	410043309
		Client Reference:	230825-115
		Submitted By:	Mikayla Frisby

Sample Type: Soil

Sample Name:		230825-115-8 25-Aug-2023
Lab Number:		3357414.1
Individual Tests		
Dry Matter	g/100g as rcvd	82
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	4
Total Recoverable Cadmium	mg/kg dry wt	0.24
Total Recoverable Chromium	mg/kg dry wt	23
Total Recoverable Copper	mg/kg dry wt	37
Total Recoverable Lead	mg/kg dry wt	490
Total Recoverable Mercury	mg/kg dry wt	0.32
Total Recoverable Nickel	mg/kg dry wt	35
Total Recoverable Zinc	mg/kg dry wt	166
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	15.5
1-Methylnaphthalene	mg/kg dry wt	0.014
2-Methylnaphthalene	mg/kg dry wt	< 0.012
Acenaphthylene	mg/kg dry wt	0.079
Acenaphthene	mg/kg dry wt	0.111
Anthracene	mg/kg dry wt	0.36
Benzo[a]anthracene	mg/kg dry wt	1.10
Benzo[a]pyrene (BAP)	mg/kg dry wt	1.36
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	1.92
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	1.90
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	1.25
Benzo[e]pyrene	mg/kg dry wt	0.76
Benzo[g,h,i]perylene	mg/kg dry wt	0.87
Benzo[k]fluoranthene	mg/kg dry wt	0.52
Chrysene	mg/kg dry wt	1.05
Dibenzo[a,h]anthracene	mg/kg dry wt	0.154
Fluoranthene	mg/kg dry wt	2.5
Fluorene	mg/kg dry wt	0.086
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.83
Naphthalene	mg/kg dry wt	< 0.06
Perylene	mg/kg dry wt	0.27
Phenanthrene	mg/kg dry wt	1.36
Pyrene	mg/kg dry wt	2.7

Sample Type: Soil		
Sample Name:		230825-115-8 25-Aug-2023
Lab Number:		3357414.1
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	98
Total hydrocarbons (C7 - C36)	mg/kg dry wt	104

3357414.1
230825-115-8 25-Aug-2023
Client Chromatogram for TPH by FID



Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1
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
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
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
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1
Total Petroleum Hydrocarbons in Soil			

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1
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

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

Testing was completed between 05-Sep-2023 and 07-Sep-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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

Certificate of Analysis

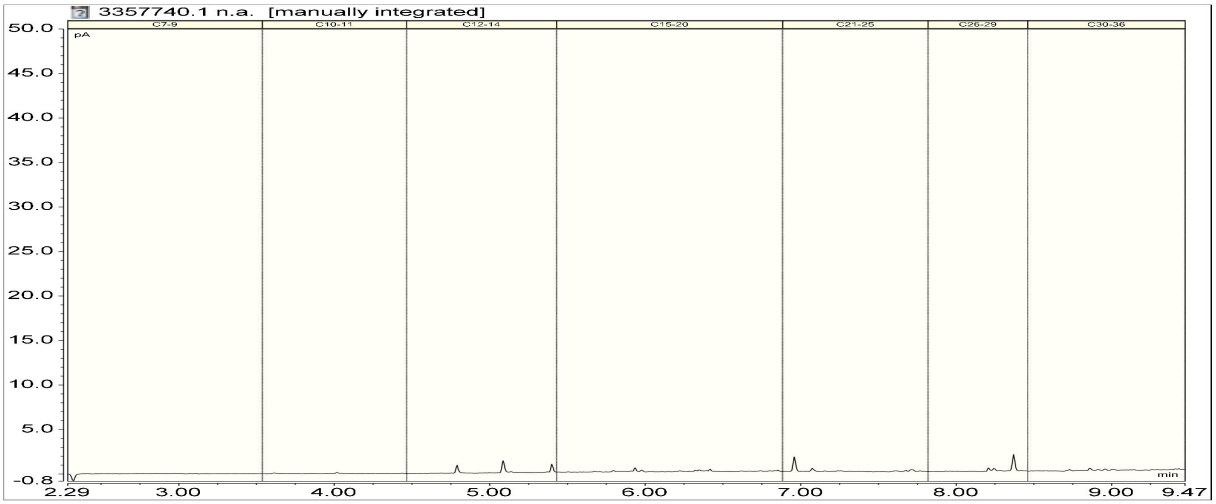
Client:	Watercare Services Limited	**Lab No:**	3357740 SPv1
Contact:	Mikayla Frisby	**Date Received:**	05-Sep-2023
	PO Box 107028	**Date Reported:**	07-Sep-2023
	Airport Oaks	**Quote No:**	126119
	Auckland 2150	**Order No:**	410043309
		Client Reference:	230825-115
		Submitted By:	Mikayla Frisby

Sample Type: Soil

		Sample Name:	230825-115-9 25-Aug-2023
		Lab Number:	3357740.1
Individual Tests			
Dry Matter	g/100g as rcvd		79
Heavy Metals with Mercury, Screen Level			
Total Recoverable Arsenic	mg/kg dry wt		3
Total Recoverable Cadmium	mg/kg dry wt		0.14
Total Recoverable Chromium	mg/kg dry wt		15
Total Recoverable Copper	mg/kg dry wt		23
Total Recoverable Lead	mg/kg dry wt		71
Total Recoverable Mercury	mg/kg dry wt		0.23
Total Recoverable Nickel	mg/kg dry wt		19
Total Recoverable Zinc	mg/kg dry wt		101
Polycyclic Aromatic Hydrocarbons Screening in Soil*			
Total of Reported PAHs in Soil	mg/kg dry wt		4.1
1-Methylnaphthalene	mg/kg dry wt		< 0.013
2-Methylnaphthalene	mg/kg dry wt		< 0.013
Acenaphthylene	mg/kg dry wt		0.027
Acenaphthene	mg/kg dry wt		0.020
Anthracene	mg/kg dry wt		0.082
Benzo[a]anthracene	mg/kg dry wt		0.29
Benzo[a]pyrene (BAP)	mg/kg dry wt		0.42
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		0.58
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		0.57
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt		0.38
Benzo[e]pyrene	mg/kg dry wt		0.25
Benzo[g,h,i]perylene	mg/kg dry wt		0.29
Benzo[k]fluoranthene	mg/kg dry wt		0.156
Chrysene	mg/kg dry wt		0.28
Dibenzo[a,h]anthracene	mg/kg dry wt		0.042
Fluoranthene	mg/kg dry wt		0.60
Fluorene	mg/kg dry wt		0.017
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		0.30
Naphthalene	mg/kg dry wt		< 0.07
Perylene	mg/kg dry wt		0.088
Phenanthrene	mg/kg dry wt		0.26
Pyrene	mg/kg dry wt		0.64

Sample Type: Soil		
Sample Name:		230825-115-9 25-Aug-2023
Lab Number:		3357740.1
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	83
Total hydrocarbons (C7 - C36)	mg/kg dry wt	87

3357740.1
230825-115-9 25-Aug-2023
Client Chromatogram for TPH by FID



Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1
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
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
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
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1
Total Petroleum Hydrocarbons in Soil			

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1
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

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

Testing was completed between 05-Sep-2023 and 07-Sep-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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

Certificate of Analysis

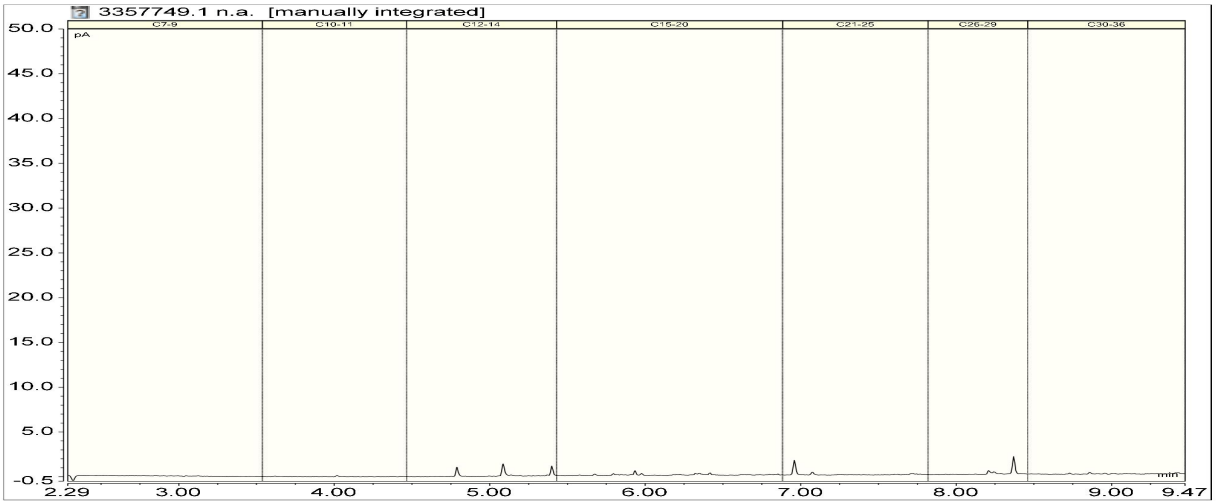
Client:	Watercare Services Limited	**Lab No:**	3357749	SPv1
Contact:	Mikayla Frisby PO Box 107028 Airport Oaks Auckland 2150	**Date Received:**	05-Sep-2023	
		Date Reported:	08-Sep-2023	
		Quote No:	126119	
		Order No:	410043309	
		Client Reference:	230825-115	
		Submitted By:	Mikayla Frisby	

Sample Type: Soil

Sample Name:		230825-115-11 25-Aug-2023
Lab Number:		3357749.1
Individual Tests		
Dry Matter	g/100g as rcvd	78
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	6
Total Recoverable Cadmium	mg/kg dry wt	0.22
Total Recoverable Chromium	mg/kg dry wt	18
Total Recoverable Copper	mg/kg dry wt	33
Total Recoverable Lead	mg/kg dry wt	52
Total Recoverable Mercury	mg/kg dry wt	0.16
Total Recoverable Nickel	mg/kg dry wt	28
Total Recoverable Zinc	mg/kg dry wt	145
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	3.2
1-Methylnaphthalene	mg/kg dry wt	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.013
Acenaphthylene	mg/kg dry wt	0.020
Acenaphthene	mg/kg dry wt	< 0.013
Anthracene	mg/kg dry wt	0.077
Benzo[a]anthracene	mg/kg dry wt	0.20
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.26
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.36
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.36
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.23
Benzo[e]pyrene	mg/kg dry wt	0.145
Benzo[g,h,i]perylene	mg/kg dry wt	0.162
Benzo[k]fluoranthene	mg/kg dry wt	0.102
Chrysene	mg/kg dry wt	0.188
Dibenzo[a,h]anthracene	mg/kg dry wt	0.028
Fluoranthene	mg/kg dry wt	0.57
Fluorene	mg/kg dry wt	0.024
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.174
Naphthalene	mg/kg dry wt	< 0.07
Perylene	mg/kg dry wt	0.058
Phenanthrene	mg/kg dry wt	0.32
Pyrene	mg/kg dry wt	0.59

Sample Type: Soil		
Sample Name:		230825-115-11 25-Aug-2023
Lab Number:		3357749.1
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	63
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80

3357749.1
230825-115-11 25-Aug-2023
Client Chromatogram for TPH by FID



Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1
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
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
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
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1
Total Petroleum Hydrocarbons in Soil			

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1
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

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

Testing was completed between 05-Sep-2023 and 07-Sep-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Kim Harrison MSc
Client Services Manager - Environmental

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Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
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Certificate of Analysis

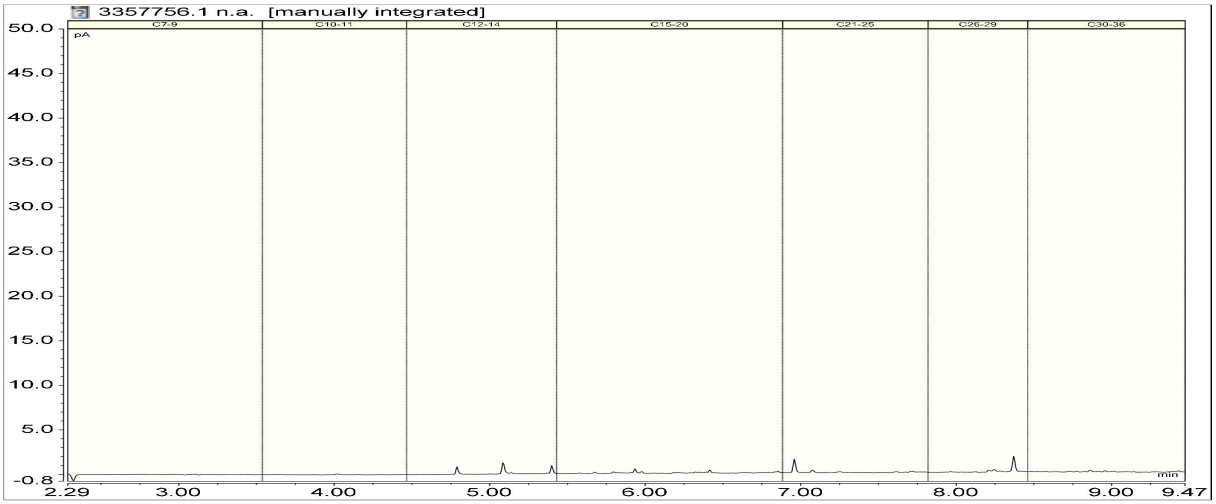
Client:	Watercare Services Limited	**Lab No:**	3357756 SPv1
Contact:	Mikayla Frisby PO Box 107028 Airport Oaks Auckland 2150	**Date Received:**	05-Sep-2023
		Date Reported:	08-Sep-2023
		Quote No:	126119
		Order No:	410043309
		Client Reference:	230825-115
		Submitted By:	Mikayla Frisby

Sample Type: Soil

Sample Name:		230825-115-13 25-Aug-2023
Lab Number:		3357756.1
Individual Tests		
Dry Matter	g/100g as rcvd	80
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	4
Total Recoverable Cadmium	mg/kg dry wt	0.29
Total Recoverable Chromium	mg/kg dry wt	19
Total Recoverable Copper	mg/kg dry wt	37
Total Recoverable Lead	mg/kg dry wt	81
Total Recoverable Mercury	mg/kg dry wt	0.29
Total Recoverable Nickel	mg/kg dry wt	36
Total Recoverable Zinc	mg/kg dry wt	172
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	3.1
1-Methylnaphthalene	mg/kg dry wt	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.013
Acenaphthylene	mg/kg dry wt	0.019
Acenaphthene	mg/kg dry wt	< 0.013
Anthracene	mg/kg dry wt	0.056
Benzo[a]anthracene	mg/kg dry wt	0.21
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.30
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.43
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.43
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.29
Benzo[e]pyrene	mg/kg dry wt	0.178
Benzo[g,h,i]perylene	mg/kg dry wt	0.21
Benzo[k]fluoranthene	mg/kg dry wt	0.118
Chrysene	mg/kg dry wt	0.195
Dibenzo[a,h]anthracene	mg/kg dry wt	0.041
Fluoranthene	mg/kg dry wt	0.53
Fluorene	mg/kg dry wt	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.21
Naphthalene	mg/kg dry wt	< 0.07
Perylene	mg/kg dry wt	0.068
Phenanthrene	mg/kg dry wt	0.126
Pyrene	mg/kg dry wt	0.55

Sample Type: Soil		
Sample Name:		230825-115-13 25-Aug-2023
Lab Number:		3357756.1
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	72
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80

3357756.1
230825-115-13 25-Aug-2023
Client Chromatogram for TPH by FID



Summary of Methods

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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%.	-	1
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
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
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
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1
Total Petroleum Hydrocarbons in Soil			

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1
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

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

Testing was completed between 05-Sep-2023 and 07-Sep-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Kim Harrison MSc
Client Services Manager - Environmental

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

Certificate of Analysis

Client:	Watercare Services Limited	**Lab No:**	3357753 SPv1
Contact:	Mikayla Frisby PO Box 107028 Airport Oaks Auckland 2150	**Date Received:**	05-Sep-2023
		Date Reported:	08-Sep-2023
		Quote No:	126119
		Order No:	410043309
		Client Reference:	230825-115
		Submitted By:	Mikayla Frisby

Sample Type: Soil

Sample Name:		230825-115-12 25-Aug-2023
Lab Number:		3357753.1
Individual Tests		
Dry Matter	g/100g as rcvd	77
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	5
Total Recoverable Cadmium	mg/kg dry wt	0.39
Total Recoverable Chromium	mg/kg dry wt	17
Total Recoverable Copper	mg/kg dry wt	45
Total Recoverable Lead	mg/kg dry wt	97
Total Recoverable Mercury	mg/kg dry wt	0.21
Total Recoverable Nickel	mg/kg dry wt	29
Total Recoverable Zinc	mg/kg dry wt	200
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	1.1
1-Methylnaphthalene	mg/kg dry wt	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.013
Acenaphthylene	mg/kg dry wt	< 0.013
Acenaphthene	mg/kg dry wt	< 0.013
Anthracene	mg/kg dry wt	0.017
Benzo[a]anthracene	mg/kg dry wt	0.072
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.102
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.147
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.145
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.099
Benzo[e]pyrene	mg/kg dry wt	0.064
Benzo[g,h,i]perylene	mg/kg dry wt	0.072
Benzo[k]fluoranthene	mg/kg dry wt	0.040
Chrysene	mg/kg dry wt	0.078
Dibenzo[a,h]anthracene	mg/kg dry wt	0.013
Fluoranthene	mg/kg dry wt	0.172
Fluorene	mg/kg dry wt	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.071
Naphthalene	mg/kg dry wt	< 0.07
Perylene	mg/kg dry wt	0.023
Phenanthrene	mg/kg dry wt	0.102
Pyrene	mg/kg dry wt	0.185

Sample Type: Soil		
Sample Name:		230825-115-12 25-Aug-2023
Lab Number:		3357753.1
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80

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%.	-	1
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
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
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
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1
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

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

Testing was completed between 05-Sep-2023 and 07-Sep-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Kim Harrison MSc
Client Services Manager - Environmental

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

Certificate of Analysis

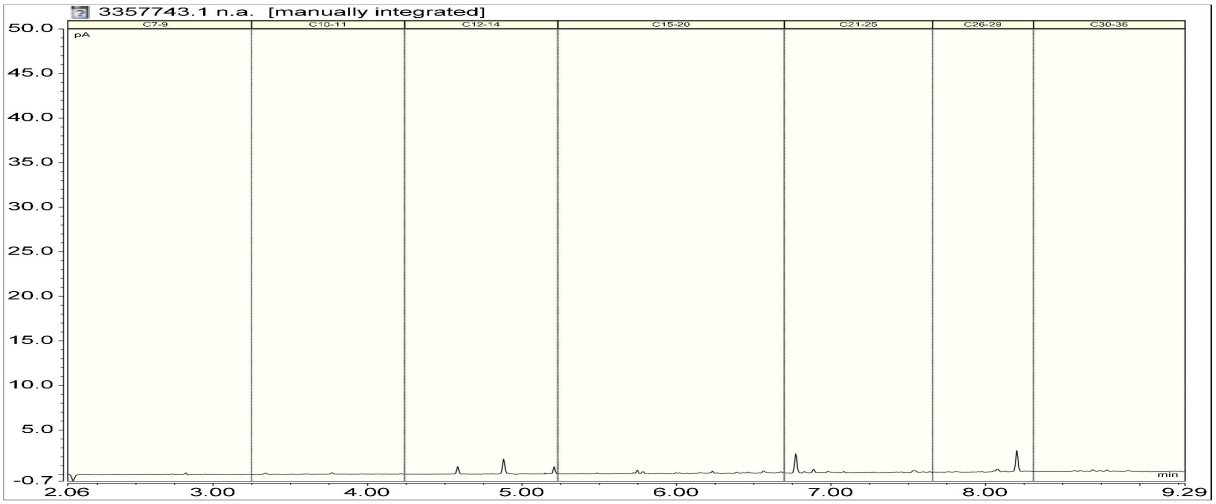
Client:	Watercare Services Limited	**Lab No:**	3357743 SPv1
Contact:	Mikayla Frisby PO Box 107028 Airport Oaks Auckland 2150	**Date Received:**	05-Sep-2023
		Date Reported:	08-Sep-2023
		Quote No:	126119
		Order No:	410043309
		Client Reference:	230825-115
		Submitted By:	Mikayla Frisby

Sample Type: Soil

Sample Name:		230825-115-10 25-Aug-2023
Lab Number:		3357743.1
Individual Tests		
Dry Matter	g/100g as rcvd	80
Heavy Metals with Mercury, Screen Level		
Total Recoverable Arsenic	mg/kg dry wt	5
Total Recoverable Cadmium	mg/kg dry wt	0.29
Total Recoverable Chromium	mg/kg dry wt	28
Total Recoverable Copper	mg/kg dry wt	51
Total Recoverable Lead	mg/kg dry wt	77
Total Recoverable Mercury	mg/kg dry wt	0.20
Total Recoverable Nickel	mg/kg dry wt	35
Total Recoverable Zinc	mg/kg dry wt	177
Polycyclic Aromatic Hydrocarbons Screening in Soil*		
Total of Reported PAHs in Soil	mg/kg dry wt	2.4
1-Methylnaphthalene	mg/kg dry wt	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.013
Acenaphthylene	mg/kg dry wt	0.015
Acenaphthene	mg/kg dry wt	< 0.013
Anthracene	mg/kg dry wt	0.020
Benzo[a]anthracene	mg/kg dry wt	0.179
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.28
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	0.39
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	0.39
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.27
Benzo[e]pyrene	mg/kg dry wt	0.155
Benzo[g,h,i]perylene	mg/kg dry wt	0.180
Benzo[k]fluoranthene	mg/kg dry wt	0.099
Chrysene	mg/kg dry wt	0.166
Dibenzo[a,h]anthracene	mg/kg dry wt	0.036
Fluoranthene	mg/kg dry wt	0.30
Fluorene	mg/kg dry wt	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.174
Naphthalene	mg/kg dry wt	< 0.07
Perylene	mg/kg dry wt	0.062
Phenanthrene	mg/kg dry wt	0.090
Pyrene	mg/kg dry wt	0.36

Sample Type: Soil		
Sample Name:		230825-115-10 25-Aug-2023
Lab Number:		3357743.1
Total Petroleum Hydrocarbons in Soil		
C7 - C9	mg/kg dry wt	< 20
C10 - C14	mg/kg dry wt	< 20
C15 - C36	mg/kg dry wt	53
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 80

3357743.1
230825-115-10 25-Aug-2023
Client Chromatogram for TPH by FID



Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1
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
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
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
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1
Total Petroleum Hydrocarbons in Soil			

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	1
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

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

Testing was completed between 05-Sep-2023 and 08-Sep-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Kim Harrison MSc
Client Services Manager - Environmental

Sample Submission Form

Watercare Laboratory Services

Watercare Laboratory Services
52 Aintree Ave, Airport Oaks, Manukau 2150

Sample Reception
Ph: (09) 539 7614
Email: SampleReception@water.co.nz
Customer Liaison: LabSales@water.co.nz

Project 230724 — 124

Client: WSP New Zealand Limited – Auckland
Date Logged: 24/07/2023 05:30:18 PM
Desc: BH23 Samples

CLIENT DETAILS

Account Name: WSP NZ Ltd
Purchase Order No: W-SL001-03
Address: 100 Beaumont Street, Auckland 1010
Contact: Tom Bell
Phone: 0272135283
Charge To *(if other than client)*:
Quote No:
Results To *(Name)*: Tom Bell
Email: tom.bell@wsp.com
Project Description/Additional Information:

CATEGORY	SAMPLE TYPE (specify for each sample below)
Potable (Drinking/For Consumption):	***PW** Potable Water *e.g.* for NZDWS Compliance **RLP** Potable Water for RLP compliance
Non-Potable/Non-Drinkable Waters:	**FW** Fresh Water (eg raw and environmental) **WW** Wastewater **TW** Tradewaste **SW** Saline and Seawater **EF** Effluent
Other:	**SP** Swimming Pool **SO** Soil & Sediments **SL** Sludge **SH** Shellfish

No.	Sample Description	Sample Type	Tests Required *(list here or indicate to test as per quote)*	Temperature (°C) *	Date Collected	Time Collected
1	BH23/03 - 1.5	SO	Metals, TPH, Asb semi quant		20/7/23	
2	BH23/03 - 2.0	SO	Metals, TPH, Asb semi quant		20/7/23	
3		~~SO~~	↓			
4		~~SO~~	Heavy metals + mercury			
5						
6						
7						
8						
9						
10						

* POTABLE WATER: to comply with the New Zealand Drinking Water Standards, samples for microbiological testing must be received less than the sampling temperature at source but above zero degree Celsius. Please provide the source temperature at the time of collection. Failure to meet this requirement will result in a comment on your CoA report.

Please tick if you require these items to be returned (courier fees may apply)

Chilly Bin ☐ New Sample Bottles ☐

Sent to Watercare Lab Services

Date: Time:
Name:
Signature:

Received at Watercare Lab Services

Temperature: 15-2°C
Correction Factor: 1.20
Thermometer ID: T1075

Received Stamp

RECEIVED
24 JUL 2023
FZ 0455

Sample Submission Form

Watercare Laboratory Services

Watercare Laboratory Services
52 Aintree Ave, Airport Oaks, Manukau 2150

Sample Reception
Ph: (09) 539 7614
Email: SampleReception@water.co.nz
Customer Liaison: LabSales@water.co.nz

Project Label

Office Use Only

CLIENT DETAILS

Account Name: WSP

Purchase Order No: Queen St Part 4

Address: L3, 100 Beaumont St Auckland.

Contact: Megan Baddiley

Phone: 021 2336761

Charge To *(if other than client)*:

Quote No: W-SL0003.00

Results To *(Name)*: Megan Baddiley

Email: megan.baddiley@wsp.com

Project Description/Additional Information:

CATEGORY	SAMPLE TYPE (specify for each sample below)
Potable (Drinking/For Consumption):	*PW Potable Water *e.g.* for NZDWS Compliance RLP Potable Water for RLP compliance
Non-Potable/Non-Drinkable Waters:	FW Fresh Water (eg raw and environmental) WW Wastewater TW Tradewaste SW Saline and Seawater EF Effluent
Other:	SP Swimming Pool SO Soil & Sediments SL Sludge SH Shellfish

No.	Sample Description	Sample Type	Tests Required *(list here or indicate to test as per quote)*	Temperature (°C) *	Date Collected	Time Collected
1	BH23/02 - 0.5	SO	Heavy metals + Hg, TPH / PAH		14/7/23	
2	BH23/02 - 1.0	SO	11 + Asbestos (semi quant).		14/7/23.	
3						
4						
5						
6						
7						
8						
9						
10						

Project 230727 – 138

Client: WSP New Zealand Limited – Auckland
Date Logged: 27/07/2023 05:14:41 PM
Desc: BH23 Samples – Queen Street pt4

* POTABLE WATER: to comply with the New Zealand Drinking Water Standards, samples for microbiological testing must be received less than the [illegible] elsius. Please provide the source temperature at the time of collection. Failure to meet this requirement will result in a comment on your CoA report.

Please tick if you require these items to be returned (courier fees may apply)	Sent to Watercare Lab Services	Received at Watercare Lab Services	Received Stamp
Chilly Bin ☐ New Sample Bottles ☐	Date: 27/7/23 Time: 1152	Temperature: 17.1	RECEIVED 27 JUL 2023 1155
	Name: M Baddiley	Correction Factor: 1.2	
	Signature:	Thermometer ID: 1075	

ECEPTION

Project 230822 — 140

Watercare Laboratory Services
52 Aintree Ave,
Airport Oaks,
PO Box 107028 Airport Oaks, Manukau 2150

Client: WSL Major Projects
Date Logged: 22/08/2023 04:11:39 PM
Desc:

Watercare
Laboratory Services

WBSE set up by CJS. See email.

CLIENT DETAILS

Name: Tom Bell — Order No: W-SL001.03

Address: 3/100 Beaumont Street, Auckland 1010

Contact: Tom Bell / Megan Baddily Ph: 027213 5283 / 021 233 6761 (Megan) Fax:
MKS 22/8/23

Charge To *(if other than client)*: Watercare Services Limited — Quote No:

Results To *(Name)*: Tom Bell / Megan — E-mail: tom.bell@wsp.com /

Additional Information: Queen Street / Mayoral Dr - Part 1, 4, 5

SAMPLE TYPES PW Potable water; RLP Potable water for RLP compliance; FW Fresh water; WW Wastewater; SL Sludge; SO Soil; SH Shellfish; SW Seawater/Saline content; TW Tradewaste

No.	Sample Description	Sample Type	Tests Required (list here or use check boxes on reverse side)	Date Sampled	Time Sampled
1	BH23/07 - 0.8	SO	Metals*, TPH, Asbestos	21/8/23	
2	BH23/07 - 1.0		Metals, TPH, Asbestos		
3	BH23/07 - 1.5		Metals, TPH, Asbestos		
4	BH23/07 - 2.0		Metals, TPH		
5	BH23/06 - 0.5		Metals, TPH, Asbestos, PAH		
6	BH23/06 - 1.0		Metals, TPH, Asbestos, PAH		
7	BH23/06 - 1.5		Metals, TPH, Asbestos, PAH (screen as per Nelly)		
8	BH23/06 - 2.0		Metals, TPH, Asbestos, PAH	22/8/23	
9	BH23/06 - 2.5		Metals, TPH, Asbestos, PAH		
10	BH23/06 - 3.0		Metals, TPH, Asbestos, PAH		

CHAIN OF CUSTODY RECORD: Please tick this box if you require the COC to be emailed back to you ☐
BOTTLES / BINS RETURNED: Please tick this box if you require bottles to be returned to you ☐

Sent to Watercare Lab Services	Received at Watercare Lab Services	Condition on Receipt
Date: 22/8/23 Time: 13:00	Date: Time:	☐ Room Temperature ☐ Chilled ☐ Frozen
Name: Tom Bell	Name:	Temperature on arrival :
Signature:	Signature:	

RECEIVED 22 AUG 2023 12:58

28.6°C (9.7) 1 bot MKS

Metals = Arsenic, cadmium, chromium, copper, lead, Nickel, Mercury, Zinc

Asbestos = Semi Quantitative

WATERCARE SERVICES LTD, LABORATORY SERVICES, STANDARD FORI

Client Request Form / Chain of Custod

Project 230825 — 115

Watercare Laboratory Services
52 Aintree Ave,
Airport Oaks,
PO Box 107028 Airport Oaks, Manukau 2150

Sample Reception
Ph: (09) 539 7614 or 539 7615
Fax: (09) 539 7620
E-mail: clientsupport@water.co.nz

Client: WSL Major Projects
Date Logged: 25/08/2023 05:53:59 PM
Desc: Queen Street – Contaminated Land Assessment

CLIENT DETAILS

Name: Tom Bell — Order No: WN0001037.00.02.03

Address: 3/100 Beaumont Street, Auckland 1010

Contact: Tom Bell — Ph: 027 213 5283 — Fax:

Charge To *(if other than client)*: — Quote No: 15842

Results To *(Name)*: Tom Bell — E-mail: tom.bell@wsp.com

Additional Information:

SAMPLE TYPES **PW** Potable water **RLP** Potable water for RLP compliance **FW** Fresh water **WW** Wastewater **SL** Sludge **SO** Soil **SH** Shellfish **SW** Seawater/Saline content **TW** Tradewaste

No.	Sample Description	Sample Type	Tests Required *(list here or use check boxes on reverse side)*	Date Sampled	Time Sampled
1	BH23/08B_1.0	SO	Metals, TPH, Asbestos	24/08/23	
2	BH23/08B_1.5				
3	BH23/08B_2.0				
4	BH23/08B_2.5				
5	BH23/08B_1.4		Metals, TPH, Asbestos ~~PAH~~		
6	BH23/08_2.0				
7	BH23/08_2.5				
8	BH23/05_0.45		Metals, TPH, Asbestos, PAH	25/8/23	
9	BH23/05_1.0				
10	BH23/05_1.5				

CHAIN OF CUSTODY RECORD: Please tick this box if you require the COC to be emailed back to you ☐
BOTTLES / BINS RETURNED: Please tick this box if you require bottles to be returned to you ☐

Sent to Watercare Lab Services	Received at Watercare Lab Services	Condition on Receipt
Date: 25/8/23 Time: 15.40	Date: Time:	☐ Room Temperature
Name: Tom Bell	Name:	☐ Chilled
Signature:	Signature:	☐ Frozen
		Temperature on arrival :

18.8°C
CF(1.2)
T1075

RECEIVED
25 AUG 2023
FZ 0423

Metals - Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Mercury, Zinc
Asbestos - Semi Quantitative

Client Request Form / Chain of Custody

Watercare
Laboratory Services

Watercare Laboratory Services
52 Aintree Ave,
Airport Oaks,
PO Box 107028 Airport Oaks, Manukau 2150

Sample Reception
Ph: (09) 539 7614 or 539 7615
Fax: (09) 539 7620
E-mail: clientsupport@water.co.nz

CLIENT DETAILS

Name: See Page 1 Order No:

Address:

Contact: Ph: Fax:

Charge To *(if other than client)*: Quote No:

Results To *(Name)*: E-mail:

Additional Information:

SAMPLE TYPES **PW** Potable water **RLP** Potable water for RLP compliance **FW** Fresh water **WW** Wastewater **SL** Sludge **SO** Soil **SH** Shellfish **SW** Seawater/Saline content **TW** Tradewaste

No.	Sample Description	Sample Type	Tests Required *(list here or use check boxes on reverse side)*	Date Sampled	Time Sampled
11 1	BH23/05-2.0	SO	Metals, TPH, Asbestos, PAH	25/8/23	
12 2	BH23/05-2.5	↓	↓	↓	
13 3	BH23/05-3.0	↓	↓	↓	
4					
5					
6					
7					
8					
9					
10					

CHAIN OF CUSTODY RECORD: Please tick this box if you require the COC to be emailed back to you ☐
BOTTLES / BINS RETURNED: Please tick this box if you require bottles to be returned to you ☐

Sent to Watercare Lab Services	Received at Watercare Lab Services	Condition on Receipt
Date: Time:	Date: Time:	❑ Room Temperature ❑ Chilled ❑ Frozen
Name:	Name:	Temperature on arrival :
Signature:	Signature:	

18.8°C
CF(1.2)
T1075

RECEIVED
25 AUG 2023
FZ 0423

Sample Submission Form

Project 230908 — 106

Watercare Laboratory Services

Watercare Laboratory Services
52 Aintree Ave, Airport Oaks, Manukau 2150

Sample Reception
Ph: (09) 539 7614
Email: SampleReception@water.co.nz
Customer Liaison: LabSales@water.co.nz

Client: WSL Major Projects
Date Logged: 08/09/2023 12:03:54 PM
Desc: Wastewater diversion Queen Street – Part 1, 5, 4

CLIENT DETAILS

Account Name: WSP (on behalf of watercare)
Purchase Order No: WWCCC1037.00.02.03
Address: 100 Beaumont St Auckland 1010
Contact: Megan Baddiley
Phone: 021 233 6761
Charge To *(if other than client)*:
Quote No: 15842
Results To *(Name)*: Megan Baddiley
Email: Megan.baddiley@wsp.com
Project Description/Additional Information: watercare wastewater Diversion Queen St Parts 1, 5, 4

CATEGORY	SAMPLE TYPE (specify for each sample below)
Potable (Drinking/For Consumption):	***PW** Potable Water *e.g.* for NZDWS Compliance **RLP** Potable Water for RLP compliance
Non-Potable/Non-Drinkable Waters:	**FW** Fresh Water (eg raw and environmental) **WW** Wastewater **TW** Tradewaste **SW** Saline and Seawater **EF** Effluent
Other:	**SP** Swimming Pool **SO** Soil & Sediments **SL** Sludge **SH** Shellfish

No.	Sample Description	Sample Type	Tests Required *(list here or indicate to test as per quote)*	Temperature (°C) *	Date Collected	Time Collected
1	BH23/09 – 0.5	S	Heavy metals + Hg, TPH, PAH, Asbestos semi-quant		5/9/23	
2	BH23/09 – 1.0	S	Heavy metals + Hg, TPH, PAH			
3	BH23/04 – 0.2	S	Heavy metals + Hg, TPH, PAH, asbestos semi-quant			
4	~~BH23/04 – 0.5~~	S				
5	BH23/04 – 0.5A	S				
6	BH23/04 – 1.0	S				
7	BH23/03 – 0.5	S	Asbestos semi-quant		14/7/23	
8	BH23/03 – 0.7 Asb	S	Asbestos semi-quant ↳ suspected ACM		14/7/23	
9						
10						

* POTABLE WATER: to comply with the New Zealand Drinking Water Standards, samples for microbiological testing must be received less than the sampling temperature at source but above zero degree Celsius. Please provide the source temperature at the time of collection. Failure to meet this requirement will result in a comment on your CoA report.

Please tick if you require these items to be returned (courier fees may apply)

Chilly Bin ☐ New Sample Bottles ☐

Sent to Watercare Lab Services

Date: 7/9/23 Time:
Name: M Baddiley
Signature:

Received at Watercare Lab Services

Temperature: 14.3 °C
Correction Factor: 1.2
Thermometer ID: T1075

Received Stamp

RECEIVED
08 SEP 2023
0825 Fz

Watercare
Laboratory Services

Quotation

Quotation Reference: 15842-2

Sample

	Item Description	Quantity	Unit Price	Total Price
Chemistry	Total Solids Percentage in Solids	26	12.39	$322.14
Inorganic	Total Recoverable Arsenic in Solids (Dry Weight Basis) by ICP-MS (Screen)	35	10.48	$366.80
	Total Recoverable Cadmium in Solids (Dry Weight Basis) by ICP-MS (Screen)	35	10.48	$366.80
	Total Recoverable Chromium in Solids (Dry Weight Basis) by ICP-MS (Screen)	35	10.48	$366.80
	Total Recoverable Copper in Solids (Dry Weight Basis) by ICP-MS (Screen)	35	10.48	$366.80
	Total Recoverable Lead in Solids (Dry Weight Basis) by ICP-MS (Screen)	35	10.48	$366.80
	Total Recoverable Mercury in Solids (Dry Weight Basis) by ICP-MS (Screen)	35	10.48	$366.80
	Total Recoverable Nickel in Solids (Dry Weight Basis) by ICP-MS (Screen)	35	10.48	$366.80
	Total Recoverable Zinc in Solids (Dry Weight Basis) by ICP-MS (Screen)	35	10.48	$366.80
Misc	Discount for 7+ Elements by ICPMS (Recoverable on Solids)	35	-5.10	$-178.50
Organic	Poly Aromatic Hydrocarbons (PAH) in Solids by GC-MS (Screen)	26	139.00	$3,614.00
	Total Petroleum Hydrocarbons (TPH) in Solids by GC-FID (Trace)	26	94.34	$2,452.84
	Volatile Organic Compounds (BTEX Profile) in Solids by Purge and Trap (Screen)	26	114.20	$2,969.20
Prep	Preparation: Drying (60°C) and Homogenising of Solids for Recoverable Metals	35	20.35	$712.25
	Preparation: Acid Digestion of Solids for Recoverable Metals	35	20.35	$712.25
Subcontracted	Asbestos Semi-Quantitative in Soil Subcontracted to Dowdell & Associates	16	165.00	$2,640.00
			Item Total:	**$16,178.58**
			Job Total:	**$16,178.58**

Samples received under this quotation will be held for a period of 14 days from the date of the final report before being disposed of.
Please contact the customer liaison team if you require a longer holding time.

WAT

Project 230908 — 116

EPTION

Watercare
Laboratory Services

Watercare Laboratory Services
52 Aintree Ave,
Airport Oaks,
PO Box 107028 Airport Oaks, Manukau 2150

Client: WSL Major Projects
Date Logged: 08/09/2023 01:35:23 PM
Desc: BH23/04

CLIENT DETAILS

Name: Tom Bell — Order No: WW0001037.00.02.03

Address: 3/100 Beaumont Street

Contact: Tom Bell — Ph: 0272135283 — Fax:

Charge To *(if other than client)*: — Quote No: 15842

Results To *(Name)*: Tom Bell — E-mail: tom.bell@wsp.com

Additional Information:

SAMPLE TYPES **PW** Potable water **RLP** Potable water for RLP compliance **FW** Fresh water **WW** Wastewater **SL** Sludge **SO** Soil **SH** Shellfish **SW** Seawater/Saline content **TW** Tradewaste

No.	Sample Description	Sample Type	Tests Required *(list here or use check boxes on reverse side)*	Date Sampled	Time Sampled
1	BH23/04	SO	TPH, PAH, Heavy Metals$	6/9/23	
2					
3					
4					
5					
6					
7					
8					
9					
10					

CHAIN OF CUSTODY RECORD: Please tick this box if you require the COC to be emailed back to you ☐
BOTTLES / BINS RETURNED: Please tick this box if you require bottles to be returned to you ☐

Sent to Watercare Lab Services	Received at Watercare Lab Services	Condition on Receipt
Date: 8/9/23 Time:	Date: Time:	☐ Room Temperature ☐ Chilled ☐ Frozen
Name: Tom Bell	Name:	Temperature on arrival :
Signature:	Signature:	

Heavy metals = Arsenic, cadmium, chromium, copper, lead, nickel, mercury, zinc

CHEMICAL TESTS

- ❑ Alkalinity
- ❑ Ammonia
- ❑ BOD
- ❑ Bromate
- ❑ Bromide
- ❑ Chlorate
- ❑ Chloride
- ❑ Chlorite
- ❑ COD
- ❑ Colour
- ❑ Conductivity
- ❑ Cyanide
- ❑ DO
- ❑ DOC
- ❑ Fluoride
- ❑ Iodide
- ❑ Ion Balance
- ❑ Nitrate
- ❑ Nitrite
- ❑ Oil & Grease
- ❑ pH
- ❑ Phosphorus Soluble
- ❑ Phosphorus Total
- ❑ Sulphate
- ❑ Sulphide
- ❑ Suspended Solids
- ❑ Total Dissolved Solids
- ❑ TKN
- ❑ TOC
- ❑ Total N
- ❑ Total Solids
- ❑ Turbidity
- ❑ UV
- ❑ Volatile Matter
- ❑ Other

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WATER PROFILES

- ❑ Bore Microbiology
- ❑ Bore Chemistry
- ❑ Pool Micriobiology

METALS

❑ Tick this box if you require ultra-trace level metals for NZDWS 2005 (revised 2018) or other compliance

	Total	Soluble
❑ Aluminium	❑	❑
❑ Antimony	❑	❑
❑ Arsenic	❑	❑
❑ Beryllium	❑	❑
❑ Boron	❑	❑
❑ Cadmium	❑	❑
❑ Calcium	❑	❑
❑ Cobalt	❑	❑
❑ Chromium	❑	❑
❑ Chromium 6	❑	❑
❑ Copper	❑	❑
❑ Hardness	❑	❑
❑ Iron	❑	❑
❑ Lead	❑	❑
❑ Lithium	❑	❑
❑ Magnesium	❑	❑
❑ Manganese	❑	❑
❑ Molybdenum	❑	❑
❑ Mercury	❑	❑
❑ Nickel	❑	❑
❑ Potassium	❑	❑
❑ Selenium	❑	❑
❑ Silver	❑	❑
❑ Sodium	❑	❑
❑ Zinc	❑	❑
❑ Other	❑	❑
.....	❑	❑
.....	❑	❑
.....	❑	❑
.....	❑	❑
.....	❑	❑
.....	❑	❑
.....	❑	❑

NB: For solid samples, analysis is for recoverable (not total) metals

GC/GCMS

- ❑ Acid Herbicides
- ❑ DHA
- ❑ HAA
- ❑ VOC
- ❑ VOC by Thermal Desorption
- ❑ THM
- ❑ SVOC
- ❑ OCP
- ❑ PAH
- ❑ PHN
- ❑ BTEX
- ❑ TPH
- ❑ PCB
- ❑ Formaldehyde
- ❑ Volatile Fatty Acids
- ❑ Taste & Odour
- ❑ Other

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MICROBIOLOGICAL TESTS

❑ Tick this box if the sterile bottles provided contain sodium thiosulphate. This is required for chlorinated samples.

- ❑ *E. coli* & Total Coliforms (Colilert MPN)
- ❑ *E. coli* (Membrane Filtration)
- ❑ Faecal Coliforms (Membrane Filtration)
- ❑ Enterococci (Membrane Filtration)
- ❑ Enterococci (Enterolert MPN)
- ❑ HPC - ❑ 22°C ❑ 35°C ❑ 37°C
- ❑ *Pseudomonas aeruginosa*
- ❑ *Salmonella* - ❑ P/A ❑ MPN
- ❑ *Campylobacter* - ❑ P/A ❑ MPN
- ❑ *Legionella*
- ❑ Giardia & Cryptosporidium
- ❑ Phytoplankton and Cyanobacteria
- ❑ F-Specific RNA Bacteriophage
- ❑ Culturable Enterovirus
- ❑ Culturable Adenovirus
- ❑ Other

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ANALYSIS OF YOUR WATER

Tests

If you require assistance with selecting tests please ask one of our Sample Receptionists for help. However, please note that if your testing is for regulatory or compliance requirements such as food production or resource consents, we can not advise you what you will require, you will need to contact the appropriate regulatory body. If you need your testing requirements to meet a particular standard please record this clearly on the sheet and inform the Sample Receptionist when you deliver the samples. With regard to drinking water, we are commonly asked to analyse water samples and confirm that the water is 'safe' to drink. Due to the number of possible contaminants that may be present in water it is not possible for us to do this. However, what we can do is analyse particular determinands and advise whether or not they meet the NZ Drinking Water Standards 2018.

Reporting

As a purely analytical laboratory we do not provide written reports with an interpretation of your test results. If you wish us to make any comment on the laboratory report, please discuss this with us at the time of delivery, to see if we can accommodate your requirements. For further information on drinking water, please refer to the following websites:

www.drinkingwater.org.nz - general information

www.moh.govt.nz - NZ Drinking Water Standards 2018

Turnaround Time

Please note that our standard turnaround time for most tests is 10 working days. For a faster turnaround time please talk to one of our Sample Receptionists.