Appendix 16

Contaminated Land Effects Assessment

Eastern Busway EB3 Commercial and EB4 Link Road

Contaminated Land Effects Assessment

Document Number: EB-RP-3C4L-PL-000007

Eastern Busway

Quality Information

Document Number: EB-RP-3C4L-PL-000007

Document History and Status			
Rev	**Date**	**Author**	**Status**
A	19.07.2023	Harry Jones	Final

Document Approval					
Rev	**Action**	**Name**	**Position**	**Date**	**Signature**
A	Reviewed by	Emilie Eddington	SQEP	17.04.2023	On file
B	Reviewed by	Roger McDonald	Alliance Principal Planner	25.07.2023	On file
1	Approved by	Jarrod Snowsill	Alliance RMA Planning Lead	31.08.2023	On file

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List of Abbreviations and Definitions

Abbreviation and Definitions	Description
AEE	Assessment of Effects on the Environment
AUP(OP)	Auckland Unitary Plan (Operative in Part) (Updated 20 July 2023)
bgl	Below Ground Level
CEMP	Construction Environmental Management Plan
CLMP	Contaminated Land Management Plan
EB1	Eastern Busway 1 (Panmure to Pakuranga)
EB2	Eastern Busway 2 (Pakuranga Town Centre)
EB3C	Eastern Busway 3 Commercial (Pakuranga Creek to Botany)
EB3R	Eastern Busway 3 Residential (SEART to Pakuranga Creek)
EB4L	Eastern Busway 4 Link Road (link between Tī Rākau Drive and Te Irirangi Drive, Botany Town Centre)
EBA	Eastern Busway Alliance
ESCP	Erosion and Sediment Control Plan
HAIL	Hazardous Activities and Industries List
km	Kilometre(s)
m	Metre(s)
m^2	Square Metre(s)
m^3	Cubic Metre(s)
NES-CS	Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011
RTN	Rapid Transit Network
RRF	Reeves Road Flyover
RMA	Resource Management Act 1991
SEART	South-Eastern Highway
SQEP	Suitability Qualified and Experienced Practitioner
TPH	Total Petroleum Hydrocarbon

Executive Summary

This report is a review and assessment of contaminated land effects associated with the construction of the Eastern Busway 3 Commercial (EB3C) and Eastern Busway 4 Link Road (EB4L) packages of the Eastern Busway Project (the Project).

Key elements of the proposed EB3C works include the construction of two bridges, noise walls and retaining walls, stormwater drainage, and a cycleway. The proposed EB3C bridge structures, new and upgraded stormwater outfalls and an area of reclamation will require works in the coastal marine area (CMA).

The proposed EB4L footprint traverses parts of Guys Reserve and Whaka Maumahara Reserve and includes road widening at the intersection of Te Irirangi and Town Centre Drive, Botany. Key elements of the proposed EB4L works include a bridge structure, retaining walls, stormwater drainage, and a new walking and cycling pathway.

This contaminated land assessment:

- Assesses whether sites within EB3C and EB4L have been subject to contaminating activities (if applicable) including the location(s) and type(s) of these activities
- Assesses the potential implications of identified sources in relation to the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES-CS)
- Provides general commentary on rules in the Auckland Unitary Plan (Operative in Part) (AUP(OP)) in relation to contamination
- Provides a general assessment of the potential effects of works within EB3C and EB4L on human health and the environment, and the potential mitigation measures to avoid, remedy or mitigate those effects (in relation to contamination effects).

Based on the information reviewed as part of this assessment, four sites were identified within EB3C and EB4L where HAIL activities may have caused contamination to be present within or adjacent to proposed works areas:

- 242 Tī Rākau Drive (service station)- EB3C
- 386 Tī Rākau Drive (service station) – EB3C
- 550 Te Irirangi Drive (service station) – EB4L
- 451 Tī Rākau Drive (21/451 Tyre City; 22/451 Pit Stop Botany; 24/451 VTNZ Botany) – EB4L

No previous environmental investigations of potential contamination at these sites were identified for review and detailed site investigations were not completed as part of this assessment. As soil and groundwater quality are unknown, it is reasonable to assume contamination is likely to be present at the above sites.

EB3C

There are seven sites within, or within 200 m of, EB3C where HAIL activities were identified and a number of residential properties where hazardous materials like asbestos or lead based paint may be found. However, it is considered likely that contamination may only be encountered at the following two sites: 242 Tī Rākau Drive and 386 Tī Rākau Drive. These sites are located within soil disturbance areas for the proposed bus lane and/or for a pedestrian/cycleway as part of works within EB3C and

require the removal of fuel storage systems before EB3C excavation works can be undertaken. There has been limited site investigation completed to date.

The remaining HAIL sites identified within EB3C have been excluded from consent requirements due to the following:

- The sites are not located within or adjacent to any area of significant excavation
- The sites have been evaluated and contamination is unlikely to be present.

EB4L

There are two sites within 200 m of EB4L where HAIL activities were identified: 550 Te Irirangi Drive and 451 Tī Rākau Drive.

At 550 Te Irirangi Drive and 451 Tī Rākau Drive, no soil disturbance activities will take place as part of work within EB4L. However, local topography slopes toward the EB4L footprint and potential shallow groundwater contamination (if present) could migrate to the proposed areas of soil disturbance. Therefore, it is reasonable to assume contamination is likely present within areas of proposed soil disturbance.

Consent Requirements

The removal of a fuel storage system is a permitted activity where criteria are met under the NES-CS and AUP(OP). As there is currently no information pertaining to the soil and groundwater quality at 242 and 386 Tī Rākau Drive, there is insufficient evidence to demonstrate that the permitted activity criteria can be met. Therefore, adopting a conservative approach, resource consents as a discretionary activity are being sought for the proposed removal of fuel storage systems at both sites.

Proposed soil disturbance volumes related to proposed works, including at 242 and 386 Tī Rākau Drive and land adjacent to 550 Te Irirangi Drive and 451 Tī Rākau Drive, will likely exceed the permitted activity criteria under the NES-CS and the AUP(OP). As there is limited to no previous environmental investigations pertaining to contamination conditions available for these sites, adopting a cautious approach, discretionary resource consents are being sought for the soil disturbance activities.

Assessment of Effects and Mitigation

During the proposed works for EB3C and EB4L, construction workers could be exposed to contaminated soil and/or groundwater (direct contact, ingestion or inhalation) and there could be discharges of soil and groundwater contaminants to land, surface water or air. This assessment demonstrates that these effects can be appropriately managed and mitigated via implementation of the Contaminated Land Management Plan (CLMP) in conjunction with the Construction Environmental Management Plan and the Erosion and Sediment Control Plan required by conditions.

Hazardous materials such as asbestos and lead based paints may be encountered during structure removal and soil disturbance activities. Unexpected discoveries of hazardous materials during site works will be managed through implementation of the required CLMP.

1 Introduction

1.1 Overview of the Eastern Busway Project

The Project is a package of works focusing on promoting an integrated, multi-modal transport system to support population and economic growth in southeast Auckland. This involves the provision of a greater number of improved public transport choices and aims to enhance the safety, quality and attractiveness of public transport and walking and cycling environments. The Project includes:

- 5 km of two-lane busway
- Two new bridges for buses across Pakuranga Creek (Bridges A and B)
- A new bridge for buses crossing Guys Reserve and Whaka Maumahara Reserve (Bridge C)
- Improved active mode infrastructure (walking and cycling) along the length of the busway
- Three intermediate bus stations
- Two major interchange bus stations.

The Project forms part of the previous Auckland Manukau Eastern Transport Initiative (AMETI) programme (the programme) which includes a dedicated busway and bus stations between Panmure, Pakuranga and Botany town centres. The dedicated busway will provide an efficient rapid transit network (RTN) service between the town centres, while local bus networks will continue to provide more direct local connections within the town centre areas. The Project also includes new walking and cycling facilities, as well as modifications and improvements to the road network.

The programme includes the following works which are not part of the Eastern Busway Project:

- Panmure Bus and Rail Station and construction of Te Horeta Road (completed)
- Eastern Busway 1 (EB1) – Panmure to Pakuranga (completed).

The Eastern Busway project consists of the following packages:

- Early Works Consents – William Roberts Road (WRR) extension from Reeves Road to Tī Rākau Drive (LUC60401706); and Project Construction Yard at 169 – 173 Pakuranga Road (LUC60403744)
- Eastern Busway 2 (EB2) – Pakuranga Town Centre, including the Reeves Road Flyover (RRF) and Pakuranga Bus Station
- Eastern Busway 3 Residential (EB3R) – Tī Rākau Drive from the South-Eastern Arterial (SEART) to Pakuranga Creek, including Edgewater and Gossamer Intermediate Bus Stations
- Eastern Busway 3 Commercial (EB3C) –which commences from Riverhills Park along Tī Rākau Drive to Botany, including two new bridges, and an offline bus route through Burswood **(this Assessment)**
- Eastern Busway 4 Link Road (EB4L) – Guys Reserve to the Botany Town Centre, including a link road through Guys Reserve and Whaka Maumahara Reserve to Te Irirangi/Town Centre Drive intersection (**this Assessment**).

The overall Project is shown in **Figure 1** below.

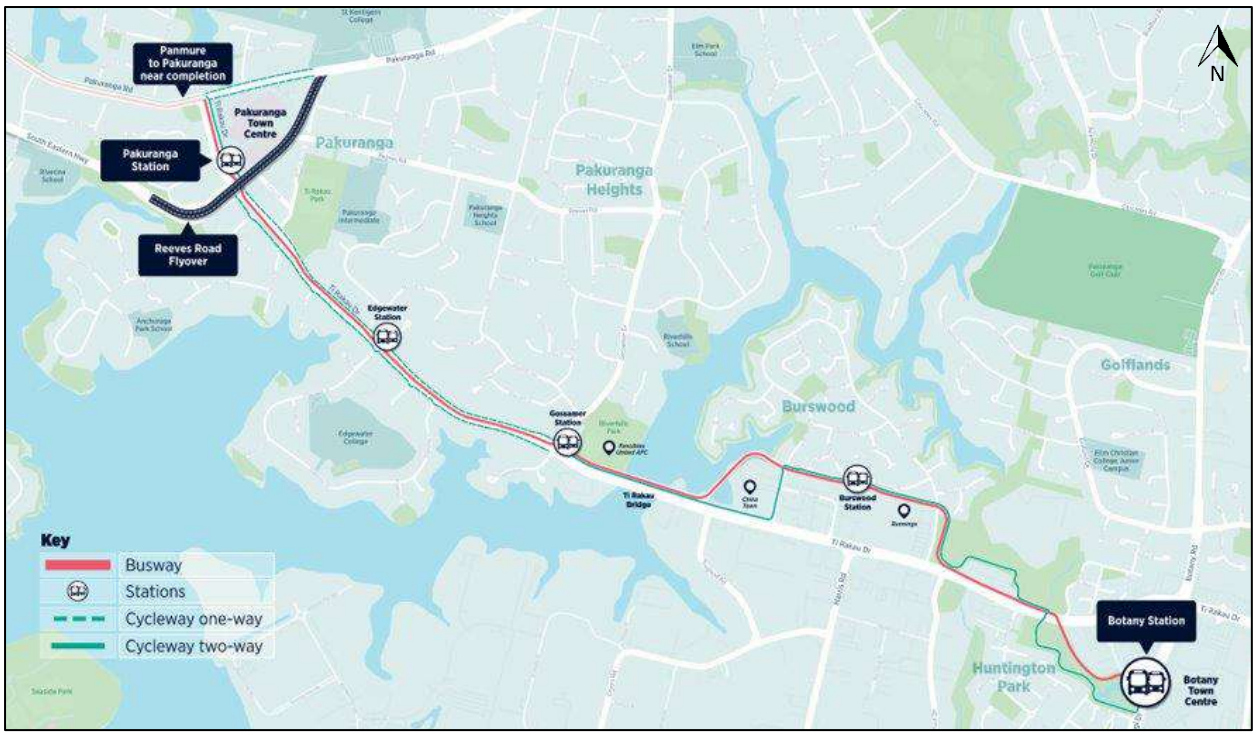

Figure 1. Project alignment.

1.2 Project Objectives

The Project Objectives are:

1. Provide a multimodal transport corridor that connects Pakuranga and Botany to the wider network and increases choice of transport options.
2. Provide transport infrastructure that integrates with existing land use and supports a quality, compact urban form.
3. Contribute to accessibility and place shaping by providing better transport connections between, within, and to the town centres.
4. Provide transport infrastructure that improves linkages, journey time and reliability of the public transport network.
5. Provide transport infrastructure that is safe for everyone.
6. "Provide or Safeguard future" transport infrastructure at (or in the vicinity of) Botany Town Centre to support the development of strategic public transport connection to Auckland Airport.

2 Proposal Description

The following sections provide a brief description of both EB3C and EB4L. These descriptions consist of the construction and operation of both EB3C and EB4L packages, with further details provided in the AEE and Notices of Requirement. A full set of proposed plans is attached to the AEE.

Figure 2. Eastern Busway 3 Commercial and 4 Link Road Project Extent

2.1 Eastern Busway 3 Commercial

The EB3C works will involve the establishment of an 'off-line' busway, cycleway, and stormwater upgrades. EB3C is presented on **Figure 3**. These works will take place within existing road reserves, Council reserves[1] and privately held land. The extent of works for EB3C runs between Riverhills Park (i.e., adjacent to the terminus of the EB3R package) in the west to Guys Reserve in the east, through the suburbs of Burswood and East Tāmaki.

The busway will be largely off-line (i.e., outside the current Tī Rākau Drive corridor), first crossing Pakuranga Creek by way of a new two-lane bridge (Bridge A) including abutments[2] and scour protection. It will then cross a coastal headland at 242 Tī Rākau Drive (a Mobil branded service station), and then an embayment within which a retaining wall, and a 4m^2 coastal reclamation will be constructed. The busway will cross a second headland at 254 Tī Rākau Drive (currently occupied by a pet store), before crossing a mangrove filled bay to the west of 262 Tī Rākau Drive (the 'Chinatown' retail business) via a second bridge (Bridge B). Bridge B will include two abutments with scour protection. Bridge B will require construction of a reinforced embankment at its northern end which includes imported fill, rip rap and permanent wick drains, and 549m^2 of coastal reclamation. In parallel, a retaining wall will be constructed to the eastern side of the embankment. Following this, the busway runs between the commercial area and residential area north of Tī Rākau Drive, crossing several residential sites. The busway also crosses Burswood Drive twice, with raised signalised crossings established to control both the busway and road traffic.

A new 'intermediate' style bus station will be established at Burswood before the busway then crosses over Burswood Esplanade Reserve and onto a widened Tī Rākau Drive (by the Howick and Eastern bus

[1] Including Burswood Esplanade Reserve and Bard Place Reserve
[2] The western abutment and associated scour protection was included in the EB3R consenting package

depot). The busway will then run beside the eastbound lanes of Tī Rākau Drive, before crossing over Tī Rākau Drive to connect with EB4L at Guys Reserve.

The busway will include a new cycleway, which will largely run parallel to the busway for most of this section of the Project. The exceptions to this include Bridge B, between 254 Tī Rākau Drive and Burswood Esplanade (west), for this section the cycleway will continue along Tī Rākau Drive before turning into Burswood Drive West, as well as where the cycleway runs behind the Howick and Eastern bus depot.

Other works included in EB3C are the relocation of existing utility services, the provision of new or upgraded stormwater infrastructure and open space upgrades. Stormwater works will involve new outfalls discharging to Pakuranga Creek (and its tributaries) and rain gardens.

Lastly, EB3C involves the establishment of two laydown areas, one at 242 Tī Rākau Drive and the other within the boundaries of Burswood Esplanade Reserve. Both laydown areas are located on land that will be occupied by the Project upon its completion.

Figure 3. Eastern Busway 3 Commercial Project Area

2.2 Eastern Busway 4 Link Road

The EB4L works will involve the establishment of an 'off-line' dedicated two-way busway, shared pathway and stormwater upgrades. EB4L is presented on **Figure 4**. These works will take place in Guys Reserve, Whaka Maumahara Reserve, existing road reserve and Botany Town Centre land for the intersection improvements on Town Centre Drive.

EB4L commences south of Tī Rākau Drive, crossing through Guys Reserve, Whaka Maumahara Reserve and ending at the intersection of Te Irirangi Drive/Town Centre Drive.

The works will primarily involve the construction of a new two-way busway corridor which will run along the eastern side of Guys Reserve and Whaka Maumahara Reserve to provide access for bus services between Pakuranga and Botany. The two-way busway is designed to integrate with EB3C and be a continuation of the EB3C busway.

This section of the busway will feature a bridge (Bridge C) approximately 350 m long. This bridge is needed due to the sloping topography of the Reserves.

The busway will then connect to Te Irirangi Drive, following alterations to the existing Te Irirangi Drive/Town Centre Drive intersection.

A shared cycle and footpath and minor retaining walls will also be constructed along the southern and western boundaries of Guys Reserve and Whaka Maumahara Reserve. The shared pathway will connect to existing walkways and will terminate at Te Irirangi Drive.

A new shared pathway and retaining wall will also be constructed along the western boundary of Te Irirangi Drive and is partially located within the Whaka Maumahara Reserve.

A new stormwater outfall (including riprap) will be constructed within Guys Reserve. The outfall will discharge stormwater over scour protection prior to its entry into a tributary of Pakuranga Creek. Additionally, a new stormwater connection will be constructed in Whaka Maumahara Reserve, adjacent to Te Irirangi Drive. This new connection will discharge via an existing outfall into the existing stormwater pond within the Reserve.

A construction laydown area will also be established within Guys Reserve, adjacent to Tī Rākau Drive and 47C Huntington Drive. A second laydown area will be established in Whaka Maumahara Reserve, between the existing stormwater pond and Te Irirangi Drive. Construction access will also be gained from Te Koha Road beside VTNZ's vehicle inspection premise located at 451 Tī Rākau Drive.

Figure 4. Eastern Busway 4 Link Road Project Area

3 Specialist Assessment

Chapter Summary
• *This contaminated land assessment evaluates whether sites within EB3R and EB4L have been subject to potential contamination sources, if consents are required and the potential contamination-related effects of proposed works on human health and the environment.* • *The approximate cut and fill volumes for EB3R and EB4L are 16,150 m^3 and 38,880 m^3, respectively.* • *This section includes a description of the regulatory framework applicable to EB3R and EB4L.*

3.1 Assessment Content

This report is a review and assessment of contaminated land effects associated with the construction of the EB3C and EB4L packages of the Project.

This contaminated land assessment:

- Assesses whether sites within EB3C and EB4L have been subject to contaminating activities (if applicable) including the location(s) and type(s) of these activities
- Assesses the potential implications of identified sources in relation to the NES-CS
- Provides general commentary on rules in AUP(OP)
- Provides a general assessment of the potential effects of works within EB3C and EB4L on human health and the environment, and the potential mitigation measures to avoid, remedy or mitigate those effects (in relation to contamination effects).

The scope of this contaminated land assessment involves:

- Completing a site walkover of EB3C and EB4L
- Completing a desktop study including:
    - Review and assessment of previous environmental investigations in the vicinity of, and including, the EB3C and EB4L
    - Review of publicly available historical aerial photographs
    - Review of Auckland Council (AC) contaminated land enquiry
- Completing preliminary soil and groundwater sampling
- Assessing the potential extent, effects, and mitigation measures of contamination in relation to EB3C and EB4L, if present.

This report has been completed in general accordance with the Ministry for the Environment (MfE), Contaminated Land Management Guidelines No 1: 'Reporting on Contaminated Sites in New Zealand' (MfE, 2021a). This report has been written and reviewed by suitably qualified and experienced practitioners (SQEPs) and otherwise complies with Regulation 3 of the NES-CS.

3.2 Specific Project Elements

The Erosion and Sediment Control Plan (ESCP; EBA,2023) details the areas within the proposed EBA packages including EB3C, where excavation during works is required.

3.2.1 EB3C Package

3.2.1.1 Removal of buildings and other assets

Construction of the Project will involve the removal of 39 houses, three commercial buildings, and roadside furniture. Specialist subcontractors will carry out the asbestos survey in the area prior to work commencing (EBA 2023a).

3.2.1.2 Earthworks

Construction of the Project will involve clearing of obstructions and vegetation and earthworks within the construction footprint. The Project construction footprint consists of approximately:

- 2 ha of land-based works
- 0.5ha of coastal works.

It is understood that the approximate total volume of excavation in the EB3C package comprises of 15,000 m^3 of cut and 17,550 m^3 of fill (EBA, 2023a).

Refer to Table 1 below for a breakdown of estimated earthwork volumes within EB3C.

Table 1. Total cut and fill quantities for EB3C

Indicative Cut and fill volumes	EB3C Quantity (approx.)
Cut	15,000 m^3
Fill	17,550 m^3

3.2.2 EB4L Package

The total area of earthworks for EB4L is 24,130 m^2 and the total volume is presented in **Table 2**.

Table 2. Volume of earthworks required for temporary and permanent EB4L works.

Description of works for EB4L	Cut (m^3)	Fill (m^3)
Busway	200	2,960
Shared pathway and retaining walls along the southern and western boundaries of Guys Reserve and Whaka Maumahara Reserve	200	620
Temporary embankment	0	17,000
Temporary construction laydown areas	500	500
Te Irirangi Drive/Town Centre Drive intersection improvement works	250	250
Total	**1,150**	**21,330**

3.3 Regulatory Framework

As part of this assessment, consent may be required under the NES-CS and/or AUP(OP) if a piece of land disturbed as part of works within EB3C and EB4L has been subject to HAIL activities and the permitted activity standards of these regulatory documents cannot be complied with.

3.3.1 NES-CS

The NES-CS is designed to ensure that the land affected by contaminants in soil is appropriately identified and assessed when particular activities are undertaken, such as soil disturbance (Regulation 5(4)) and that the effects of activities occurring on a piece of land that may cause risk(s) to human health are managed (Regulation 5(7))**. Figure 5** demonstrates the decision process for determining whether resource consent is required under the NES-CS.

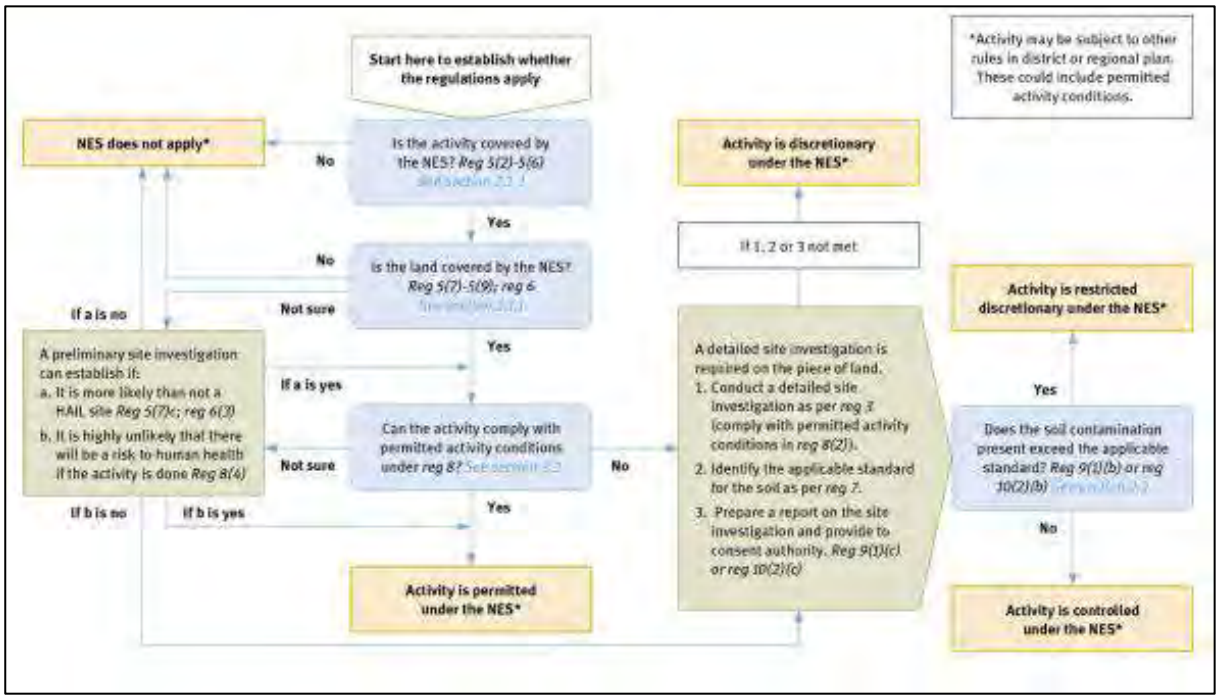

Figure 5. Process for determining resource consent requirements under the NES-CS

Regulation 5 (7) of the NES-CS describes land subject to the Regulations as:

> *(7) the piece of land is a piece of land that is described by 1 of the following:*
> *(a) an activity or industry described in the Activities and Industries List (HAIL) is being undertaken on it*
> *(b) an activity or industry described in the HAIL has been undertaken on it*
> *(c) it is more likely than not that an activity or industry described in the HAIL is being or has been undertaken on it.*

The MfE has developed the HAIL, which is a compilation of 53 activities and industries that are considered likely to cause land contamination resulting from hazardous substance use, storage, or disposal, both currently and historically (MfE, 2023). The HAIL is intended to identify activities or industries where hazardous substances have the potential to cause soil and groundwater contamination. The HAIL groups similar industries together, which typically use or store hazardous substances that could cause contamination if these substances escaped from safe storage, were

disposed of on the site, or were lost to the environment through use. If the proposed activity is on, or intersects with, a piece of land that currently has, or has had, a HAIL activity on it, then the NES-CS applies.

3.3.2 Auckland Unitary Plan – Chapter E30 Contaminated Land

This section of the AUP(OP) addresses the effects of the discharge from contaminated land or land containing elevated levels of contaminants into air, or into water, or into land under section 15 of the Resource Management Act 1991. Chapter E30 of the AUP(OP) is relevant to EB3C and EB4L due to the potential discharges associated with soil disturbance that may liberate contaminants.

4 Methodology

Chapter Summary
This chapter presents the methodologies employed for the site walkovers, the desktop study and the soil and groundwater sampling.

As part of this contaminated land assessment, site walkovers were carried out at EB3C and EB4L, a desktop study was completed which included reviewing previous environmental investigation reports, historical aerial photographs, and Auckland Council (AC) site contamination enquiry, and soil and groundwater samples were collected. The methodologies are presented in the sections below.

4.1 Site Walkovers

A contaminated land specialist completed site walkovers at EB3C and EB4L to visually assess the site features along the Project.

4.2 Desktop Study

4.2.1 Previous Environmental Investigations

As part of the desktop study, the following previous environmental investigations pertinent to sites in the vicinity of and including the EB3C area were reviewed:

- *Phase 1 PSI for the Pakuranga Scheme Assessment of the Auckland Manukau Eastern Transport Initiative (AMETI) Alignment*, prepared by GHD Limited (GHD), 7 December 2012
- Multiple letter-reports prepared by URS and responses from AC in 2002 and 2003 for works completed at 380 Tī Rākau Drive
- *AMETI Eastern Busway 2 and 3 Draft Environmental Assessment (Contamination)*, prepared by AECOM, 15 April 2019.

The previous environmental investigation reports are included in **Appendix A** and are summarised below**.**

4.2.2 Aerial Photographs

A review of publicly available historical aerial photographs has been conducted in the vicinity of EB3C and EB4L, to identify historical or current HAIL sites not identified in previous environmental investigations. Historical and current aerial photographs were obtained through the AC GeoMaps online portal, the Retrolens online portal and Google Maps. A review of aerial photographs was undertaken for the period 1940-2019. This allowed for the determination of land use changes and the identification of any pertinent items that have become apparent since the PSI in December 2012 and to allow for the identification of any pertinent land uses that may have been omitted during the development of previous environmental investigations. The aerial photographs are included in **Appendix B**.

4.2.3 AC Contamination Enquiry

EBA requested a contaminated land enquiry in June 2021 related to the AMETI EB3 and AMETI EB4 packages and on 30 November 2022, requested and received information pertaining to 380 Tī Rākau Drive (EB3C). Information received was reviewed and included data on landfill bores, air discharge, industrial and trade process consents and environmental assessments within the boundaries of the AMETI EB3 and EB3C packages. A copy of the AC contamination enquiry is included in **Appendix C**.

4.3 Preliminary Sampling Activities

Based on the results of the desktop study, a contaminated land specialist undertook preliminary soil and groundwater sampling on 29 June 2022. Details of the soil and groundwater sampling including logs, sampling details, laboratory analysis reports and results are included in **Appendix D**.

4.3.1 Soil Sampling

Soil samples were collected using a hand auger with a 50-millimetre (mm) diameter auger. The boreholes were advanced from surface to a maximum depth of 1.5 m below ground level (bgl). Soil encountered was logged and sampled, following which hand auger holes were backfilled with the remaining excavated soils.

To prevent cross contamination between samples, the hand auger was decontaminated via a three-step process using a combination of water and decon-90 solution and a new pair of nitrile gloves was worn. Soil samples were collected directly by hand and placed into laboratory supplied containers. All samples were stored in a chilled container and submitted to R J Hill Laboratories Limited (Hill Laboratories) in Auckland under standard chain of custody (CoC) procedure. CoC documentation is presented in **Appendix D**. The samples were analysed by Hill Laboratories for heavy metals, total petroleum hydrocarbons (TPH) and semi-quantitative asbestos.

Soil sampling was completed in general accordance with the MfE Contaminated Land Management Guidelines No 5 Site Investigation and Analysis of Soil (MfE, 2021b).

4.3.2 Groundwater Sampling

A qualitative grab groundwater sample was collected using a dedicated polyvinyl chloride bailers from a monitoring well installed for geotechnical purposes on 29 June 2022.

Prior to collecting the sample, the depth to groundwater and presence/absence of light non-aqueous phase liquid (LNAPL) was measured using an electronic oil-water interface probe.

The sample was collected into sample bottles supplied by Hill Laboratories. A duplicate sample was also collected for quality control purposes. The sample bottles were placed into a chilled storage container and submitted to Hill Laboratories in Auckland under standard CoC procedure. CoC documentation is presented in **Appendix D**. The samples were analysed by Hill Laboratories for pH, dissolved heavy metals (heavy metals), TPH and organochlorine pesticides (OCP).

4.3.3 Applicable Guidelines for Comparison

In accordance with the hierarchy defined in the MfE Contaminated Land Management Guidelines No 2: Hierarchy and Application in New Zealand of Environmental Guideline Values (MfE, 2011a), the soil analytical results have been compared against the criteria in the documents listed below:

4.3.3.1 Soil

- Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (MfE, 1999; Revised 2011). All pathways soil acceptance criteria for a commercial/industrial land use with sandy silt, silty clay and clay soil types and depth of contamination between < 1 and 1 – 4 based on the current land use. Hereinafter referred to as **Oil Industry Guidelines**
- The **NES-CS**

- Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Canadian Council for Ministers of the Environment (CCME), 2002). Hereinafter referred to as **CCME Soil Guidelines**
- New Zealand Guidelines for Assessing and Managing Asbestos in Soil (The Building Research Association of New Zealand (BRANZ), 2017). Hereinafter referred to as the **BRANZ Guidelines**

In accordance with Chapter E, Section 30 of the AUP(OP), soil analytical results have also been compared to:

- **Auckland Background Concentrations:** AUP(OP) Table E30.6.1.4.2 Background ranges of trace elements in Auckland soils sources from Table 3 of TP153:2001 Background Concentrations of Inorganic Elements in Soils from the Auckland Region (Auckland Council, 2001)
- **Permitted Activity Criteria**: AUP(OP) Table E30.6.1.4.1 Permitted Activity Soil Acceptance Criteria
- **Oil Industry Guidelines**: Soil acceptance criteria for protection of groundwater quality. The source of contamination is less than 100 metres from a sensitive surface water body. Therefore, the soil acceptance criteria for the protection of groundwater quality in sensitive aquifers specified in Table 4.20 of the Oil Industry Guidelines apply at the Site.

4.3.3.2 Groundwater

- Australian and New Zealand Guidelines (ANZG); Fresh Water Quality for 80% level of protection for freshwater ecosystems (National Water Quality Management Strategy, 2000 -revised 2018). Hereinafter referred to as the **ANZG** (formerly known as ANZECC, 2000)
- **Oil Industry Guidelines** – Tier 1 Groundwater Acceptance Criteria
  - Protection of outdoor inhalation exposure pathway for a commercial/ industrial land use. Groundwater analytical results have been compared against guidelines for silty clay soil types with groundwater at 2 – 4 m bgl (table 5.10).

5 Results – EB3C

Chapter Summary
• *Based on the site walkovers and the information reviewed, there are seven sites within 200 m of EB3C where HAIL activities were identified and other residential properties where hazardous materials like asbestos or lead based paint may be found.* • *All soil and groundwater sampling results were below the applicable guideline values or laboratory limit of reporting.*

5.1 Site Walkover - EB3C

Site walkovers of the EB3C Project were completed between June 2022 and January 2023.

The following is a summary of observations noted during the site walkovers along EB3C:

- Commercial and residential buildings are present within the Project area
- The area on the northern boundary of the Howick and Eastern Bus Depot (380 Tī Rākau Drive) is flat and grassed with steep banks sloping down to the north to an unnamed tributary of Pakuranga Creek
- Vegetation dieback was noted along the fence line of the Bus Depot, possibly from pesticide/herbicide spraying
- No olfactory evidence of contamination was noted.

5.2 No new HAIL sites were identified. Desktop Study – EB3C

5.2.1 Previous Environmental Investigations

5.2.1.1 Phase 1 PSI (GHD)

During their 2012 assessment, GHD reviewed packages EB2, EB3R, EB3C and EB4, areas previously referred to as Packages 3 & 4. The purpose of the PSI was to support AT in meeting the requirements of the NES-CS as it applies to 'a piece of land'. As such, the objective of the PSI was to assess the likelihood of the presence of soil contamination resulting from historical and/or current land use activity within or adjacent to the EBA packages.

The PSI comprised of a review of information from the following sources:

- Draft alignment plans as of October 2012 developed by GHD/Aurecon
- Selected publicly available historical aerial photographs from 1940 to 2010
- Collection of photographs as part of a walkover conducted on 26 September 2012
- AC contaminated sites register
- AC groundwater borehole register
- Readily available site investigation reports resulting from a site register search
- Readily available geology and hydrogeology information
- Publicly available information on the environmental fate of contaminants
- Identification of sensitive human and/or environmental receptors.

GHD presented the following key findings and conclusions relevant to EB3C:

- There are a number of geological units present, with the most prominent being rhyolitic pumiceous deposits of the Tauranga Group. The industrial zone between Trugood Drive and Burswood Drive is a mottled patchwork of construction fill and basalt and basanite lavas derived

from the Auckland Volcanic Field. To the west of the intersection between Botany Road and Tī Rākau Drive, near Bard Place Reserve, there is a rhyolitic pumice deposit. The fragments in this unit are mud to sand sized and include non-welded ignimbrite, tephra (ash fall volcanic deposits), and alluvial pumice deposits

- A site contamination enquiry was completed, seeking records from AC. A borehole register search revealed boreholes were advanced at two contaminated and potentially contaminated sites at 257 and 380 Tī Rākau Drive for monitoring purposes. At the time of this contaminated lands assessment, AC had no records of monitoring reports from the sites. 257 Tī Rākau Drive is close to the proposed cycleway and not near significant areas of soil disturbance
- A walkover identified Pakuranga Creek (adjacent to the north and east of 386 Tī Rākau Drive) as a sensitive receptor
- GHD identified four HAIL sites along EB3C and three additional sites within 200 m of EB3C. The report stated the regulations of the NES-CS apply on the basis of HAIL category H adjacent sites. Category H is defined as 'any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment'. The identified HAIL sites are detailed in **Table 3** below and presented on **Figure 6**.
- GHD recommended intrusive soil investigations were to be undertaken to assess potential contaminants along the alignment, at locations where the adjacent land use has been identified as having current or historical HAIL activities where the likelihood of contamination has been assessed as medium to high.

Table 3. Summary of HAIL Sites on or directly adjacent to EB3C or within 200 m of EB3C

Site Name	Location	Landuse Activity	Key Contaminants of Concern*
242 Tī Rākau Drive	On proposed busway/cycleway	Mobil Service Station	HAIL category F7- Polycyclic aromatic hydrocarbons (PAH) in coal, lubricating oil, hydrocarbon fuels, benzene, toluene, ethylbenzene and xylenes (BTEX)
245 Burswood Drive	Directly adjacent (west) of proposed cycleway	Best Automotive Clinic, now Auto Super Shoppe Pakuranga	HAIL category F4- Metals and metalloids, solvents, chlorinated solvents, petrol, diesel, lubricating oil, PAHs, urea, ethylene glycol
269 Tī Rākau Drive	Within 200 m (south) of proposed cycleway	Sandvik Materials Technology	HAIL category D5- Solvents, chlorinated solvents, metals and metalloids, lubricating oil, alkalis, acids
279 Tī Rākau Drive	Within 200 m (south-east) of proposed cycleway	Former Timber Storage Yard	HAIL category A18- Chromated copper arsenate (CCA), boron, pentachlorophenol, creosote, solvents, tributyltin, dioxins and difurans, pesticides, synthetic pyrethroids
284 Tī Rākau Drive	Within 200 m (east) of proposed cycleway	Z Service Station	HAIL category F7- PAH in coal, lubricating oil, hydrocarbon fuels, BTEX

Site Name	Location	Landuse Activity	Key Contaminants of Concern*
380 Tī Rākau Drive	Directly adjacent (north) of proposed busway and directly adjacent (south) of proposed cycleway	Howick and Eastern Bus Depot	HAIL category F8- PAH in coal, lubricating oil, hydrocarbon fuels, BTEX
386 Tī Rākau Drive	On proposed busway and directly adjacent (south) of proposed cycleway	Gull Service Station	HAIL category F7- PAH in coal, lubricating oil, hydrocarbon fuels, BTEX

*As presented in the HAIL document (MfE, 2023).

5.2.1.2 380 Tī Rākau Drive (URS)

URS completed initial investigation works at 380 Tī Rākau Drive between 29 November and 12 December 2002 and product recovery between 20 December 2002 and 1 October 2003. The works comprised:

- Drilling of two deep (10 m bgl) and two shallow (4 m bgl) soil bores on each of the four sides of the tank pit
- Installation of one deep (10 m bgl) and two shallow (0.8 m bgl) monitoring wells
- Collection of a groundwater sample from the deep monitoring well
- Determination of presence of separate phase product and depth to water in all monitoring wells and in two wells installed previously within the tank pit
- Removal of a total of 5300 litres of hydrocarbon product from the tank pit as of 1 October 2003.

In summary, hydrocarbon product and water appeared to be perched and contained within the tank pit due to the low permeabilities of the surrounding silt and clay soils. The soils adjacent to the tank returned TPH results below applicable guidelines. There was no evidence that hydrocarbon product had migrated within either the shallow granular basecourse fill material or stormwater services.

In letters dated 28 January 2003 and 26 November 2003, Auckland Regional Council confirmed it did not require a resource consent to authorise the discharge of residual contaminants to ground. The letters also acknowledged the successful removal of product from within the tank pit and that they would approve the decommissioning of the system. EBA notes that no light end hydrocarbon results like benzene, toluene, ethylbenzene and xylenes (BTEX) were available for review for soil or groundwater.

5.2.1.3 Environmental Assessment (AECOM)

In 2018 and 2019, following recommendations of the 2012 PSI completed by GHD, AECOM undertook a data gap analysis and site investigation in support of the design for the proposed AMETI EB2 and EB3 packages (now EB2 to EB3C) and prepared a draft environmental assessment.

The gap analysis identified areas where further investigation was required. Between April and August 2018 and February 2019, six machine drilled boreholes and thirty-three environmental hand augered boreholes were advanced within the wider EBA works, of which eighteen soil samples were submitted for analysis from five hand augered boreholes (EHA113, EHA114, EHA116, EHA119 and EHA120) and two machine drilled boreholes (DH108 and DH109) within EB3C at depths between 0.1 and 1.5 m bgl. The investigation locations relevant to the EB3C package are presented in **Figure 6** below.

Samples were analysed for the following contaminants:

- Heavy metals,
- TPH,

- Benzene, toluene, ethylbenzene and xylenes (BTEX),
- Polycyclic aromatic hydrocarbons (PAHs),
- Pentachlorophenol (PCP), and
- Semi-quantitative asbestos.

The environmental assessment focussed on the collection of soil samples for laboratory analysis from materials within anticipated areas of soil disturbance and areas adjacent to HAIL sites identified in the 2012 PSI (refer to **Table 4** below). Soil samples were analysed for contaminants associated with the HAIL activities at or in the vicinity of the EB3C package.

The Data Gap Assessment is included in section 3.0 of the Draft Environmental Assessment in **Appendix A.**

Figure 6. 2018 Environmental investigation locations within the proposed EB3C

Table 4. Summary of sample locations from the 2018 Environmental Investigation relevant to EB3C package

Sampling Location	Rationale
EHA113	Area of proposed soil disturbance at 242 Tī Rākau Drive
EHA119*	Adjacent to 269 Tī Rākau Drive
EHA114*	Adjacent to 284 Tī Rākau Drive
EHA120*	Adjacent to 279 Tī Rākau Drive
DH108	Adjacent to 380 Tī Rākau Drive and an area of proposed soil disturbance
EHA116	Adjacent to 380 Tī Rākau Drive and an area of proposed soil disturbance
DH109	Adjacent to 386 Tī Rākau Drive (Petrol Station) and an area of proposed soil disturbance

*Note: locations are close to the proposed cycleway (not near significant areas of soil disturbance).

A summary of the analytical results in relation to EB3C is as follows:

- All soil analytical results were below criteria for NES-CS, Oil Industry Guidelines and Permitted Activity Criteria.
- All soil analytical results for TPH, BTEX, PAH and PCP concentrations were below the laboratory limit of reporting (LOR).
- Heavy metal concentrations from all soil analytical results were below the Auckland Background Concentrations (volcanic), with the exception of a surface sample collected at EHA113, which was above the Auckland Background Concentrations (volcanic) for lead.

5.2.2 Aerial Photographs

The first step of the aerial photograph review was to look at the land uses surrounding the entire length of the proposed EB3C package. The review then focused in on the three HAIL sites located on or directly adjacent to the EB3C package during the desktop review to get a more in-depth look at changes over time (242, 380 and 386 Tī Rākau Drive).

The review of aerial photographs highlighted the following key items across EB3C:

5.2.2.1 EB3C package

- Much of the land is undeveloped farmland in the 1940 aerial photograph, with the exception of scattered residential dwellings and ancillary farm buildings
- Tī Rākau Drive Bridge was constructed sometime between 1968 and 1975. In the 1975 aerial photograph, Tī Rākau Drive extends from the Tī Rākau Drive Bridge to the east for approximately 800 m, where it meets Harris Road. The remainder of the landscape is residential dwellings and ancillary farm buildings scattered across agricultural land
- Between 1988 and 1995 much of the EB3C area was developed, with residential dwellings established in the Burswood area, as well as commercial buildings along Tī Rākau Drive
- The building at 245 Burswood Drive was developed between 1988 and 1995, prior to which the area was either undeveloped or used for stock grazing. Google Street View confirms the site has been a motor vehicle workshop since at least 2008
- The site at 284 Tī Rākau Drive was developed between 1988 and 1995, prior to which the area was either undeveloped or used for stock grazing. Google Street View confirms the site has been a service station since at least 2008
- In the 1996 aerial photograph, development has begun at the site at 32 Torrens Road. In the northeast corner of the site a building has been constructed with the balance of the site either undeveloped or used as a storage yard. The site was fully developed by 2001, with the adjacent lot to the north used as either a carpark or car storage lot. Prior to establishment the site was either undeveloped or used for stock grazing. Google Street View confirms the site has been a Honda Service, Panel and Paint workshop since 2008.

5.2.2.2 242 Tī Rākau Drive

- The Service Station at 242 Tī Rākau Drive was developed between 1996 and 2001, prior to which the area was either undeveloped or used for pastoral farming.

5.2.2.3 380 Tī Rākau Drive

- The Howick and Eastern Bus Depot at 380 Tī Rākau Drive began development in 1996 and was completed sometime before 2001
- A tributary of the Pakuranga Creek flows at the back of the site
- The land appears to be previously undeveloped and used for pastoral farming

5.2.2.4 386 Tī Rākau Drive

- The service station at 386 Tī Rākau Drive began development around 1996 and was completed sometime before 2001
- A tributary of the Pakuranga Creek flows at the back of the site
- The land appears to be previously undeveloped and used for pastoral farming.

5.2.3 Auckland Council Contamination Enquiry

The information received from the AC contamination enquiry in relation to EB3C is detailed below.

- The 2021 contamination enquiry identified four sites as HAIL within a 200 m radius of the AMETI EB3. However, only 279 Tī Rākau Drive is within a 200 m radius of the proposed cycleway at the corner of Tī Rākau Drive and Burswood Drive. The site is more than 200 m away from the proposed EB3C busway **(Figure 6**)
- All bores identified within the enquiry area were either expired or the assessments were complete
- Discharge consents were noted at service stations located at 242 Tī Rākau Drive, 284 Tī Rākau Drive and 380 Tī Rākau Drive
- No closed landfills or pollution incidents were noted within EB3C.

A copy of the AC contamination enquiry is included in **Appendix C**.

5.3 Soil and Groundwater Sampling – EB3C

Following the desktop study, it was identified that further investigation was required at 242, 380 and 386 Tī Rākau Drive. As both 242 and 386 Tī Rākau Drive were in use as service stations at the time of investigation, access to the sites to assess the soil and groundwater conditions was not possible. EBA completed soil and groundwater sampling along the proposed cycleway north of 380 Tī Rākau Drive. The results are presented below.

5.3.1 Soil sampling

EBA advanced four hand augered boreholes within the cycleway along the northern boundary of the Howick and Eastern Bus Depot at 380 Tī Rākau Drive on 29 June 2022 (EHA124-EHA127). The location of the boreholes is presented on **Figure 7** below.

Soils encountered generally comprised minor layers of topsoil underlain by fill materials including silts and clays.

The following is the summary of the soil analytical results from the sampling activities. The results are compared to relevant guidelines and presented in **Table D1** in **Appendix D**.

- All soil analytical results were below all applicable guidelines
- All soil analytical results for TPH concentrations were below the laboratory LOR
- Heavy metal concentrations from all soil analytical results were below the Auckland Background Concentrations.

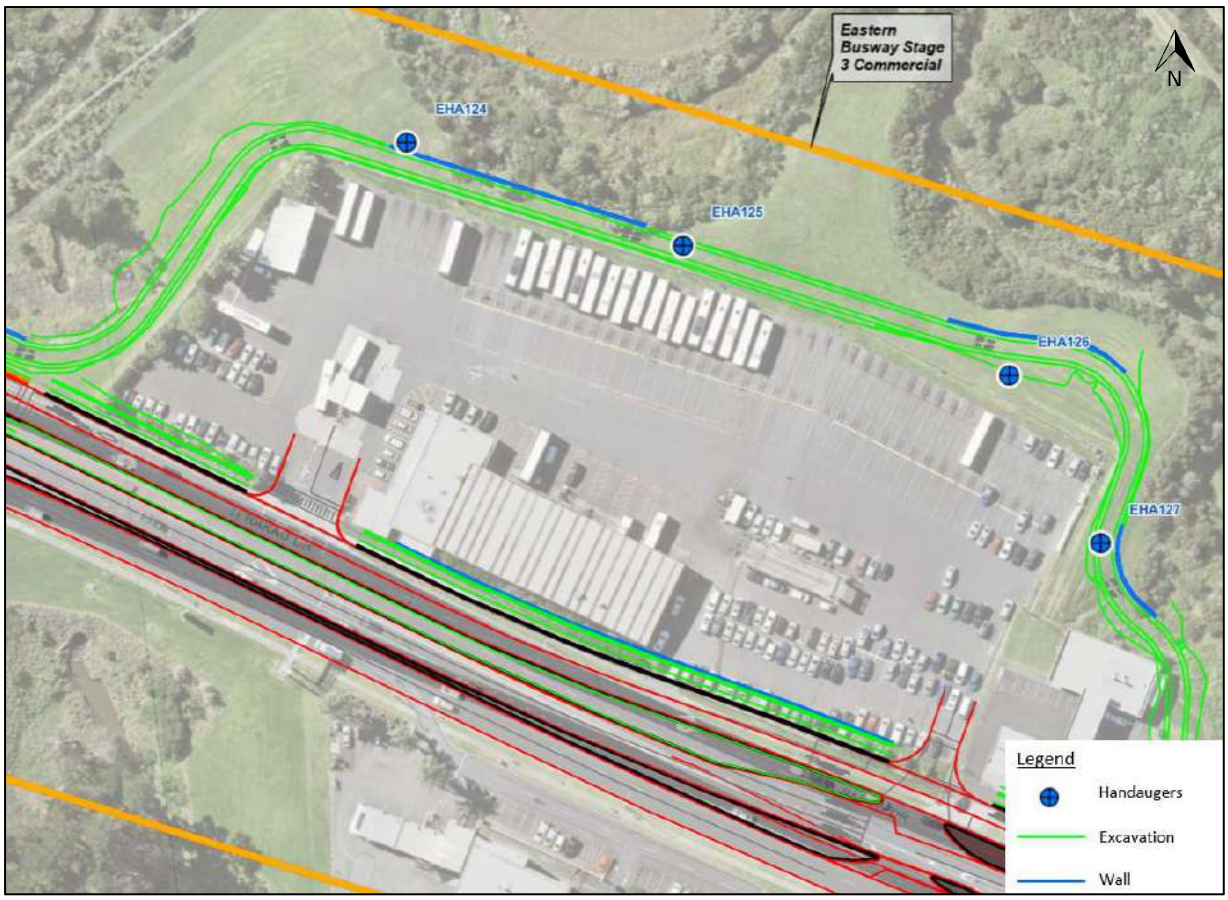

Figure 7. Soil sample locations along the proposed cycleway north of 380 Tī Rākau Drive.

5.3.2 Groundwater Samples

EBA collected a grab sample and duplicate sample from monitoring well DH322 on 29 June 2022. The location of DH322 is presented on **Figure 8** below. The following is a summary of the groundwater analytical results. The results are compared to relevant guidelines and presented in **Table D2** in **Appendix D**.

- Groundwater was measured at 3.134 m bgl
- Minor concentrations of dissolved arsenic, nickel and zinc were detected in the sample collected from DH322
- All analytes returned concentrations below the relevant guidelines
- Concentrations of TPH and OCPs returned results below the laboratory LOR
- The duplicate sample, collected for quality control purposes, returned a maximum relative percentage difference of 24.3%. A field duplicate relative percentage difference value of less than 30% is generally considered acceptable. There are no concerns with the laboratory dataset.

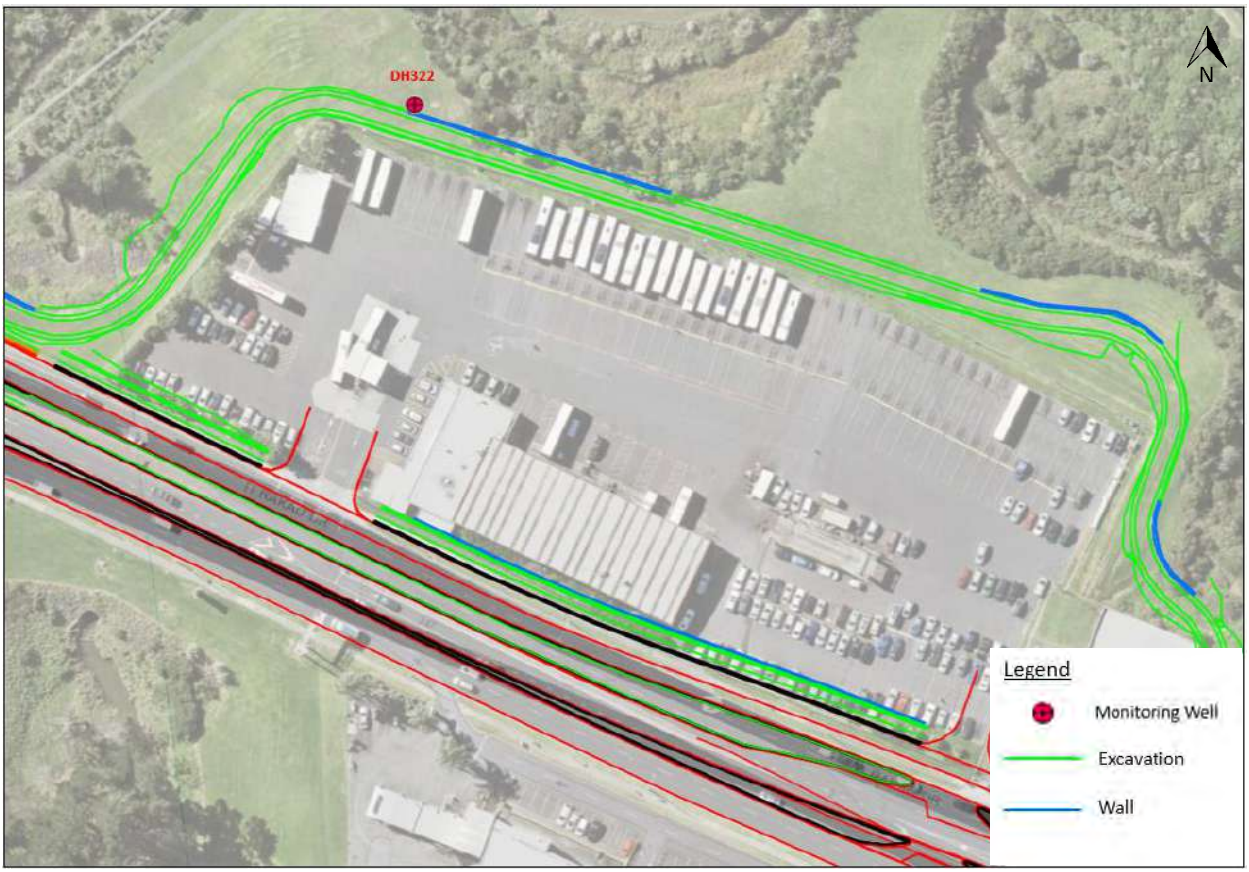

Figure 8. Location of monitoring well DH322.

6 Consent Requirements – EB3C

Chapter Summary

• *Discretionary consents are sought for works at 242 Tī Rākau Drive and 386 Tī Rākau Drive.*
• *The remaining HAIL sites identified within EB3C have been excluded from consent requirements due to the following:*
  • *The sites are not located within or adjacent to any area of significant excavation*
  • *The sites have been evaluated and contamination is unlikely to be present.*

Based on the information reviewed, there are seven sites within, or within 200 m of, EB3C where HAIL activities were identified and a number of residential properties where hazardous materials like asbestos or lead based paint may be found. **Table 5** presents these sites against a summary of the proposed soil disturbance activities and likelihood of contamination to be present and an assessment of whether resource consents are required.

Site Name	Land use Activity	Summary	Consent Required
245 Burswood Drive	Best Automotive Clinic, now Auto Super Shoppe Pakuranga	Proposed cycleway is adjacent to the site. No soil disturbance is proposed within the site boundaries. No exposure to potentially contaminated groundwater as the proposed earthworks for the cycleway is likely to be shallower than the depth to groundwater.	No
269 Tī Rākau Drive	Sandvik Materials Technology	The sites are within 200 m of the proposed cycleway. No soil disturbance is proposed within the site boundaries. The sites were investigated in 2018. No soil contamination was encountered. No exposure to potentially contaminated groundwater as the proposed earthworks for the cycleway is likely to be shallower than the depth to groundwater.	No
279 Tī Rākau Drive	Former Timber Storage Yard		No
284 Tī Rākau Drive	Service Station		No
380 Tī Rākau Drive	Howick and Eastern Bus Depot	Remedial works completed in 2003. Soil and groundwater TPH results were below applicable guidelines. Site investigated in 2018 and 2022. No soil or groundwater contamination encountered.	No
242 Tī Rākau Drive	Service Station	Limited site investigation completed in 2018. Soil disturbance proposed onsite. Potential for migration of contaminants into area of soil disturbance within EB3C.	Yes
386 Tī Rākau Drive	Service Station	Limited site investigation completed in 2018. Soil disturbance proposed onsite. Potential for migration of contaminants into area of soil disturbance within EB3C.	Yes
Various Residential Properties	Residential Properties	Historical aerials identified potential for hazardous building materials like asbestos and lead based paint to be present in EB3C. Covered under unexpected discoveries.	No

Table 5. Summary of findings within EB3C.

6.1 242 and 386 Tī Rākau Drive

242 Tī Rākau Drive and 386 Tī Rākau Drive were identified as HAIL sites (service stations) in the 2012 PSI. A request to the AC contaminated land team returned no environmental investigations pertaining to these sites and soil and groundwater assessments could not be completed in 2022. Therefore, adopting a conservative approach, it is considered reasonably likely that contamination is present onsite.

At 242 Tī Rākau Drive and 386 Tī Rākau Drive, two proposed activities that may trigger consent requirements under the NES NES-CS and AUP(OP) will take place:

- Disturbing the soil: 242 Tī Rākau Drive is located within the soil disturbance area for the proposed busway as part of works within EB3C. 386 Tī Rākau Drive is located within a soil disturbance area for a pedestrian/cycleway as part of works within EB3C.
- Removing a fuel storage system: The sites are still active service stations with underground storage tanks (USTs) and associated fuel lines located within/directly adjacent to the soil disturbance areas. The project proposal involves the closure of the sites and subsequent removal of service station assets (USTs, fuel dispensers etc).

6.1.1 NES- CS

Under Regulation 5(7) and 5(8), the NES-CS applies to both sites for the soil disturbance and fuel storage system removal activities undertaken as part of EB3C works.

Soil disturbance at both sites will likely exceed the permitted activity requirements for soil disturbance volume as allowed under Regulation 8(3) of the NES-CS (25 m^3 per 500 m^2 of soil disturbance and 5 m^3 per 500 m^2 of removal). As Detailed Site Investigations (DSI) are not able to be completed prior to submission of this report, consent under controlled or restricted discretionary status is not possible.

The removal of a fuel storage system is a permitted activity where requirements are met under Regulation 8(1) of the NES-CS. As there is currently little information pertaining to the removal of the fuel storage systems at both 242 and 386 Tī Rākau Drive and DSIs were not able to be completed prior to submission of this report, there is insufficient evidence to demonstrate that the permitted, controlled, or restricted discretionary activity requirements can be met.

The soil disturbance and removal of fuel storage systems at both sites will need to be completed under a resource consent for a discretionary activity (Regulation 11) and any potential effects to human health managed through a CLMP.

6.1.2 Auckland Unitary Plan

As both 242 Tī Rākau Drive and 386 Tī Rākau Drive are considered reasonably likely to contain elevated levels of contaminants, consent is sought under the AUP(OP) for the following activities:

- Soil disturbance volumes at both sites will likely exceed the permitted activity criteria of 200 m^3 outlined in Chapter E30.6.1.2.
- The removal of a fuel storage system is unlikely to meet the permitted activity requirements under Chapter E30.6.1.5(2).

As there is currently little information pertaining to the removal of the fuel storage systems at both 242 and 386 Tī Rākau Drive and DSIs are not able to be completed prior to submission of this report, consent under permitted and controlled activity status is not possible for either activity.

Therefore, adopting a cautious approach, resource consents for a discretionary activity are being sought for the soil disturbance and removal of the fuel storage systems and any potential contamination-related effects will be appropriately managed through the conditions of consent and a CLMP.

7 Results – EB4L

Chapter Summary
• *Based on the site walkover and the information reviewed, there are two sites within 200 m of EB4L where HAIL activities were identified.*

7.1 Site Walkover – EB4L

A site walkover of EB4L was completed on 12 January 2023.

The following is a summary of observations noted during the site walkover:

- A Z service station at 550 Te Irirangi Drive
- Tyre City, Pitstop and VTNZ at 451 Tī Rākau Drive
- The banks adjacent to the northeast of Whaka Maumahara are steep, with a stormwater culvert feeding the stormwater pond along the eastern edge
- Refuse (including tyres, rubbish, and disused appliances) from fly-tipping throughout Guys Reserve
- A pipeline (Watercare Asset) in the middle of Guys Reserve.

7.2 Desktop Study – EB4L

7.2.1 Previous Environmental Investigations

As part of the desktop study, a review was undertaken of the following previous environmental investigation pertinent to sites in the vicinity of EB4L:

- *Phase 1 Preliminary Site Investigation for the Pakuranga Scheme Assessment of the Auckland Manukau Eastern Transport Initiative (AMETI) Alignment*, prepared by GHD Limited (GHD), 7 December 2012.

The previous environmental investigation report is included in **Appendix A.**

7.2.1.1 Phase 1 PSI (GHD)

During their 2012 assessment, GHD reviewed packages EB2, EB3R, EB3C and EB4L, areas previously referred to as Packages 3 & 4. The purpose of the PSI was to support AT in meeting the requirements of the NES-CS as it applies to 'a piece of land'. As such, the objective of the PSI was to assess the likelihood of the presence of soil contamination resulting from historical and/or current land use activity within or adjacent to the EBA packages.

The PSI comprised of a review of information from the following sources:

- Draft alignment plans as of October 2012 developed by GHD/Aurecon
- Selected publicly available historical aerial photographs from 1940 to 2010
- Collection of photographs as part of a walkover conducted on 26 September 2012
- AC contaminated sites register
- AC groundwater borehole register
- Readily available site investigation reports resulting from a site register search
- Readily available geology and hydrogeology information
- Publicly available information on the environmental fate of contaminants

- Identification of sensitive human and/or environmental receptors.

GHD presented the following key findings and conclusions relevant to EB4L:

- There are a number of geological units present, with the most prominent being rhyolitic pumiceous deposits of the Tauranga Group. To the west of the intersection between Botany Road and Tī Rākau Drive, near Bard Place Reserve, there is a rhyolitic pumice deposit. The fragments in this unit are mud to sand sized and include non-welded ignimbrite, tephra (ash fall volcanic deposits), and alluvial pumice deposits
- 550 Te Ririangi Drive is identified as a Z branded service station and may present issues relating to hydrocarbon contamination during the construction phase of the alignment along Te Koha Road as a result of underground fuel storage facilities on site. The report stated the regulations of the NES-CS apply on the basis of HAIL category H adjacent sites. Category H is defined as 'any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment'. GHD identified the following potential contaminants of concern associated with 550 Te Ririangi Drive: TPH and BTEX
- GHD recommended intrusive soil investigations were to be undertaken to assess potential contaminants along the alignment, at locations where the adjacent land use has been identified as having current or historical HAIL activities where the likelihood of contamination has been assessed as medium to high.

7.2.2 Aerial Photographs

The first step of the aerial photograph review was to look at the land uses surrounding the entire length of the proposed EB4L package. The review then focused in on the two HAIL sites located directly adjacent to the EB4L package during the desktop review and January 2023 site walkover to get a more in-depth look at changes over time (550 Te Ririangi Drive and 451 Tī Rākau Drive). The review of aerial photographs highlighted the following key items across EB4L:

7.2.2.1 EB4L package

- Between 1940 and 1988 the majority of the land in the EB4L area is undeveloped farmland, with the exception of scattered residential dwellings and ancillary farm buildings. A road transects the middle of the EB4L area. Trees are visible in Guys Reserve, adjacent to the south of the EB4L area
- In the 1994 aerial image, earthworks are visible in the eastern section of EB4L, which extend to the northeast where a commercial development has begun. Tī Rākau Drive has been constructed to the north of EB4L. The majority of the EB4L area remains unchanged from the 1988 aerial image
- In the 1996 aerial image, further earthworks have begun in the eastern portion of EB4L, which extend to the south and east. The majority of the EB4L area remains unchanged from the 1988 aerial image
- In the 2001 aerial image, development has begun within the EB4L project area, with exposed soil and concrete foundations visible. Te Koha Road and Te Ririangi Drive have been constructed. The Whaka Maumahara (stormwater pond) has been constructed. The remainder of EB4L through Guys Reserve appear unchanged from the previous aerial image.
- In the 2003/2004 and 2015/2016 aerial images, construction is complete in the northern portion of the EB4L project area

- From the aerial images reviews the EB4L project area appears unchanged between 2003/2004 and 2023.

7.2.2.2 550 Te Irirangi Drive

- The Z service station at 550 Te Irirangi Drive was constructed between 1996 and 2001. Prior to construction the area was undeveloped farmland
- Development was completed by 2001 and the structure and surrounding surfaces on site do not appear to have been altered since development.

7.2.2.3 451 Tī Rākau Drive

- Development at 451 Tī Rākau Drive began between 1996 and 2001. Prior to development the site was undeveloped farmland
- Development was completed by 2006 and the structure and surrounding surfaces on site do not appear to have been altered since development.

7.2.3 Auckland Council Contamination Enquiry

EBA requested a contaminated land enquiry in June 2021 related to the AMETI EB4 package. No information was returned regarding the EB4L footprint.

A copy of the AC contamination enquiry is included in **Appendix C.**

7.3 Soil and Groundwater Sampling – EB4L

Based on the results of the desktop study, preliminary soil and groundwater samples were not collected along the EB4L footprint as soil disturbance activities will not take place on the two HAIL sites identified.

8 Consent Requirements – EB4L

Chapter Summary
• *Discretionary consents are sought for works in relation to 550 Ti Irirangi Drive and 451 Tī Rākau Drive.*

Based on the information reviewed, there are two sites within 200 m of EB4L where HAIL activities (category H) were identified: 550 Te Irirangi Drive and 451 Tī Rākau Drive. **Table 6** presents these sites against a summary of the proposed soil disturbance activities and likelihood of contamination to be present and an assessment of whether resource consents are required. The sites are presented on

Figure 9.

Table 6. Summary of findings within EB4L

Site Name	Landuse Activity	Summary	Consent Required
550 Te Irirangi Drive	Z Service Station	No information pertaining to the contamination conditions is available for the sites. Potential exists for migration of contaminants into areas of soil disturbance within EB4L.	Yes
21/451 Tī Rākau Drive	Tyre City		Yes
22/451 Tī Rākau Drive	Pit Stop Botany Downs		Yes
24/451 Tī Rākau Drive	VTNZ Botany		Yes

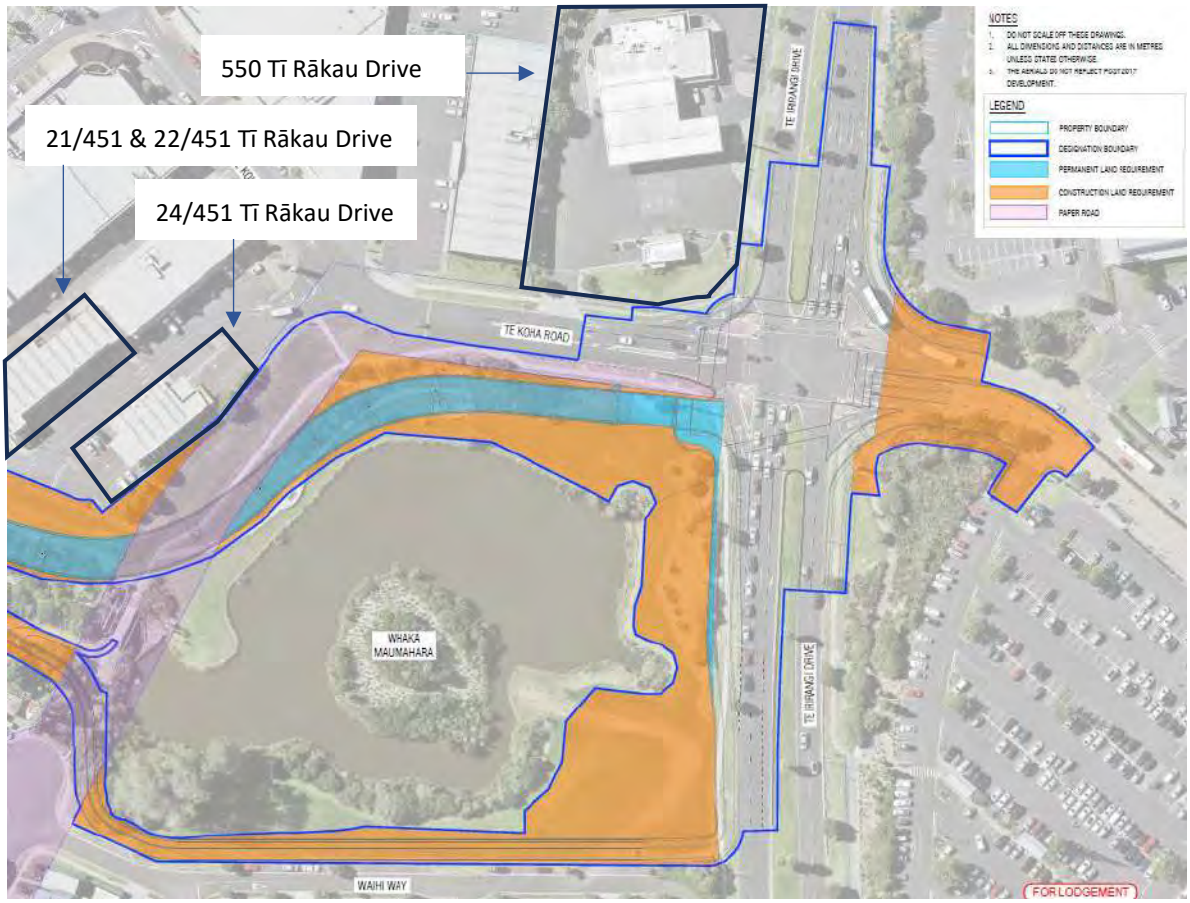

Figure 9. HAIL sites within EB4L.

8.1 550 Te Irirangi Drive

550 Te Irirangi Drive was identified as a HAIL site (service station) in the 2012 PSI. A request to the AC contaminated land team returned no environmental investigations pertaining to this site and a soil and groundwater assessment could not be completed in 2023.

No soil disturbance activities will take place onsite, however, local topography directly adjacent to the site slopes south toward areas of proposed soil disturbance. Any potential shallow groundwater

contamination would be expected to flow towards the proposed area of soil disturbance works, following topography. Therefore, a conservative assumption is to consider it reasonably likely for contamination to be migrating offsite to areas of proposed soil disturbance.

8.1.1 NES-CS

Under Regulation 5(7), the NES-CS applies for the soil disturbance activities undertaken as part of EB4L works. Earthworks adjacent to 550 Te Irirangi Drive will likely exceed the permitted activity criteria for soil disturbance volume as allowed under Regulation 8(3) of the NES-CS (25 m^3 per 500 m^2 of soil disturbance and 5 m^3 per 500 m^2 of removal). As a DSI was not completed prior to submission of this report, consent under controlled or restricted discretionary status is not possible. Therefore, resource consent for a discretionary activity is sought under Regulation 11 of the NES-CS for proposed soil disturbance activities and any potential effects to human health will be managed through the required CLMP and conditions.

8.1.2 Auckland Unitary Plan

As 550 Te Irirangi Drive could contain elevated levels of contaminants that may have migrated to the areas of earthworks along EB4L, consent is required under the AUP(OP). Soil disturbance adjacent to 550 Te Irirangi Drive will likely exceed the permitted activity criteria of 200 m^3 outlined in Chapter E30 of the AUP(OP). As a DSI is not able to be completed prior to submission of this report, consent under controlled activity status is not possible. Therefore, resource consents for discretionary activities are sought for proposed soil disturbance and any potential effects will be managed through the required CLMP and conditions.

8.2 451 Tī Rākau Drive

21/451 Tī Rākau Drive, 22/451 Tī Rākau Drive and 24/451 Tī Rākau Drive have been identified as HAIL sites (motor vehicle workshops). A request to the AC contaminated land team returned no environmental investigations pertaining to 451 Tī Rākau Drive. Therefore, a conservative assumption is to consider it reasonably likely for contamination to be present onsite.

No soil disturbance activities will take place on 451 Tī Rākau Drive, however, local topography directly adjacent to the site slopes southwest toward areas of proposed soil disturbance. Any potential shallow groundwater contamination would be expected to flow towards the proposed area of soil disturbance works, following topography. Therefore, a conservative assumption is to consider it reasonably likely for contamination to be migrating offsite to areas of proposed soil disturbance.

8.2.1 NES-CS

Under Regulation 5(7), the NES-CS applies for the soil disturbance activities undertaken as part of EB4L works. Soil disturbance adjacent to 451 Tī Rākau Drive will likely exceed the permitted activity criteria for soil disturbance volume as allowed under Regulation 8(3) of the NES-CS (25 m^3 per 500 m^2 of soil disturbance and 5 m^3 per 500 m^2 of removal). As a DSI is not able to be completed prior to submission of this report, consent under controlled or restricted discretionary status is not possible. Therefore, resource consent for a discretionary activity is sought under Regulation 11 of the NES-CS for proposed soil disturbance activities and any potential effects to human health will be managed through the required CLMP and conditions. AUP(OP)

As the sites at 451 Tī Rākau Park identified in **Table 6** could contain elevated levels of contaminants that may have migrated to the areas of earthworks along EB4L, consent is required under the AUP(OP). Soil

disturbance volumes adjacent to 541 Tī Rākau Drive will likely exceed the permitted activity criteria of 200 m^3 outlined in Chapter E30 of the AUP(OP). As DSI's were not completed prior to submission of this report, consent under controlled activity status is not possible. Therefore, resource consents for discretionary activities are sought for proposed soil disturbance and any potential effects will be managed through the required CLMP and conditions.

9 Contaminated Land Effects – EB3C and EB4L

Chapter Summary
Based on the findings within this assessment, the following sites were identified within EB3C and EB4L as having the potential to generate contamination-related effects during construction: • *242 Tī Rākau Drive* • *386 Tī Rākau Drive* • *451 Tī Rākau Drive* • *550 Te Irirangi Drive* *The potential contamination-related effects associated with proposed earthworks in relation to these sites include:* • *Exposure to contaminated soil and/or groundwater to construction workers (direct contact, ingestion or inhalation)* • *Discharge of soil and groundwater contaminants to land, surface water or air during construction.*

Based on the findings of this assessment, the potential effects from contaminated land for the purpose of construction activities within EB3C and EB4L are presented in **Table 7** below.

Table 7. Assessment of effects within EB3C and EB4L.

Site Name	Land Use Activity	Potential Effects
242 Tī Rākau Drive	Mobil Service Station	Exposure of construction workers to potentially contaminated soil and/or groundwater (direct contact, ingestion, or inhalation). Discharge of potential soil and groundwater contaminants to land, surface water or air during construction.
386 Tī Rākau Drive	Gull Service Station	
550 Te Irirangi Drive	Z Service Station	
21/451 Tī Rākau Drive	Tyre City	
22/451 Tī Rākau Drive	Pit Stop Botany Downs	
24/451 Tī Rākau Drive	VTNZ Botany	
Various residential properties removed as part of EB3C works	Accidental release of hazardous building materials	Exposure to contaminated soil for construction workers (ingestion or inhalation). Discharge of soil contaminants to land, surface water or air during construction.

10 Mitigation

Chapter Summary
• *Hazardous building materials like asbestos and lead based paint may be present during works within EB3C. The CLMP should be consulted for guidance during works.* • *It is likely unexpected discoveries of hazardous material will be encountered during works. The CLMP should be consulted for guidance during works.*

10.1 Residential Properties

As part of the proposed works within EB3C, numerous residential buildings are planned for deconstruction/demolition. As identified in the aerial images in Section 5, numerous houses in the EB3C package were constructed pre-2000 and it is possible that some buildings may contain hazardous building material such as asbestos or lead based paint. Such contaminants have the potential to generate localised effects when soil disturbance occurs. Prior to the removal of structures within the EB3C area, an asbestos survey will be required in accordance with Health and Safety at Work (Asbestos) Regulations (Worksafe New Zealand Limited, 2016) and BRANZ guidelines. No deconstruction/ demolition of residential properties is proposed within the EB4L alignment.

10.2 Unexpected Discoveries

It is considered more likely than not that during the course of the works, unexpected discoveries of impact in soils will be encountered across EB3C and EB4L. For example, this could include hazardous building materials from demolition work/fly tipping, visual observations of staining or the presence of odours. The effects from unexpected discoveries can be appropriately mitigated via implementation of the measures detailed in the CLMP as required through conditions of consent.

10.3 Contaminated Land Management Plan (CLMP)

Based on the information reviewed as part of this contaminated land assessment report, there is the potential for contaminated soils and groundwater or hazardous building materials to be encountered during the construction of EB3C and EB4L which may have the potential to impact the health of workers, the health of the public and surrounding environment. However, it is considered that any effects can be appropriately managed via implementation of the required CLMP in conjunction with the Construction Environmental Management Plan (CEMP) and the Erosion and Sediment Control Plan (ESCP) (all required by the consent conditions).

The CLMP should be prepared by a suitably qualified environmental practitioner (SQEP) and will require updating as the Project progresses, as further information becomes available and includes:

- Summary of information and overview of the proposed alignment construction methodology
- Summary of any soil sampling works undertaken
- Roles and responsibilities and contact details for the parties involved in the land disturbance activities, including the SQEP
- Identify potential and known hazards arising from contamination (if present)
- Identify specific management procedures developed for construction earthworks including:
    - On-site soil management practices
    - Off-site soil transport and disposal
    - Erosion and sediment control
    - Management of dust and odour

- Contingency measures in the event of accidental/unexpected discovery (asbestos, unknown fill, odours, staining etc.)
- Post development controls (if required).

The contractor will need to manage its health and safety obligations with respect to risks relating to contaminated land. Measures to protect the health of workers, the public and the surrounding environment will need to be incorporated into any health and safety plan that relates to work on sites where potential or known hazards have been identified in the AEE.

11 Recommendations and Conclusions

Hazardous Building Materials

Hazardous materials such as asbestos and lead based paints may be encountered during structure removal in EB3C and soil excavation activities in EB3C/EB4L. Unexpected discoveries of hazardous materials during site works will be managed through a CLMP (required by the consent conditions) and a SQEP should be consulted.

242 and 386 Tī Rākau Drive

Both of these sites were identified as HAIL (service stations) within the EB3C package. Only limited previous environmental investigations pertaining to contamination conditions at either site was available. As soil and groundwater quality are unknown at either site, a conservative assumption is to consider it reasonably likely for contamination to be present at both sites.

Both 242 and 386 Tī Rākau Drive are located within areas of soil disturbance for the EB3C works and subsequently will be required to close, with fuel storage systems removed following the closures.

The NES-CS and AUP(OP) apply to both sites for the following activities:

- Disturbing soil
- Removal of a fuel storage system

As the permitted and controlled activity criteria cannot be met for both the NES-CS and AUP(OP), consent is being sought for a discretionary activity for both activities at both sites. Any potential effects to human health and the environment will be managed through a CLMP in conjunction with the CEMP and the ESCP (all required by the consent conditions).

550 Ti Irirangi Drive and 451 Tī Rākau Drive

550 Te Irirangi Drive, 21/451 Tī Rākau Drive, 22/451 Tī Rākau Drive and 24/451 Tī Rākau Drive have been identified as HAIL sites within the EB4L package. Environmental investigations have not been completed to date at these sites. As soil and groundwater quality are unknown, a conservative assumption is to consider it reasonably likely for contamination to be present.

Soil disturbance activities will not take place on these sites. However, topography suggests contamination from these sites is likely to be migrating to areas of proposed soil disturbance for the EB4L works and therefore, the NES-CS and AUP(OP) apply. As the permitted and controlled activity criteria cannot be met for both the NES-CS and AUP(OP), consent is being sought for a discretionary activity for the soil disturbance activities and any potential effects to human health and the environment managed through a CLMP in conjunction with the CEMP and the ESCP (all required by the consent conditions).

12 References

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Appendix A: Previous Environmental Investigations

07 December 2012

Renata Smit
Auckland Transport
31-33 Manukau Station Road
Manukau

Our ref: 51/28564/16//AMETI PSI

Dear Renata,

Phase 1 Preliminary Site Investigation for the Pakuranga Scheme Assessment of the Auckland Manukau Eastern Transport Initiative (AMETI) Alignment

1 Introduction

GHD Limited (GHD) was engaged by Auckland Transport to undertake a Phase 1 Preliminary Site Investigation (PSI) for the proposed Package 4 Scheme Assessment which is part of the Auckland Manukau Eastern Transport Initiative (AMETI) Project which runs between Pakuranga and Botany, Auckland. The following route comprises the Package 4 Scheme Assessment which is the subject of this assessment;

Segment 1 – Pakuranga Road between the eastern abutment of the Panmure Bridge and Ti Rakau Drive.

Segment 2 – Pakuranga Town Centre and its immediately surrounding corridors i.e. Pakuranga Road, between Ti Rakau Drive (including the Pakuranga Road intersection) and St Kentigerns signalised entrance; Ti Rakau Drive, between Pakuranga Road and Reeves Road (including the Reeves Road intersection); and Reeves Road, between William Roberts Road and Ti Rakau Drive.

Segment 3 – Ti Rakau Drive between Reeves Road and Gossamer Drive.

Segment 4 – Ti Rakau Drive between Gossamer Drive and Greenmount Drive.

Segment 5 – Ti Rakau Drive between Greenmount Drive and Botany Road.

It is understood that this Preliminary Site Investigation will support resource consent applications for the project, and feed into design considerations where necessary.

2 NES Requirements

The intention of this assessment is to support Auckland Transport in meeting the requirements of the *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health* (NES) which took effect on January 1st 2012. As such, some land uses are classified as a HAIL activity (Hazardous Activities and Industries List) and there is potential that these land uses have occurred or are occurring along the alignment and will need to be investigated before construction begins. Disturbance of soil (at a scale above a prescribed threshold volume) at a HAIL site is a controlled activity, and as such requires consent. The NES covers a range of land use activities.

The NES also requires investigation of soil contaminants to assess potential risks to human health, and this requirement is triggered if the land is to be subdivided, developed or disturbed.

The intention of the Soil NES is to enable safe use of contaminated land to ensure that contaminated land is appropriately assessed prior to development, and if necessary, the land is made safe for human activity. The NES does not include criteria for environmental risk assessment. However, environmental risks should be considered in accordance with New Zealand guidelines.

The NES addresses land that is located adjacent to a HAIL site that may be impacted by contaminants from the HAIL site (HAIL category H).

It is understood that this PSI will support the Auckland Transport resource consent applications for the project and help meet their obligations under the NES for any HAIL sites that may be encountered along the Pakuranga Scheme Assessment of the AMETI alignment.

3 Hazardous Activities and Industries List

The HAIL is incorporated by reference into the NES. Under the NES, land is considered to be contaminated or potentially contaminated if an activity or industry on the HAIL 'is being undertaken, has been undertaken or is ***more likely than not*** to have been undertaken'[1]. If current, and/or historic land uses are included on the HAIL and are identified on the land under investigation then the NES is triggered. Proposed activities also trigger the NES and include removal of underground fuel storage systems and associated soil, soil sampling, soil disturbance, subdivision of land and changing land use.

4 Objectives

The objective of this report was to:

- assess the likelihood[2] of the presence of soil and/or groundwater contamination resulting from historic and/or current land use[3] along the route and/or adjacent to the route.

5 Scope of work

This assessment was undertaken in accordance with the Ministry for Environment *Contaminated Land Management Guidelines: Reporting on Contaminated Sites in New Zealand (No. 1) 2011*. This guideline is referenced in the *National Environmental Standards (NES) for Assessing and Managing Contaminants in Soil to Protect Human Health*.

A review of information available from the following sources was completed as part of this assessment:

- draft alignment plans as at October 2012 developed by GHD/Aurecon
- a review of publicly available historical aerial photos from 1940 to 2010
- a review of site photos
- Auckland Council contaminated sites and borehole register search
- review of readily available site investigation reports resulting from the site register search

[1] Ministry for the Environment. (2011). *Draft user's guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.* Wellington, New Zealand: Ministry for the Environment.

[2] Defined in the NES as: Likely is greater than 50% chance, and unlikely is less than 50% chance of contaminants being present.

[3] Land that may be impacted by the migration of contaminants from adjacent sites is addressed in the NES (refer category H in the Hazardous Activities & Industries; HAIL List).

- an alignment walkover inspection conducted on the 26th September 2012
- review of readily available geology and hydrogeology information
- review of surrounding land uses to assess potential off site environmental impacts to the property or properties of interest
- identification of potential contaminants of concern
- publically available information on the environmental fate of contaminants
- identification of sensitive human and/or environmental receptors.

6 Project Description

The AMETI project aims to develop an integrated multi-modal transport system that supports population and economic growth in East Auckland around the areas of Glen Innes, Howick and Botany.

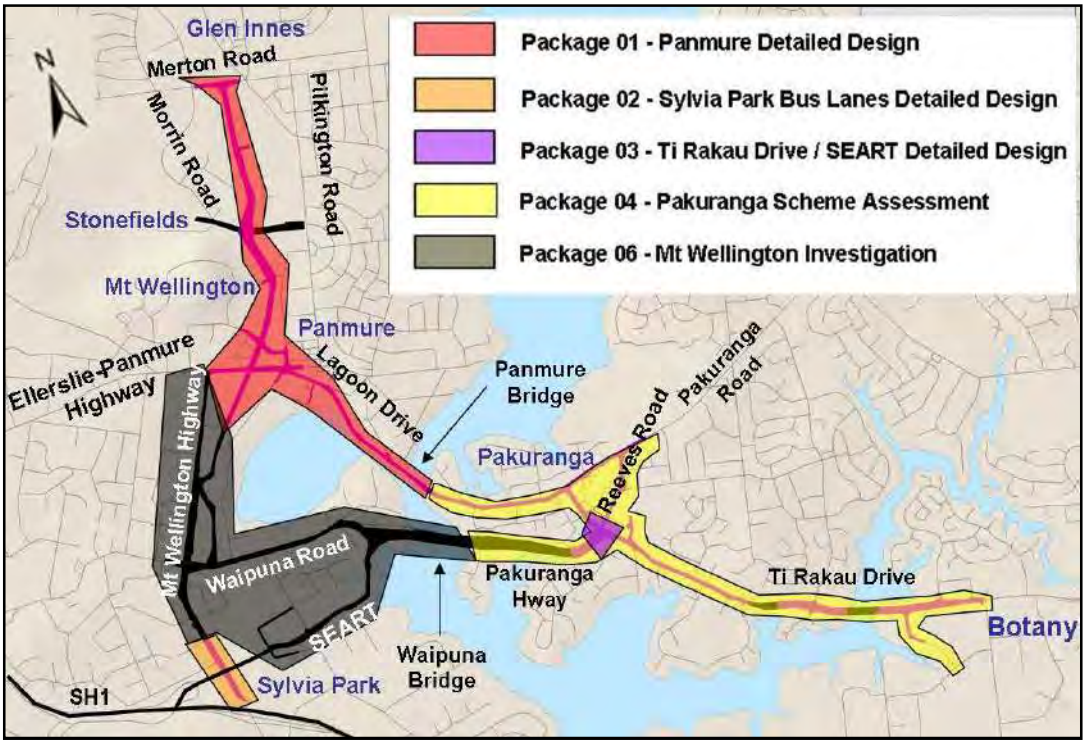
The project aims to provide more and improved transport choices to significantly enhance the safety, quality and attractiveness of passenger transport, walking and cycling while recognising that not all transport demand can be accommodated by these modes alone. The project includes providing Rapid Transport Network infrastructure or the ability to further develop this site at a future date. This will enable frequent and reliable bus services to improve access between the Eastern suburbs of Howick, Pakuranga and Botany and the Auckland City area, particularly the Auckland CBD.

GHD, in partnership with Aurecon, was commissioned by the then Manukau City Council (MCC) in February 2010 to undertake Package 04 (Pakuranga Scheme Assessment) of the AMETI project, which involves the preparation of a Scoping Report followed by a Scheme Assessment Report (SAR) for improvement works on Pakuranga Road, Ti Rakau Drive and Reeves Road including incorporation of the Rapid Transit Network (RTN)[4].

The packages of work included in the AMETI programme are illustrated in Figure 1. The geographic extent of the current PSI is illustrated as Package 04; the Pakuranga Scheme Assessment.

[4] Auckland Transport website http://www.aucklandtransport.govt.nz/improving-transport/ameti/phase-2-panmure-to-pakuranga/Pages/default.aspx

Figure 1: Package 04 Pakuranga Scheme Assessment shows the extent of the assessment



6.1 Alignment Setting

In general, from Panmure Bridge and Waipuna Bridge on the western end of the alignment to Ti Rakau Bridge the land use is predominantly residential. From Ti Rakau Bridge to Botany Town Centre the land use is mixed commercial/industrial. The area was formerly utilised as pastoral grazing land and urban development occurred from the mid-1950s. Appendix 2 shows the alignment in more detail.

7 Site Description

The following site description is based on readily available information on geology and hydrogeology, a review of aerial photos and the results of a contaminated site search via Auckland Council's Natural Resources and Specialist Input Unit.

7.1 Geology

Along the length of the project there are a number of geological units present[5], the most prominent being rhyolitic pumiceous deposits of the Tauranga Group. This unit consist of light grey to orange-brown undifferentiated pumiceous mud, sand and gravel with black muddy peat and lignite. Near the Tamaki River is a lithic tuff deposit which consists of thin graded beds of grey mud-sand sized lithic fragments of comminuted country rock. The lithic fragments include basalt and basanite fragments, mudstone, sandstone, alluvium and micaceous sand. To the north of Ti Rikau Drive (near Udys Road) the near

[5] Kermode, L.O. 1992: Geology of the Auckland Urban Area, Scale 1:50 000. Institute of Geological & Nuclear Sciences Geological Map 2. 1 sheet + 63p. Institute of Geological & Nuclear Sciences Ltd, Lower Hutt, New Zealand.

surface unit is Flysch of the East Coast Bays Formation which consists of well bedded, variably graded, grey to greenish grey muddy sandstone.

The large complex between Ti Rakau Drive and Pakuranga Road consists of engineered construction fill. The construction fill likely consists of re-compacted clay to gravel sized material and may include construction and demolition wastes. The industrial zone between Trugood Drive and Burswood Drive is a mottled patchwork of construction fill and basalt and basanite lavas derived from the Auckland Volcanic Field. The lavas are grey to dark grey, dense fine grained basalt or basanite. To the west of the intersection between Botany Road and Ti Rakau Drive, near Bard Place Reserve, there is a rhyolitic pumice deposit which consists of light grey massive to finely laminated pumice deposit. The fragments in this unit are mud to sand sized and include non-welded ignimbrite, tephra (ash fall volcanic deposits), and alluvial pumice deposits.

7.2 Hydrogeology

Given the proximity to coastal areas, regional groundwater flow is anticipated to be in a generally North, North East and North West direction towards the inner Waitemata Harbour. Localised groundwater flows will also be expected towards the Tamaki Basin, Tamaki River and the Pakuranga Creek. Shallow unconfined groundwater will tend to be influenced by local topography and proximate surface water bodies.

7.3 Review of aerial photos

Historical aerial photos were obtained from the Auckland Council GIS Viewer[6]. The aerial photo dates available and selected for the purposes of this assessment included:

- 1940, 1959, 1996, 2006, 2008 and 2010

These photos were selected to identify previous and current land uses that may indicate potential contamination of the area within which the road works will take place. The following tables provide a summary of observations from the historical aerial photos.

Because of the significant extent of the proposed alignment, a limited set of photographs has been summarised here initially as a general overview, with subsequent focus on specific sites.

[6] http://maps.aucklandcouncil.govt.nz/AucklandCouncilViewer/

7.3.1 Alignment overview

Date	Observations
1940	There is limited aerial photography available for this date. The photograph available depicts the land use in Pakuranga to be predominantly farmland dedicated to what appears to be pastoral farming. The road bridge crosses the Tamaki Estuary at Kerswill Road. The Waipuna and the Panmure bridges are yet to be constructed. The blacked out area on the image indicates that aerial photography is not available for this area. Historically, land use in the Pakuranga area consisted of horticultural market gardening activities and as such it is considered likely that trace concentrations of pesticides such as DDT remain in the topsoil and therefore residual risk remains with regard soil disturbance in the area regarding these contaminants.
	

Date	Observations
1959	The aerial image shows that land use has intensified with residential developments in the Pakuranga area as well as along the Tamaki river closest to the bridge. The land use is still predominantly what appears to be pastoral farming. A racing track is located south of what is present day Pakuranga Town Centre. Panmure Bridge has now been constructed over the Tamaki Estuary. The blacked out area on the image indicates that aerial photography is not available for this area.
	

Date	Observations
1996	By 1996 farmland has given way to mainly mixed urban residential in the Pakuranga Area and to the early stages of Botany Industrial area and town centre. The area was not fully developed yet as evidenced by extensive land development in the Botany area although the industrial area appears well developed at this stage. An orchard appears to be located on what is modern day Greenmount Park. Greenmount landfill is also active as well. Close to Panmure bridge a greenhouse is in operation. Pakuranga substation occupies land off Ti Rakau Drive. The Bridge at Kerswill Road has now been removed and the Waipuna Bridge has been constructed south of Panmure Bridge.
	

Date	Observations
2006	The large area of exposed soil related to land development activities apparent in the Botany area in 1996 is now occupied by high density residential and industrial developments. Land use has intensified and there is less green open space apparent. Greenmount parks land use has changed since 1996 from apparent orchard to parkland.
	

Date	Observations
2010	Urban development continues but there are no major changes apparent compared to 2006 and land use overall remains relatively static.
	

7.3.2 Site specific overview

Date	Observations
2008	Glasshouses can be seen on the aerial photo at 24 Pakuranga Road (oval) and a potential small scale orchard in 39 Pakuranga Road (circle) which may present pesticide contamination issues, although both sites are separate from the alignment and therefore not considered likely to affect the project.
	

Date	Observations
2008	3 Kentigern Close is the site of a former Mobil branded service station (large circle). This site is currently vacant. A contaminated site investigation was undertaken in 2008 and the report was issued to the former Auckland Regional Council. A copy of the report was requested from Mobil but is yet to be received at the time of writing. A copy was also requested from Auckland Council under the Local Government Official Information and Meetings Act 1987 but the report was not available to read. Directly across the road a BP branded service station is currently in operation (small circle). These sites may present issues relating to hydrocarbon contamination during construction of the alignment.
	

Date	Observations
2010	New Zealand Dry Cleaners are located at Aylesbury Street, Pakuranga Town Centre. This business may present contamination issues to the proposed alignment with regards chlorinated solvents and potentially other volatile organic compounds (VOCs).
	

Date	Observations
2008	Pakuranga Automotive (large oval) and Pakuranga Panelbeaters (circle) are located at 16 and 12 Cortina Place respectively. Pakuranga Auto Transport are located at 16D Cortina Place (small circle). These businesses may present issues to the proposed alignment with regards hydrocarbon, solvents and trace element contamination as a result of activities relating to vehicle servicing and repair.
	

Date	Observations
2008	3 Reeves Road is currently occupied by a Gull branded service station and may present issues relating to hydrocarbon contamination to the construction phase of the alignment as a result of fuel storage facilities here.
	

Date	Observations
2010	64B Ti Rakau Drive /11 Cortina Place is the site of a former Caltex branded service station. It is currently a vacant site. A site investigation[7] concluded that 7 soil samples exceeded the Oil Industry Guideline Tier 1 Criteria for Commercial / Industrial Land Use. These samples exceeded the criteria for subsurface maintenance/excavation worker human health pathways for selected hydrocarbon contaminants and could present a health risk to construction workers on the alignment.
	

[7] URS, O'Donohue, K., 2010, Caltex Pakuranga Service Station – Underground Petroleum Storage System Decommissioning, Residual Petroleum Hydrocarbon Assessment.

Date	Observations
2010	242 Ti Rakau Drive is currently occupied by a Mobil branded service station and may present issues relating to hydrocarbon contamination to the construction phase of the alignment as a result of fuel storage facilities there. Enquiries with the Auckland Council have not identified any environmental investigation reports available for this site. The Pakuranga Creek flows close to the site.
	

Date	Observations
2008	Best Automotive Clinic is located at 245 Burswood Drive. This business may present issues to the proposed alignment with regards hydrocarbon, solvents and trace element contamination as a result of activities relating to vehicle servicing and repair.
	

Date	Observations
2008	Sandvik Materials Technology is located at 269 Ti Rakau Drive. This business may present issues to the proposed alignment with regards hydrocarbon and trace element contamination as a result of materials processing.
	

Date	Observations
2006	279 Ti Rakau Drive is the site of a former timber storage yard (rectangular outline). It is currently a buy and sell yard and may host residual contamination relating to timber treatments. Across the road at 284 Ti Rakau Drive a Z branded service station is currently in operation (oval outline) and may also present issues during construction of the alignment relating to hydrocarbon contamination.
	

Date	Observations
2008	Forging Ahead is located at 293 Ti Rakau Drive. This business may present issues to the proposed alignment with regards hydrocarbon and trace element contamination resulting from foundry operations.
	

Date	Observations
2008	333 Ti Rakau Drive is occupied by the Blue n Green Dry Cleaners (large oval) whilst next door on the corner of Harris Road and Ti Rakau Drive is a BP branded service station (circle). Behind BP is Jireh Auto Tyres at 179 Harris Road (small oval) dealing in automotive repairs. The service station may present issues to the construction of the alignment relating to hydrocarbon contamination and the dry cleaners may present issues related to chlorinated solvent and VOC contamination. The auto workshop may also have some issues with solvents, hydrocarbons as well as trace elements.
	

Date	Observations
2010	380 Ti Rakau Drive is occupied by the Howick and Eastern Bus Company whilst next door at 384 is a Gull branded service station. Both of these sites may present issues to the construction of the alignment relating to hydrocarbon contamination as a result of fuel storage facilities at both sites. A tributary of the Pakuranga Creek flows at the back of both properties and could be considered a sensitive receptor. According to council borehole records Chevron have installed a borehole at 380 Ti Rakau Drive for monitoring purposes. A site investigation report was not available from Auckland Council. It is understood that Chevron previously operated a Caltex branded service station at 384 Ti Rakau Drive.
	

Date	Observations
2010	550 Te Iririangi Drive is currently occupied by a Z branded service station and may present issues relating to hydrocarbon contamination during the construction phase of the alignment along Te Koha Road as a result of fuel storage facilities here.
	

8 Council Records

A site contamination enquiry was completed for the road alignment by seeking records from Auckland Council. The complete results of this search are included as Appendix A of this report. A contaminated site discharge was identified at 11 Cortina Place / 64B Ti Rakau Drive (Caltex branded service station). The Council's register indicates that a tank pull report was received by the then Auckland Regional Council when the Underground Petroleum Storage System (UPSS) was removed from the site in May 2010. As a result, a discharge consent was required for the site. Another contaminated site discharge was identified at 3 Kentigern Close (Mobil branded service station) and the register indicates that an Environmental Site Assessment report was received by the council for that site.

The site reports for these properties have been requested from Auckland Council. The site investigation report was received for the Caltex branded service station but not the Mobil branded service station. The report[8] for 11 Cortina Place / 64B Ti Rakau Drive detailed 9 soil samples that exceeded the Oil Industry Guideline Tier 1 Criteria for Commercial / Industrial Land Use. Seven soil samples exceeded the criteria for subsurface maintenance/excavation worker human health pathways for selected contaminants. This will need to be taken into account during the alignment works regarding the health and safety of construction workers.

Auckland Council recommended that Mobil should be contacted to gain access to the site report for the Mobil branded service station. Mobil was contacted by phone[9] and they recommended an email request be submitted but the site report is yet to be received. Following that a request for more information was submitted to the Auckland Council Local Government Official Information and Meeting Act (LGOIMA) process. Auckland Council responded that they were withholding the Environmental Site Assessment Report provided by Mobil under section 7(2)(c)(i) of the LGOMIA as the report was supplied under an obligation of confidence and making it available would "be likely to prejudice the supply of similar information, or information from the same source, and it is in the public interest that such information should continue to be supplied". Given that both Mobil and Auckland Council have been contacted for more information on the site and that this information is not forthcoming any construction activities on site should proceed on the assumption of contamination existing onsite.

The Environmental Site Assessment report for the Mobil site should be read in conjunction with this assessment to better understand the risks associated with the former service station at 3 Kentigern Close regarding the health and safety of construction workers.

A borehole register search conducted by the Auckland Council Natural Resources and Specialist Input Unit revealed 3 cases of borehole installation for the following contaminated and potentially contaminated sites.

[8] URS, O'Donohue, K., 2010, Caltex Pakuranga Service Station – Underground Petroleum Storage System Decommissioning, Residual Petroleum Hydrocarbon Assessment.

[9] Personal Communication with Erin Richards of Exxon Mobil on 16th October 2012

Site Name	Address	Purpose
Chevron	380 Ti Rakau Drive, Pakuranga	The construction of a bore for monitoring purposes.
Chevron	11 Cortina Place / 64B Ti Rakau Drive, Pakuranga.	The construction of 4 bores for contaminated site investigations.
T.M.K Packers Ltd.	257 Ti Rakau Drive, Pakuranga	The construction of 4 bores for environmental monitoring.

9 Potential Locations of Interest

To summarise the site specific review the following sites were noted as potential contaminated sites that may present contamination issues once work commences on the alignment.

Site Name	Activity	HAIL Activity	Potential Contaminant of Concern based upon identified HAIL activity
3 Kentigern Close	BP branded service station	Vehicle refuelling, service and repair	Total petroleum hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)
Aylesbury Street, Pakuranga Town Centre	New Zealand Dry Cleaners	Chemical manufacture, application and bulk storage	Chlorinated Solvents, VOCs
12 Cortina Place	Pakuranga Panelbeaters	Vehicle refuelling, service and repair	Chlorinated solvents, TPH, BTEX, Trace Elements
16 Cortina Place	Pakuranga Automotive	Vehicle refuelling, service and repair	Chlorinated solvents, TPH, BTEX, Trace Elements
16D Cortina Place	Pakuranga Auto Transport	Vehicle refuelling, service and repair	Chlorinated solvents, TPH, BTEX, Trace Elements
3 Reeves Road	Gull branded service station	Vehicle refuelling, service and repair	TPH, BTEX
242 Ti Rakau Drive	Mobil branded service station	Vehicle refuelling, service and repair	TPH, BTEX

245 Burswood Drive	Best Automotive Clinic	Vehicle refuelling, service and repair	Chlorinated solvents, TPH, BTEX, Trace Elements
269 Ti Rakau Drive	Sandvik Materials Technology	Metal extraction, refining and reprocessing, storage and use	TPH, BTEX, Trace Elements
279 Ti Rakau Drive	Former Timber Storage yard.	Chemical manufacture, application and bulk storage	Trace Elements, PCP, PAH, Pesticides
Corner Ti Rakau Drive and Burswood Drive	Z branded service station	Vehicle refuelling, service and repair	TPH, BTEX
179D Harris Road	Jireh Auto Tyres	Vehicle refuelling, service and repair	Chlorinated solvents, TPH, BTEX, Trace Elements
Corner Ti Rakau Drive and Harris Road	BP branded service station	Vehicle refuelling, service and repair	TPH, BTEX
293 Ti Rakau Drive	Forging Ahead (Foundry)	Metal extraction, refining and reprocessing, storage and use	TPH, BTEX, Trace Elements
333 Ti Rakau Drive	Blue n Green Dry Cleaners	Chemical manufacture, application and bulk storage	Chlorinated Solvents, VOCs
380 Ti Rakau Drive	Howick and Eastern Bus Depot	Vehicle refuelling, service and repair	TPH, BTEX
386 Ti Rakau Drive	Gull branded service station	Vehicle refuelling, service and repair	TPH, BTEX
550 Te Irirangi Drive	Z branded service station	Vehicle refuelling, service and repair	TPH, BTEX

10 Potential Contaminants of Concern

The table below outlines the potential contaminants of concern that may be present in the area surrounding the proposed road upgrade. The identified contaminants are based on past and current land use.

Soil Contaminants	Potential Source
Inorganic elements	Arsenic, copper and chromium are commonly used timber treatment chemicals used for fence posts, and other timbers used in the outdoor environment. Trace elements relating to foundry operations.
Total petroleum hydrocarbons (TPH), Benzene, toluene, ethylbenzene, xylenes (BTEX)	Petrol stations and associated underground storage tanks and fuel system.
VOCs and Chlorinated Solvents	Dry Cleaning Services, automotive workshops.
Pentachlorophenol (PCP)	Wood preservative (anti sap stain) used in the treatment of timber.

11 Sensitive Receptors

A site walkover and aerial photo review identified no sensitive receptors in close proximity to the potentially contaminated sites along the AMETI alignment with the exception of the tributary of the Pakuranga Creek flowing at the back of the Gull Service Station at 386 Ti Rakau Drive. The alignment is located in an urban landscape and as such there is limited access to exposed soil, although once the alignment construction begins the amount of exposed soil will increase. The land use is a mix of commercial, residential and industrial. There are nursing homes, schools, gardens, streams and parks in the vicinity of the alignment but none of these are in close proximity to the potential contaminated sites listed.

12 Qualitative Assessment of Risk

The following assessment of potential risk is qualitative only and does not represent a detailed quantitative assessment of risk to human health or the environment. Rather, it presents a selection of the primary contaminants of concern that may be encountered along the alignment.

12.1 Organochlorines

Pentachlorophenol (PCP) is an organochlorine preservative used in the treatment of timber and as such may be present at the former timber storage yard and as such may pose a risk during the construction of the alignment. Exposure to PCP can cause harmful effects on the liver and kidneys and may cause cancer[10].

[10] http://water.epa.gov/drink/contaminants/basicinformation/pentachlorophenol.cfm

Chlorinated solvents are used in a range of commercial and industrial purposes to include mixing and thinning solutions. Their chlorine chemical structure allows them to dissolve organic material and some compounds are used as a raw material in the production of other chemicals. There is a range of short term and long term exposure effects including skin problems, and damage to the nervous system, kidneys and liver. Some chlorinated solvents are known to cause cancer[11].

12.2 Trace Elements

Generally, trace elements are immobile under normal soil (non-acidic or alkaline) conditions. These trace elements tend to sorb strongly to the (inorganic) soil particles; hence the propensity for leaching is very limited for most soil conditions and impacted topsoil can be mobilised as dust or sediment if the soil is exposed.

Copper chrome arsenate (CCA) contamination (if any) of near surface soil from the storage of treated timber is likely to be limited to that of the storage yard. The highly localised nature of the contamination restricts the risk posed to either human health or the environment.

Copper adsorbs strongly to most soil types. Along with other trace elements, the mobility of copper represents a low human health risk. Copper can pose a threat to sediment and surface water quality under certain conditions if sediment control measures are not sufficient to contain impacted soil that is exposed.

12.3 Petroleum Hydrocarbons

Petroleum hydrocarbons can exist in the soil environment as a separate phase liquid; dissolved in groundwater or the soil solution; and/or vapour[12]. Physical (including groundwater processes), chemical and biological processes affect the fate and migratory rates of these contaminants. The key influences include sorption (adsorption and absorption), diffusion (dilution and dispersion), volatilisation, chemical and biological degradation which are ultimately determined by the characteristics of the soil.

The low molecular weight fraction of petrol volatilises rapidly when exposed to the atmosphere. These compounds have a reported biodegradable half-life of five years in groundwater[12]. In the soil environment the half-life can be as short as 1-4 weeks[13].

Petroleum hydrocarbons can be toxic to the environment and human health. The volatile compounds have an adverse effect on the central nervous system of animals and benzene has been identified as a human carcinogen[12]. Some higher molecular weight compounds present in diesel and fuel oils (PAHs) are also carcinogenic.

Also associated with the accumulation of petroleum hydrocarbon vapour and liquid is a fire and/or explosion risk. This requires oxygen and the introduction of an ignition source[12].

[11] http://www.worker-health.org/chlorinatedsolvents.html

[12] Ministry for the Environment. (1999). Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (Revised 2011).

[13] Ahrens, M. (2008). *Literature review of organic chemicals of emerging environmental concern in use in Auckland* (Prepared by NIWA for Auckland Regional Council. Auckland Regional Council Technical Report 2008/028).

13 Conclusions

Based upon the review of available information, the alignment walk over inspection and qualitative risk assessments undertaken as part of this Preliminary Site Investigation, the following conclusions can been drawn:

- Adjacent to the road alignment up to 20 sites with land uses included on the HAIL were identified. Given that the surface soil will be disturbed along the alignment corridor through significant soil disturbance activity the regulations of the NES apply on the basis of HAIL category H adjacent sites. Category H is defined as "Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment."
- The likelihood that the HAIL activities identified adjacent to the proposed alignment the proposed alignment may impact the alignment varies for each site depending on the nature of the contaminants and therefore the likely migration mechanisms. The relative likelihood of contaminant migration to the alignment from each site is summarised in the table below;

Site Name	**Activity**	**Contamination Risk Rating**	**Potential Contaminant of Concern based upon identified HAIL activity**
11 Cortina Place / 64B Ti Rakau Drive	Former Caltex branded service station, now a vacant site	High Risk	Total petroleum hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)
24 Pakuranga Road	Market Gardening	Low Risk	Pesticides, Inorganic Elements
39 Pakuranga Road	Possible Orchard	Low Risk	Pesticides, Inorganic Elements
3 Kentigern Close	BP branded service station	Medium to High Risk (review risk after review of Mobil environmental site assessment report.)	TPH, BTEX
Aylesbury Street, Pakuranga Town Centre	New Zealand Dry Cleaners	Medium Risk	Chlorinated Solvents, VOCs
12 Cortina Place	Pakuranga Panelbeaters	Medium Risk	Chlorinated solvents, TPH, BTEX, Trace Elements
16 Cortina Place	Pakuranga Automotive	Medium Risk	Chlorinated solvents, TPH, BTEX, Trace Elements

16D Cortina Place	Pakuranga Auto Transport	Medium Risk	Chlorinated solvents, TPH, BTEX, Trace Elements
3 Reeves Road	Gull branded service station	Medium Risk	TPH, BTEX
242 Ti Rakau Drive	Mobil branded service station	Medium Risk	TPH, BTEX
245 Burswood Drive	Best Automotive Clinic	Medium Risk	Chlorinated solvents, TPH, BTEX, Trace Elements
269 Ti Rakau Drive	Sandvik Materials Technology	Medium Risk	TPH, BTEX, Trace Elements
279 Ti Rakau Drive	Former Timber Storage yard.	Low to Medium Risk	Trace Elements, PCP, PAH, Pesticides
Corner Ti Rakau Drive and Burswood Drive	Z branded service station	Medium Risk	TPH, BTEX
179D Harris Road	Jireh Auto Tyres	Medium Risk	Chlorinated solvents, TPH, BTEX, Trace Elements
Corner Ti Rakau Drive and Harris Road	BP branded service station	Medium Risk	TPH, BTEX
293 Ti Rakau Drive	Forging Ahead (Foundry)	Medium Risk	TPH, BTEX, Trace Elements
333 Ti Rakau Drive	Blue n Green Dry Cleaners	Medium Risk	Chlorinated Solvents, VOCs
380 Ti Rakau Drive	Howick and Eastern Bus Depot	Medium Risk	TPH, BTEX
386 Ti Rakau Drive	Gull branded service station	Medium Risk	TPH, BTEX
550 Te Irirangi Drive	Z branded service station	Medium Risk	TPH, BTEX

14 Recommendations

We recommend that Auckland Transport considers the following in order to minimise risks associated with contaminated land along the alignment of the proposed road works;

- Obtain environmental site investigations reports from Auckland Council

- Engage with the Auckland Council contaminated site officers to present this report and the planned strategy to assess potential contamination from adjacent sites along the alignment.
- Undertake intrusive soil investigations to assess potential contaminants along the alignment, at locations where the adjacent land use has been identified as having current or historic HAIL activities and where the likelihood of contamination has been assessed as medium to high.

15 Limitations

This Preliminary Site Investigation refers to the proposed AMETI Project as described in Section 4 of this report and:

1. has been prepared by GHD Limited ("GHD") for Auckland Transport;

2. may only be used and relied on by Auckland Transport;

3. must not be copied to, used by, or relied on by any person other than Auckland Transport without the prior written consent of GHD and subject always to the next paragraph; and

4. GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than Auckland Transport arising from or in connection with this Report.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

- were limited to those specifically detailed in section 3;
- were undertaken in accordance with current professional practice and by reference to relevant environmental regulatory authority and industry standards, guidelines and assessment criteria in existence as at the date of this Report; and
- did not include the collection of samples for the purpose of laboratory analysis or verification of information obtained from the site history review.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking the services mentioned above and preparing the Report ("Assumptions"), as specified throughout this Report.

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation of this Report and are relevant until such times as the site conditions and/or relevant legislations changes, at which time, GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.

GHD has prepared this Report on the basis of information provided by Auckland Transport (and others who provided information to GHD including Government authorities, which GHD has not independently verified or checked ("Unverified Information") beyond the agreed scope of work).

GHD expressly disclaims responsibility in connection with the Unverified Information, including (but not limited to) errors in, or omissions from, the Report, which were caused or contributed to by errors in, or omissions from, the Unverified Information.

Inspections undertaken in respect of this Report were limited to visual inspections only and were constrained by the particular site conditions, such as locations of buildings, services or vegetation.

The opinions, conclusions and any recommendations in this Report are based on information obtained from readily available information sources.

Except as otherwise expressly stated in this Report, GHD makes no warranty, statement or representation of any kind concerning the suitability of the site for any purpose or the permissibility of any use, development or re-development of the site.

These Disclaimers should be read in conjunction with the entire Report and no excerpts are taken to be representative of the findings of this Report.

16 Third Party Reliance

The work created in this document is the property of GHD Ltd and any unauthorised use of it in any form whatsoever is prohibited. The document is intended for the use of Auckland Transport. It has been prepared in accordance with the Terms of Engagement for the commission and on the basis of specific instructions and information provided by the client for exclusive use by the client for its particular purpose. The contents and conclusions of this document may therefore be inappropriate for any third party in the context of that third party's particular purposes and circumstances. Any third party should obtain its own independent information or advice and no responsibility is accepted and no duty of care is assumed by GHD Ltd to any third party who may use or rely on the whole or any part of the content of this document.

Yours sincerely
GHD Limited

Sean Toland
Senior Geo-Environmental Scientist
09 3708204

Dr. Murray Wallis
National Planning and Environment BGM
09 3708206

Appendix A

Auckland Council Site Contamination Search

Auckland Council
Te Kaunihera o Tāmaki Makaurau

25 September 2012

GHD
Level 16
ASB Bank Centre
135 Albert Street
Auckland

Attention: Sean Toland

Dear Sean

Site Contamination Enquiry – Various properties along AMETI route.

This letter is in response to your enquiry requesting available site contamination information for the sites as indicated in your email of 25 September 2012. The following details are based on information available from the former Auckland Regional Council records system and information currently held by the Auckland Council Natural Resources and Specialist Input Unit. The details provided below exclude any property information held by the former district/city councils.

The tables below outline the reference for the site files and pollution incident files available for the subject site:

File Reference	T096-03		
File Name	Catchment file		
Site Occupier Name	**2C Amera Place**		
Pollution Date	22/05/08	Comment	Incident no. 08/2053. Vomit smell.
Pollution Date	09/05/11	Comment	Incident no. 11/0598. Waste being tipped into stormwater drain continuously.
Pollution Date	03/11/03		Incident no. 03/1344. Restaurant tipping fat to stormwater.

File Reference	6-03-2874		
File Name	**2G Amera Place**		
Site Occupier Name	Dynamo Group Ltd		
Pollution Date	14/01/03	Comment	Concrete in drain.
Pollution Date	02/09/02	Comment	Concrete in drain.

File Reference	P270-04-03		
File Name	Catchment file		
Site address	**12 Amera Place**		
Pollution Date	06/06/03	Comment	Incident no. 03/0628. Discharge from small building site
Pollution Date	03/11/03	Comment	Incident no. 03/1344. Restaurant tipping fat to stormwater.

File Reference	P270-04-01-03		
File Name	Catchment file		
Site address	**183 Harris Rd - BP Express Ti Rakau**		
Pollution Date	12/04/04	Comment	Incident no. 04/0627. Petrol spill on forecourt.
Site Visit Date	15/01/01	Comment	Site audit.

File Reference	T096-03		
File Name	Catchment File		
Site Occupier Name	**166B Harris Road**		
Pollution Date	21/03/11	Comment	Incident no. 11/0689. Carwashing soapy liquid to stormwater.
Site Visit Date		Comment	

File Reference	T096-03		
File Name	Catchment File		
Site Occupier Name	**Corner Harris Road & TiRakau Drive**		
Pollution Date	01/09/09	Comment	Incident no. 09/2608. Fire page fertilizers to road and stormwater from crash.
Site Visit Date		Comment	

File Reference	T096-03		
File Name	Catchment file		
Site Address	**13 Millen Ave**		
Pollution Date	23/03/12	Comment	Incident no. 12/1671. Sewage overflow.

File Reference	T096-03		
File Name	**Catchment file**		
Site Address	**Pakuranga Shopping Centre**		
Pollution Date	23/03/11	Comment	Incident no. 11/0958. Strong sewage smell coming from carpark.
Site Address	**34 Pakuranga Road**		
Pollution Date	11/11/08	Comment	Burning.
Site Address	**130 Pakuranga Road**		
Pollution Date	19/06/12	Comment	Incident no. 12/2449. Dye in stormwater.
Pollution Date	20/04/12	Comment	Incident no. 12/1768. Oil slick coming down the Tamaki river behind St Kentigern College, Pakuranga
Site Address	**140 Pakuranga Road**		
Pollution Date	27/12/10	Comment	Incident no. 11/0011. Brown slick in the Tamaki River
Site Address	**165 Pakuranga Highway (BP Town Centre)**		
Pollution Date	23/07/05	Comment	Incident no. 05/1898. Hydrocarbon spill – 10-200 litres.
Pollution Date	04/10/03	Comment	Incident no. 03/1327. Hydrocarbon spill – less than 10 litres.
Site Address	**172 Pakuranga Road**		
Pollution Date	28/11/10	Comment	Incident no. 11/0330. Burning
Site Address	**Pakuranga Road**		
Pollution Date	14/11/03	Comment	Incident no. 03/1088. Vehicle washing to stormwater.

File Reference	6-03-1340		
File Name	**2 Pakuranga Rd, Pakuranga**		
Site Occupier Name	Panmure Bridge Marina Ltd		
Pollution Date	22/06/01	Comment	Washing to stormwater.
Pollution Date	07/08/97	Comment	Spill when spray painting.
Pollution Date	31/07/97	Comment	Boat sanded on slipway.

File Reference	P270-04-17		
File Name	**22 Pakuranga Road**		
Site Occupier Name	Foley Concrete Ltd		
Pollution Date	12/10/05	Comment	Concrete waste to stormwater.
Pollution Date	18/02/03	Comment	Concrete waste to stormwater.

File Reference	6-03-0143		
File Name	**102 Pakuranga Road**		
Site Address	Mobil Service Station		
Pollution Date	29/07/94	Comment	Engines cleaned to yard and waste to stormwater.

File Reference	T096-03		
File Name	Catchment file		
Site Occupier Name	**Corrner Pakuranga Highway and Ti Rakau Drive**		
Pollution Date	01/08/06	Comment	Possible battery acid on petrol station forecourt
File Reference	P270-04-03		
File Name	Catchment file		
Site Address	**3 Reeves Road**		
Site Visit Date	31/07/94	Comment	Site audit.

File Reference	6-03-1754		
File Name	**3 Reeves Road**		
Site Occupier Name	Gull Petroleum		
Pollution Date	17/01/01	Comment	Petrol on forecourt washed off with water.

File Reference	6-03-2954		
File Name	**7 Reeves Road**		
Site Occupier Name	Great City Restaurant		
Pollution Date	03/10/02	Comment	Leakage from waste bin.
Pollution Date	10/09/02	Comment	Leakage from waste bin (leaking blood).

File Reference	T096-03		
File Name	Catchment file		
Site Address	**7 Reeves Road**		
Pollution Date	14/02/12	Comment	Incident no. 12/0816. White / grey smoke coming from restaurant.

File Reference	T096-03		
File Name	Catchment file		
Site Address	**Corner Reeves Road, and TiRakau Road intersection.**		
Pollution Date	23/03/11	Comment	Incident no. 11/1035. Major sewage spill.

File Reference	T096-03		
File Name	Catchment file		
Site Occupier Name	**Corrner Ti Rakau Drive and Te Irirangi**		
Pollution Date	07/07/05	Comment	Incident no 05/1795. Hydraulic oil spill to stormwater cesspit.

File Reference	T096-03		
File Name	Catchment file		
Site Occupier Name	**Corrner Ti Rakau Drive and Waipuna Highway**		
Pollution Date	31/01/92	Comment	Incident no. 91/0127. Drum of hydrochloric acid spilled on road.

File Reference	T096-03		
File Name	Catchment file		
Site Address	**550 Te Irirangi Drive**		
Pollution Date	13/05/07	Comment	Incident no. 07/1916. Petrol spill.
Pollution Date	21/07/05	Comment	Incident no. 05/1890. Diesel spill – approx 180 litres.

Pollution	Date	03/03/05	Comment	Incident no. 05/0795. Mixed fuel being drained to forecourt. 10-200 litres.
Site visit	Date	20/01/01	Comment	Site audit.
Pollution	Date	17/06/08	Comment	Incident no. 08/2296. Oil spill to stormwater.

File Reference	A224-06		
File Name	Catchment file (Air Quality)		
Site Address	**164 TiRakau Drive**		
Pollution Date	18/11/08	Comment	Incident no. 08/3750. Burning.
Pollution Date	21/01/08	Comment	Incident no. 08/0328. Burning.
Site Address	**214 TiRakau Drive**		
Pollution Date	09/04/07	Comment	Incident no. 07/2040. Burning.
Site Address	**451 TiRakau Drive**		
Pollution Date	18/06/08	Comment	Incident no. 08/2331. Odour from Pizza Hutt.
Site Address	**TiRakau Drive**		
Pollution Date	22/12/09	Comment	Incident no. 10/0043. Burning.

File Reference	A256-03		
File Name	Catchment file		
Site Address	**Ti Rakau Dr (TJ's Carwash)**		
Pollution Date	14/01/08	Comment	Incident no. 07/0582. Overspray from car wash.
Site Visit Date		Comment	

File Reference	T096-03		
File Name	Catchment file (Air Quality)		
Site Address	**53 TiRakau Drive**		
Pollution Date	07/12/11	Comment	Incident no. 11/4523. Sediment to stormwater.
Site Address	**81 TiRakau Drive**		
Pollution Date	6/4/2008	Comment	Incident no. 08/2170. Concrete cutting.
Site Address	**97 TiRakau Drive**		
Pollution Date	20/11/09	Comment	Incident no. 09/3355. Milky coloured stream.
Site Address	**126 TiRakau Drive**		
Pollution Date	01/08/05	Comment	Incident no. 05/1980. Concrete washing to stormwater.
Site Address	**130 TiRakau Drive**		
Pollution Date	10/08/10	Comment	Paint to stormwater.
Site Address	**164 TiRakau Drive**		
Pollution Date	13/01/08	Comment	Burning incident.
Site Address	**176 TiRakau Drive**		
Pollution Date	04/05/10	Comment	Incident no. 10/1678. Oil washing to stormwater.
Pollution Date	29/03/10	Comment	Incident no. 10/1282. Oil spill on driveway.
Site Address	**242 TiRakau Drive**		
Site visit Date	27/09/02	Comment	Site audit.
Site visit Date	15/01/01	Comment	Site audit.
Site Address	**249 TiRakau Drive**		
Pollution Date	25/11/09	Comment	Incident no. 09/3469. Rotten egg odour.
Pollution Date	13/09/10	Comment	Sewage odour.
Pollution Date	30/06/10	Comment	Incident no. 10/2214. Sewage odour.
Pollution Date	16/04/10	Comment	Incident no. 10/1456. Strong odour.
Site Address	**263 TiRakau Drive**		
Pollution Date	16/10/01	Comment	Wasterblasting to stormwater.

Site Address	**290 TiRakau Drive**		
Pollution Date	27/05/09	Comment	Incident no. 09/1878. Odour from a fish shop.
Site Address	**298 TiRakau Drive**		
Pollution Date	13/03/06	Comment	Incident no.06/0794. Oil spill from restaurant.
Site Address	**320 TiRakau Drive**		
Pollution Date	21/07/12	Comment	Incident no. 12/2755. Concrete dust in channel and gutter.
Pollution Date	28/05/09	Comment	Incident no. Clay washed to creek (from Urban Worx Limited).
Site Address	**380 TiRakau Drive**		
Site visit Date	13/01/02	Comment	Site audit.
Site Address	**396 TiRakau Drive (Soda Blast Auckland)**		
Pollution Date	14/02/08	Comment	Incident no. 08/0275. Waterblasting of soda to stormwater.
Site Address	**451 TiRakau Drive**		
Pollution Date	22/06/11	Comment	Incident no. 11/2871. Paint discharged to stormwater.
Pollution Date	28/01/10	Comment	Incident no. 10/0597. Waste cooking spill.
Pollution Date	04/04/08	Comment	Incident no. 08/1463. Waste cooking spill.
Pollution Date	10/10/11	Comment	Incident no. 11/2871. Paint discharge to stormwater.
Site Address	**500 TiRakau Drive**		
Pollution Date	15/06/12	Comment	Incident no. 12/2451. Fire at bowling alley.
Site Address	**TiRakau Drive**		
Pollution Date	14/11/09	Comment	Incident no. 09/3542. Odour complaint.
Pollution Date	2/1/2007	Comment	Incident no. 07/3676. Petrol to stormwater.
Pollution Date	23/02/07	Comment	Incident no. 07/0877. Car washing to stormwater.
Pollution Date	13/07/04	Comment	Incident no. 04/0935. TJ's carwash discharge to stormwater.
Pollution Date	27/11/01	Comment	Incident no. 01/0683. Washing paint brushes to stormwater.
Pollution Date	30/11/93	Comment	Incident no. 93/0754. Hydrocarbon spill from BP.
Site Address	**Ti Rakau Bridge-Mangrove Swamp**		
Pollution Date	23/01/96	Comment	Incident no. 96/0144. 2 X 44 Gallon Drums Going Down Stream, Planks Of Wood & Oil Slick, Ending Up In Swamp Area

File Reference	7-45-3322		
File Name	**53 TiRakau Drive**		
Pollution Date	07/12/11	Comment	Sediment to stormwater.

File Reference	6-03-1527		
File Name	**249 TiRakau Drive**		
Site Occupier Name	Cascade Hire Centre Ltd		
Site visit Date	04/08/94	Comment	Site audit.

File Reference	P240-04-04		
Site Address	**279 TiRakau Drive - Total Hire Limited**		
Pollution Date	19/01/02	Comment	Incident no. 02/1104. Waste oil overflowing out of drums.
Site Address	**TiRakau Drive**		
Pollution Date		Comment	Incident no.

File Reference	6-03-2465		
File Name	**298 TiRakau Drive**		
Site Occupier Name	Lucky House Restaurant		
Pollution Date	18/05/01	Comment	Washing dishes to stormwater.

File Reference	6-03-2724		
File Name	**318D TiRakau Drive**		
Site Occupier Name	Redox Chemicals NZ		
Pollution Date	18/01/02	Comment	Chemical spill to road.

File Reference	6-03-2157		
File Name	**330 TiRakau Drive**		
Site Occupier Name	Howick & Eastern Buses Ltd		
Pollution Date	14/10/99	Comment	Site visit.

File Reference	6-03-2928		
File Name	**347 TiRakau Drive**		
Site Occupier Name	TJ's Carwash		
Pollution Date	12/02/07	Comment	Carwash to stormwater.
Pollution Date	04/07/04	Comment	Carwash to stormwater.
Pollution Date	15/09/02	Comment	Carwash to stormwater.

File Reference	6-03-2157		
File Name	**380 TiRakau Drive**		
Site Occupier Name	Howick & Eastern Buses		
Pollution Date	26/08/12	Comment	Small oil spill.
Site Visit Date	14/10/99	Comment	Site audit.

File Reference	6-03-2294		
File Name	**TiRakau Drive**		
Site Occupier Name	**Plumbing World**		
Pollution Date	19/10/07	Comment	Black chemical substance seeping from ground.

File Reference	6-03-0141		
File Name	**92-98 Harris Road (but incident was on TiRakau Road)**		
Pollution Date	01/10/95	Comment	Incident no. 95/0014. Chemical Spill At Aspac. Watertech Trucks by Ponds on Ti Rakau Drive

The general catchment file and site visit file for the catchment (6-03 and 6-03-SV respectively) were not searched. These files contain pollution incidents where the source of pollution was not traced to a particular site, site visits where no follow-up correspondence was required and some information from archived files.

If the above sites are coastal or beside a river, it is possible that historic, unconsented reclamation may have occurred. The Auckland Council, Natural Resources and Specialist Input, Coastal Team may be able to provide further information.

The records reviewed as part of this Site Contamination Enquiry search do not identify individual horticultural sites in the region. However, there is a possibility that horticultural activities may have occurred at the sites. The local Auckland Council customer service centre, specific to the area of the site may be able to provide relevant information where former horticultural sites have been mapped.

If you are concerned that a historic land use (such as filling) may have caused the underlying soils to become contaminated, it is recommended that you obtain an independent environmental assessment of the sites. Staff from the Auckland Council Earthworks and Contaminated Land Team can provide advice on the results of any evaluation in terms of site remediation and/or potential consent requirements.

The former Auckland Regional Council and current Natural Resources and Specialist Input Unit databases were searched for records of landfill, bore, air discharge, industrial and trade process consents, contaminated site discharge consents, and environmental assessments within sites which are approximately 50 metres of either side of the road reserve. Relevant details of the identified consents are appended to this letter (Attachment A).

The details provided are in accordance with the obligation to make information publicly available upon request. While the Auckland Council has carried out the 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.

In addition, it is recommended that you contact the local customer service centre of the Auckland Council, specific to the site being investigated: Ground Floor, Kotuku House, 4 Osterley Way, Manukau Central as they also may hold files with relevant information.

I trust that this answers your query. If you wish to discuss the matter further, please contact Andrew Kalbarczyk on 301 0101. Should you wish to request any of the files listed above 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 files will be available).

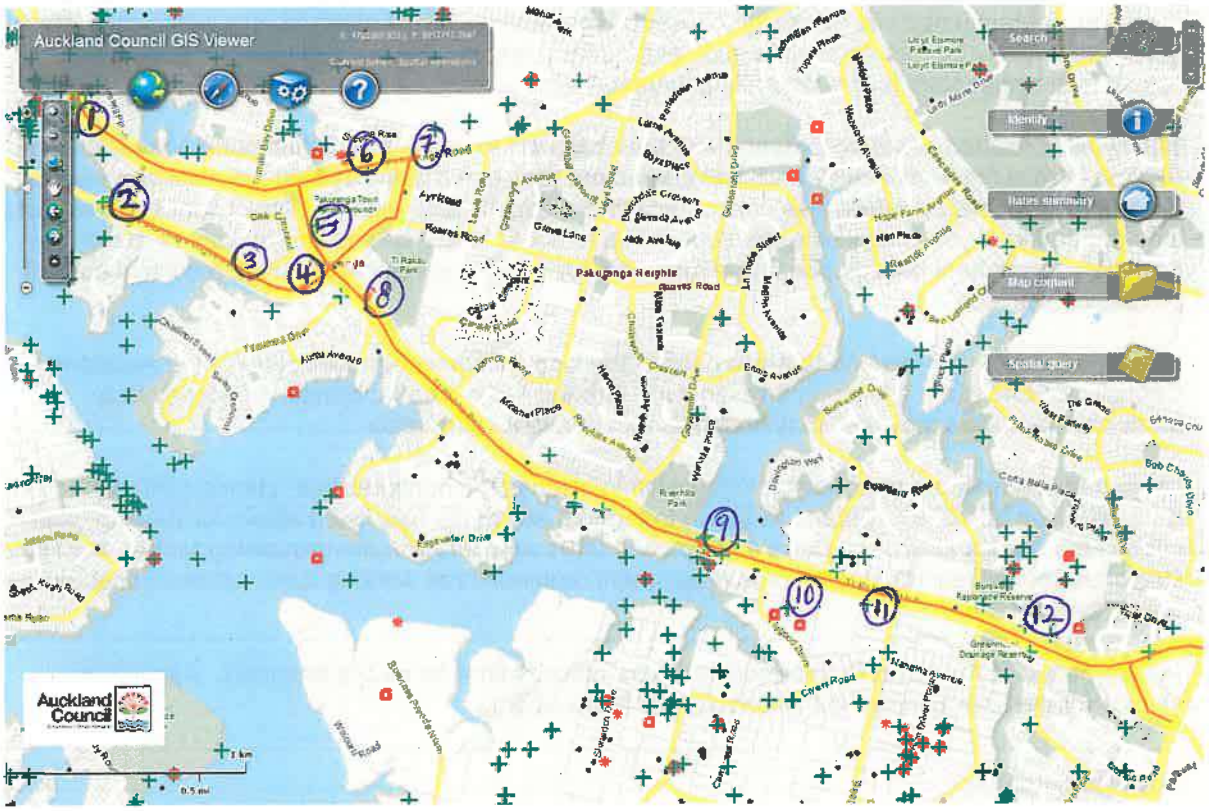
Please note: the Auckland Council cost recovers officer's time for all site enquiries. As such an invoice for the time involved in this enquiry will follow shortly.

Yours sincerely

pp

David Hampson
Team Leader - Earthworks and Contaminated Land
Natural Resources and Specialist Input

Attachment A



1 ACTIVITY DESCRIPTION:	To authorise the construction of up to 16 bores for investigation purposes.
ACTIVITY ID:	21951
ACTIVITY STATUS:	Drilled
ACTIVITY TYPE:	Bore
CONSENT HOLDER:	Opus International Consultants Ltd
CONSENT NUMBER:	28231
CONSENT STATUS:	Expired
DATE CREATE:	24/09/2012 7:17:02 p.m.
EXPIRY DATE:	20040824
FILE REFERENCE:	C512-12-3153*
GRANTED DATE:	20030820
LOC TYPE:	Point
PROCESSING OFFICER:	Sarah Pinkerton
PROPERTY ADDRESS:	Eastern Corridor Auckland City & Manukau City
PURPOSE:	To authorise the construction of up to 16 bores for investigation purposes.
REVIEW DATE:	Null
SITE DESCRIPTION:	St Johns
SITE NAME:	Null
WORKS DESCRIPTION:	Construction of up to 16 100mm diameter bores, to a depth of approximately 40m. Installation of PVC casing.

2. ACTIVITY DESCRIPTION:	Null
ACTIVITY ID:	20039
ACTIVITY STATUS:	Proposed
ACTIVITY TYPE:	Discharge Other
CONSENT HOLDER:	Transpower New Zealand Limited

CONSENT NUMBER:	24690
CONSENT STATUS:	Expired
DATE CREATE:	24/09/2012 7:17:02 p.m.
EXPIRY DATE:	20010531
FILE REFERENCE:	15256
GRANTED DATE:	20010223
LOC TYPE:	Point
PROCESSING OFFICER:	Wes Smith
PROPERTY ADDRESS:	Parts of the four power transmission towers as described in the application, being towers on the Otahuhu-Penrose A Line Numbered 20, 22 and 37 and tower Number 9 on the Penrose-Roskill A Line.
PURPOSE:	To authorise the discharge of contaminants to ground from the maintenance trials on specified lead painted power transmission towers in the Auckland Region in accordance with Section 15(1)(b) of the Resource Management Act 1991.
REVIEW DATE:	Null
SITE DESCRIPTION:	Manukau & Auckland City
SITE NAME:	Transpower Towers
WORKS DESCRIPTION:	The discharge of blast media and wastewater to ground as a result of power transmission tower refurbishment trials.

2. ACTIVITY DESCRIPTION:	Clean & paint tower previously coated wit lead-based paint
ACTIVITY ID:	20066
ACTIVITY STATUS:	Proposed
ACTIVITY TYPE:	Discharge Other
CONSENT HOLDER:	Transpower New Zealand Limited
CONSENT NUMBER:	25577
CONSENT STATUS:	Superseded
DATE CREATE:	24/09/2012 7:17:02 p.m.
EXPIRY DATE:	20041231
FILE REFERENCE:	15256
GRANTED DATE:	20011025
LOC TYPE:	Point
PROCESSING OFFICER:	Belinda Gillespie
PROPERTY ADDRESS:	All transmission towers Otahuhu-Penrose B Line Manukau City
PURPOSE:	To authorise the discharge of contaminants to ground from the maintenance trials on specified lead painted power transmission towers in the Auckland Region in accordance with Section 15(1)(b) of the Resource Management Act 1991.
REVIEW DATE:	Null
SITE DESCRIPTION:	Null
SITE NAME:	Transpower Towers
WORKS DESCRIPTION:	Null

2. ACTIVITY DESCRIPTION:	Clean & paint tower previously coated wit lead-based paint
ACTIVITY ID:	20066
ACTIVITY STATUS:	Proposed
ACTIVITY TYPE:	Discharge Other
CONSENT HOLDER:	Transpower New Zealand Limited

CONSENT NUMBER:	26761
CONSENT STATUS:	Expired (Not Replace
DATE CREATE:	24/09/2012 7:17:02 p.m.
EXPIRY DATE:	20041231
FILE REFERENCE:	15256
GRANTED DATE:	20020913
LOC TYPE:	Point
PROCESSING OFFICER:	Clive Couldwell
PROPERTY ADDRESS:	All transmission towers Otahuhu-Penrose B Line Manukau City
PURPOSE:	To authorise the discharge of contaminants to ground from the maintenance trials on specified lead painted power transmission towers in the Auckland Region in accordance with Section 15(1)(a) and (b) of the Resource Management Act 1991.
REVIEW DATE:	Null
SITE DESCRIPTION:	Null
SITE NAME:	Transpower Towers
WORKS DESCRIPTION:	Null

2. ACTIVITY DESCRIPTION:	Null
ACTIVITY ID:	20111
ACTIVITY STATUS:	Proposed
ACTIVITY TYPE:	Discharge Other
CONSENT HOLDER:	Transpower New Zealand Limited
CONSENT NUMBER:	26789
CONSENT STATUS:	Expired (Not Replace
DATE CREATE:	24/09/2012 7:17:02 p.m.
EXPIRY DATE:	20041231
FILE REFERENCE:	15256
GRANTED DATE:	20020913
LOC TYPE:	Point
PROCESSING OFFICER:	Clive Couldwell
PROPERTY ADDRESS:	Parts of the transmission towers as described in the application, being tower Number 25 on the PEN - ROS A Line Auckland City
PURPOSE:	To authorise the discharge of contaminants to ground from the maintenance trials on specified lead painted power transmission towers in the Auckland Region in accordance with Section 15(1)(b) of the Resource Management Act 1991.
REVIEW DATE:	Null
SITE DESCRIPTION:	Null
SITE NAME:	Transpower Towers
WORKS DESCRIPTION:	Null

3. ACTIVITY:	Bore
ACTIVITY DESCRIPTION:	To authorise the construction of nineteen bores for Geotechnical investigation.
ACTIVITY ID:	28689
ACTIVITY STATUS:	Proposed
CONSENT STATUS:	Under Assessment
EASTING:	1766322
EXPIRY DATE:	Null
FILE REFERENCE:	C512-12-4948*
GRANTED DATE:	Null

LOC TYPE:	Point
NORTHING:	5912882
PERMITTED:	Bore
PERMITTED ACTIVITY TYPE :	52773
PROCESSING OFFICER:	Reginald Samuel
PROPERTY ADDRESS:	
PURPOSE:	To authorise the construction of nineteen bores for Geotechnical investigation.
REVIEW DATE:	Null
SITE DESCR:	Multiple sites across Reeves Rd Flyover, Pakuranga. Sites ranging between coordinates: 1) E 1766322 N 5912882 2) E 1766548 N 5912835 3) E 1767011 N 5913381
SITE NAME:	Reeves Rd Flyover
WORKS DESCRIPTION:	Null

4. ACTIVITY:	Bore
ACTIVITY DESCRIPTION:	To authorise the construction of nineteen bores for Geotechnical investigation.
ACTIVITY ID:	28689
ACTIVITY STATUS:	Proposed
CONSENT STATUS:	Under Assessment
EASTING:	1766548
EXPIRY DATE:	Null
FILE REFERENCE:	C512-12-4948*
GRANTED DATE:	Null
LOC TYPE:	Point
NORTHING:	5912835
PERMITTED:	Bore
PERMITTED ACTIVITY TYPE :	52773
PROCESSING OFFICER:	Reginald Samuel
PROPERTY ADDRESS:	
PURPOSE:	To authorise the construction of nineteen bores for Geotechnical investigation.
REVIEW DATE:	Null
SITE DESCR:	Multiple sites across Reeves Rd Flyover, Pakuranga. Sites ranging between coordinates: 1) E 1766322 N 5912882 2) E 1766548 N 5912835 3) E 1767011 N 5913381
SITE NAME:	Reeves Rd Flyover
WORKS DESCRIPTION:	Null

5. ACTIVITY DESCRIPTION:	5/12/09 ext appeal date to due to submitteres not getting their copy of decision WBS 30355 master C 8 Pakuranga - network discharges wetweather and emergency discharges
ACTIVITY ID:	20592
ACTIVITY STATUS:	Occurring
ACTIVITY TYPE:	Wastewater Discharge
CONSENT HOLDER:	Watercare Services Limited
CONSENT NUMBER:	30355
CONSENT STATUS:	Issued
DATE CREATE:	24/09/2012 7:17:02 p.m.
EXPIRY DATE:	20431231
FILE REFERENCE:	18036
GRANTED DATE:	20091030
LOC TYPE:	Point

PROCESSING OFFICER:	Lisa Doran
PROPERTY ADDRESS:	Wastewater Network within the Catchment 8 Pakuranga Manukau City
PURPOSE:	To authorise the discharge of wastewater to land or water as a result of wet weather wastewater overflows, and/or overflows resulting solely from network blockages or breakages, and/or exfiltration, and/or power failure or mechanical failure at pump stat
REVIEW DATE:	20151231
SITE DESCRIPTION:	PS 9, 10, 11, 12, 13, 17, 18, 33 and 65
SITE NAME:	C 8 Pakuranga
WORKS DESCRIPTION:	As indicated in the Catchment 8 WNMP prepared by Manukau Water Limited.

6. ACTIVITY:	Contaminated Site Discharge
ACTIVITY DESCRIPTION:	Tank removal
ACTIVITY ID:	21038
ACTIVITY STATUS:	Occurring
CONSENT STATUS:	Under Assessment
EASTING:	1766716.5
EXPIRY DATE:	Null
FILE REFERENCE:	Null
GRANTED DATE:	Null
LOC TYPE:	Point
NORTHING:	5913366.2
PERMITTED:	Contaminated Site Discharge
PERMITTED ACTIVITY TYPE :	52127
PROCESSING OFFICER:	Null
PROPERTY ADDRESS:	3 Kentigern Close Pakuranga Manukau City
PURPOSE:	file T096-03-1288
REVIEW DATE:	Null
SITE DESCR:	Lot 1 DP 149241, Lot 51 & 52 DP 69912
SITE NAME:	Mobil Pakuranga
WORKS DESCRIPTION:	Environmental Site Assessment report received 12/09/08

6. ACTIVITY:	Contaminated Site Discharge
ACTIVITY DESCRIPTION:	Ex Mobil service station. Remediation undertaken by Mobil. The CoC granted 21/9/2009.
ACTIVITY ID:	21076
ACTIVITY STATUS:	Completed
CONSENT STATUS:	Assessment Completed
EASTING:	1766716
EXPIRY DATE:	Null
FILE REFERENCE:	21158
GRANTED DATE:	20090921
LOC TYPE:	Point
NORTHING:	5913382
PERMITTED:	Contaminated Site Discharge
PERMITTED ACTIVITY TYPE :	52257
PROCESSING OFFICER:	John O'Grady
PROPERTY ADDRESS:	3 Kentigern Close Pakuranga Manukau City
PURPOSE:	An application for a Certificate of Compliance to certify that the soil contaminant levels at the site.meet the PA criteria, based on PARP:ALW

	Rule 5.5.41
REVIEW DATE:	Null
SITE DESCR:	Null
SITE NAME:	Sea Horse Investments Ltd
WORKS DESCRIPTION:	Rule 5.5.41

6. ACTIVITY:	Contaminated Site Discharge
ACTIVITY DESCRIPTION:	Removal of underground storage tanks and pipework
ACTIVITY ID:	21021
ACTIVITY STATUS:	Completed
CONSENT STATUS:	Assessment Completed
EASTING:	1766716
EXPIRY DATE:	Null
FILE REFERENCE:	21158
GRANTED DATE:	20090209
LOC TYPE:	Point
NORTHING:	5913382
PERMITTED:	Contaminated Site Discharge
PERMITTED ACTIVITY TYPE :	52100
PROCESSING OFFICER:	John O'Grady
PROPERTY ADDRESS:	3 Kentigern Close Pakuranga Manukau City
PURPOSE:	Certifying that the petroleum hydrocarbon residues left in the soils tested after the removal of the UPSS meet the ARC PA Criteria under rule 5.5.42(2) for the site being used for petroleum storage
REVIEW DATE:	Null
SITE DESCR:	Certifying that the petroleum hydrocarbon residues left in the soils tested after the removal of the UPSS meet the ARC PA Criteria under rule 5.5.42(2) for the site being used for petroleum storage
SITE NAME:	Sea Horse Investments Ltd
WORKS DESCRIPTION:	PO Dave Robotham Rule 55 42 (2)

6. ACTIVITY:	Contaminated Site Discharge
ACTIVITY DESCRIPTION:	Tank removal
ACTIVITY ID:	21038
ACTIVITY STATUS:	Occurring
CONSENT STATUS:	Under Assessment
EASTING:	1766716.5
EXPIRY DATE:	Null
FILE REFERENCE:	Null
GRANTED DATE:	Null
LOC TYPE:	Point
NORTHING:	5913366.2
PERMITTED:	Contaminated Site Discharge
PERMITTED ACTIVITY TYPE :	52127
PROCESSING OFFICER:	Null
PROPERTY ADDRESS:	3 Kentigern Close Pakuranga Manukau City
PURPOSE:	file T096-03-1288
REVIEW DATE:	Null
SITE DESCR:	Lot 1 DP 149241, Lot 51 & 52 DP 69912
SITE NAME:	Mobil Pakuranga
WORKS DESCRIPTION:	Environmental Site Assessment report received 12/09/08

7. ACTIVITY:	Bore
ACTIVITY DESCRIPTION:	To authorise the construction of nineteen bores for Geotechnical investigation.
ACTIVITY ID:	28689
ACTIVITY STATUS:	Proposed
CONSENT STATUS:	Under Assessment
EASTING:	1767011
EXPIRY DATE:	Null
FILE REFERENCE:	C512-12-4948*
GRANTED DATE:	Null
LOC TYPE:	Point
NORTHING:	5913381
PERMITTED:	Bore
PERMITTED ACTIVITY TYPE :	52773
PROCESSING OFFICER:	Reginald Samuel
PROPERTY ADDRESS:	
PURPOSE:	To authorise the construction of nineteen bores for Geotechnical investigation.
REVIEW DATE:	Null
SITE DESCR:	Multiple sites across Reeves Rd Flyover, Pakuranga. Sites ranging between coordinates: 1) E 1766322 N 5912882 2) E 1766548 N 5912835 3) E 1767011 N 5913381
SITE NAME:	Reeves Rd Flyover
WORKS DESCRIPTION:	Null

8. ACTIVITY:	Contaminated Site Discharge
ACTIVITY DESCRIPTION:	Tank removal validation report provided to AC on the 28 June 2010.
ACTIVITY ID:	21228
ACTIVITY STATUS:	Occurring
CONSENT STATUS:	Null
EASTING:	1766830
EXPIRY DATE:	Null
FILE REFERENCE:	6-03-4522
GRANTED DATE:	Null
LOC TYPE:	Point
NORTHING:	5912819
PERMITTED:	Contaminated Site Discharge
PERMITTED ACTIVITY TYPE :	52616
PROCESSING OFFICER:	Andrew Kalbarczyk
PROPERTY ADDRESS:	11 Cortina Place Pakuranga Manukau City
PURPOSE:	Tanks were pulled in 2010, site no longer a petrol station. 9 samples exceeded the applicable soil acceptance criteria. Those exceedances relate to protection of maintenance/excavation workers, and indoor inhalation human health exposure pathways. Full
REVIEW DATE:	Null
SITE DESCR:	Tank removal validation report provided to AC on the 28 June 2010.
SITE NAME:	11 Cortina Place, Pakuranga
WORKS DESCRIPTION:	CONSENT IS REQUIRED FOR THIS SITE!

8. ACTIVITY:	Bore

ACTIVITY DESCRIPTION:	The construction of four bores for contaminated site investigation.
ACTIVITY ID:	28063
ACTIVITY STATUS:	Proposed
CONSENT STATUS:	Under Assessment
EASTING:	1766810
EXPIRY DATE:	Null
FILE REFERENCE:	C512-12-4841
GRANTED DATE:	Null
LOC TYPE:	Point
NORTHING:	5912797
PERMITTED:	Bore
PERMITTED ACTIVITY TYPE :	52654
PROCESSING OFFICER:	Reginald Samuel
PROPERTY ADDRESS:	11 Cortina Place Pakuranga Manukau City
PURPOSE:	The construction of four bores for contaminated site investigation.
REVIEW DATE:	Null
SITE DESCR:	56 Ti Rakau Drive, Pakuranga
SITE NAME:	Chevron
WORKS DESCRIPTION:	The construction of four 100mm diameter bores to a maximum depth of 6m. Installation of Grade D PVC casing material to an approximate depth of 6m. Proposed grouting to 0.5m.

9. ACTIVITY DESCRIPTION:	To authorise the construction of up to 16 bores for investigation purposes.
ACTIVITY ID:	21951
ACTIVITY STATUS:	Drilled
ACTIVITY TYPE:	Bore
CONSENT HOLDER:	Opus International Consultants Ltd
CONSENT NUMBER:	28231
CONSENT STATUS:	Expired
DATE CREATE:	24/09/2012 7:17:02 p.m.
EXPIRY DATE:	20040824
FILE REFERENCE:	C512-12-3153*
GRANTED DATE:	20030820
LOC TYPE:	Point
PROCESSING OFFICER:	Sarah Pinkerton
PROPERTY ADDRESS:	Eastern Corridor Auckland City & Manukau City
PURPOSE:	To authorise the construction of up to 16 bores for investigation purposes.
REVIEW DATE:	Null
SITE DESCRIPTION:	St Johns
SITE NAME:	Null
WORKS DESCRIPTION:	Construction of up to 16 100mm diameter bores, to a depth of approximately 40m. Installation of PVC casing.

9. ACTIVITY DESCRIPTION:	Largely domestic use for toilets and showers etc.
ACTIVITY ID:	1397
ACTIVITY STATUS:	Drilled
ACTIVITY TYPE:	Bore
CONSENT HOLDER:	TRU-TEST LIMITED
CONSENT NUMBER:	12889
CONSENT STATUS:	Expired
DATE CREATE:	24/09/2012 7:17:02 p.m.

EXPIRY DATE:	19950711
FILE REFERENCE:	C512-12-1309
GRANTED DATE:	19940711
LOC TYPE:	Point
PROCESSING OFFICER:	Gillian Crowcroft
PROPERTY ADDRESS:	
PURPOSE:	Authorize the construction of a bore for the extraction of groundwater for supply to industrial showers & toilets.
REVIEW DATE:	Null
SITE DESCRIPTION:	241 TI RAKAU DRIVE, EAST TAMAKI
SITE NAME:	Null
WORKS DESCRIPTION:	Construction of a 100mm dia. bore to approx 120m depth and installation of steel casing to approx. 90m.

9. ACTIVITY DESCRIPTION:	Null
ACTIVITY ID:	5225
ACTIVITY STATUS:	Drilled
ACTIVITY TYPE:	Bore
CONSENT HOLDER:	Pattle Delamore Partners Limited
CONSENT NUMBER:	14985
CONSENT STATUS:	Expired
DATE CREATE:	24/09/2012 7:17:02 p.m.
EXPIRY DATE:	19970311
FILE REFERENCE:	C512-12-1701*
GRANTED DATE:	19960311
LOC TYPE:	Point
PROCESSING OFFICER:	Gillian Crowcroft
PROPERTY ADDRESS:	242 Ti Rakau Drive East Tamaki Manukau City
PURPOSE:	Authorize the construction of three (3) piezometers for groundwater level and/or Chemistry investigations 3 bores drilled under bore code 5225. Details of S1 bore entered.
REVIEW DATE:	Null
SITE DESCRIPTION:	242 Ti Rakau Drive, Pakuranga
SITE NAME:	Null
WORKS DESCRIPTION:	Construction of three (3) 50mm dia. piezometers to approx 5m depth. Installation of PVC casing to approx 5m and PVC screen from approx. 1m to 5m if required.

10. ACTIVITY DESCRIPTION:	To authorise the construction of four bores for environmental monitoring.
ACTIVITY ID:	23194
ACTIVITY STATUS:	Proposed
ACTIVITY TYPE:	Bore
CONSENT HOLDER:	T.M.K. Packers Limited
CONSENT NUMBER:	36060
CONSENT STATUS:	Expired
DATE CREATE:	24/09/2012 7:17:02 p.m.
EXPIRY DATE:	20090807
FILE REFERENCE:	C512-12-4267*
GRANTED DATE:	20080808
LOC TYPE:	Point
PROCESSING OFFICER:	Reginald Samuel
PROPERTY ADDRESS:	257 Ti Rakau Drive East Tamaki Manukau City

PURPOSE:	To authorise the construction of four bores for environmental monitoring.
REVIEW DATE:	Null
SITE DESCRIPTION:	known as 2/20 Trugood Drive - Rates data as shown in property data 257 Ti Rakau Drive
SITE NAME:	T.M.K Packers Limited
WORKS DESCRIPTION:	The construction of four 50mm diameter bores to an approximate depth of 5m. Installation of PVC casing to an approximate depth of 5m. Proposed grouting to 0.5m. Screen material PVC, depth to top of screen 1m and bottom of screen 5m.

11. ACTIVITY DESCRIPTION:	Null
ACTIVITY ID:	20209
ACTIVITY STATUS:	Occurring
ACTIVITY TYPE:	Discharge To Air
CONSENT HOLDER:	The Spa & Pool Factory Ltd *In Liq*
CONSENT NUMBER:	29732
CONSENT STATUS:	Issued
DATE CREATE:	24/09/2012 7:17:02 p.m.
EXPIRY DATE:	20130428
FILE REFERENCE:	17693
GRANTED DATE:	20030428
LOC TYPE:	Point
PROCESSING OFFICER:	Manukau City Council
PROPERTY ADDRESS:	295 Ti Rakau Drive East Tamaki Manukau City
PURPOSE:	To control the discharge of atmospheric contaminants to air.
REVIEW DATE:	Null
SITE DESCRIPTION:	C-93
SITE NAME:	Spa and Pool Factory
WORKS DESCRIPTION:	Null

12. ACTIVITY DESCRIPTION:	Null
ACTIVITY ID:	21814
ACTIVITY STATUS:	Proposed
ACTIVITY TYPE:	Bore
CONSENT HOLDER:	Chevron New Zealand ***USE 751***
CONSENT NUMBER:	27499
CONSENT STATUS:	Expired
DATE CREATE:	24/09/2012 7:17:02 p.m.
EXPIRY DATE:	20031201
FILE REFERENCE:	C512-12-3033
GRANTED DATE:	20021202
LOC TYPE:	Point
PROCESSING OFFICER:	Michelle Ip
PROPERTY ADDRESS:	380 Ti Rakau Drive East Tamaki Manukau City
PURPOSE:	Authorise the construction of a bore for monitoring purposes.
REVIEW DATE:	Null
SITE DESCRIPTION:	Null
SITE NAME:	Null
WORKS DESCRIPTION:	Construction of a 50mm diameter bore to a depth of approximately 10m. Installation of PVC casing to a depth of approximately 10m.

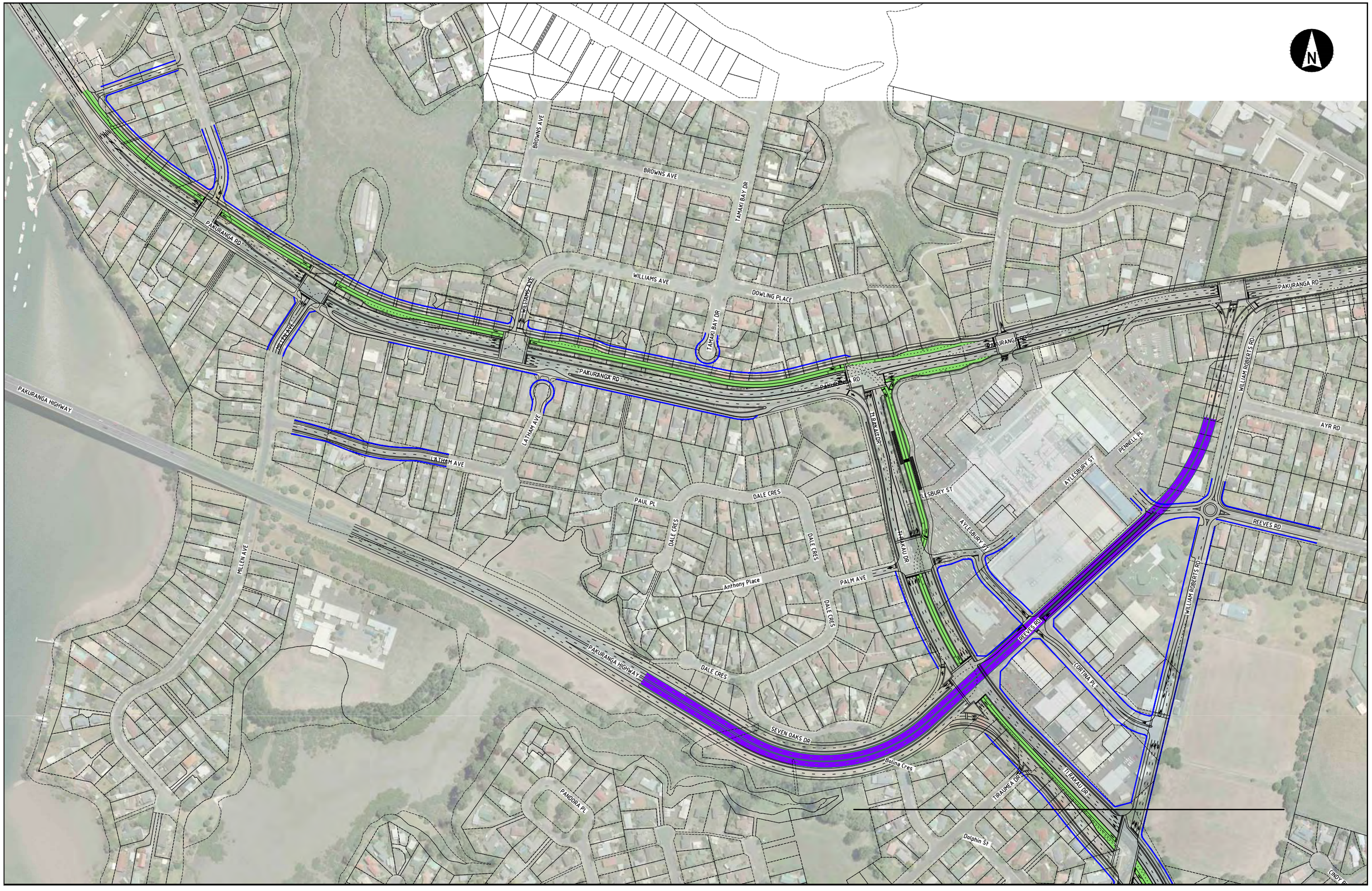
Appendix B

Pakuranga Scheme Assessment Alignment Sheets

A3 SCALE 1:4000
A1 SCALE 1:2000

0 50 100 150 200 250 (m)

AMETI PACKAGE 4
- SHEET 2



A3 SCALE 1:4000
A1 SCALE 1:2000

0 50 100 150 200 250 (m)

AMETI PACKAGE 4
- SHEET 1

A3 SCALE 1:4000
A1 SCALE 1:2000

0 50 100 150 200 250 (m)

AMETI PACKAGE 4
- SHEET 4

A3 SCALE 1:4000
A1 SCALE 1:2000

0 50 100 150 200 250 (m)

AMETI PACKAGE 4
- SHEET 3

Auckland
Regional Council
TE RAUHITANGA TAIAO

26 November 2003

Caltex New Zealand Limited
PO Box 684
Auckland

Attention: Simon Hunt

Vodafone House, 21 Pitt Street
Private Bag 92 012, Auckland
New Zealand
DX CP 28 008 Pitt St
Telephone +64 9 379 4420
Facsimile +64 9 366 2155
www.arc.govt.nz

Dear Simon

Caltex: Howick and Eastern Buses Depot.

Thank you for meeting with Auckland Regional Council (ARC) staff on 30th October to discuss Howick and Eastern Buses Depot and submitting the Summary of Works report for this site.

The ARC acknowledge the successful removal of product from within the tank pit by manual and automated product recovery systems, ARC are happy to approve the decommissioning of the system by Caltex and allow the residual product to attenuate naturally. However, in the unlikely event of an increase in product within the tank pit, the ARC are to be informed and a recovery system installed immediately.

Please note that as the ARC is a ratepayer funded organisation, it is our policy to recover costs incurred for provision of information in respect of resource consents in accordance with Section 36(1)(e) of the RMA 1991. These costs may include officer's/consultant's time, travel and analytical fees.

If you have any queries regarding the above please contact Sarah Harvey , ARC on 366 2000 ext. 8084.

Yours sincerely

Sarah Harvey
Environmental Scientist
Contaminated Sites

URS

Date: 30 September 2003

To: Simon Hunt - Caltex

From: Shane Moore

Subject: Caltex: Howick & Eastern Bus Depot - Summary of Works to 1 October 2003

1. Summary of Works

As requested please find following a summary of the works completed at the above site to 1 October 2003. A graphical summary of the product recovery works, volumes of product recovered and product thicknesses within the tank pit is provided on the attached chart.

1. Investigation works were completed at the site between 29 November and 12 December 2002, these comprised:

   - Drilling of two deep (~10m bgl) and two shallow (~4m bgl) soil bores and collection of soil samples for analysis. One soil bore was located on each of the four sides of the tank pit (refer attached site layout sketch).
   - Installation of one deep (MW1 - 10m bgl) and two shallow (SW1 & 2 - 0.8m bgl) groundwater monitoring wells and collection of a groundwater sample from the deep well for analysis.
   - Determination of the presence of separate phase product and depth to water in all monitoring wells.

   In summary, the findings of the investigation works were that the product and water appeared to be perched and contained within the tank pit as a result of the low permeabilities of the surrounding silt and clay soils and that the soils adjacent to the tank pit have not been impacted by the presence of product in the tank pit.

2. A product recovery trial was conducted on 8 December 2002. Approximately 1250 litres of product and liquid was pumped, by skimming, from the tank pit. An estimated volume of approximately 800 litres of product was recovered.

3. Product recovery works were conducted Carlyon Civil Construction by manually skimming product from the tank pit between 20 December and 18 February 2003. Carlyon estimate that approximately 2250 litres of product was recovered (total to 18 February 2003 = 3050 litres).

4. On 14 May 2003 the automated product recovery system was commissioned. The system skims product from a product only skimmer installed in one of the tank pit observation wells (OB2). A pneumatic diaphragm pump operates the product

URS New Zealand Limited
6th Floor, Bank Direct Centre
13-15 College Hill, Auckland
PO Box 821, Auckland New Zealand
Tel: 64 9 355 1300

skimmer (air is supplied from workshop compressor on-site) and delivers the recovered product to a bunded above ground storage tank that is situated within the depot carpark, adjacent to the refuelling area.

In summary, the automated recovery system has recovered a further volume of approximately 2265 litres since May 2003, bringing the total volume of product recovered to approximately 5300 litres as at 1 October 2003. Product thicknesses in the tank pit have been reduced from an initial thickness of approximately 200mm to less than 10mm.

2. Future Works

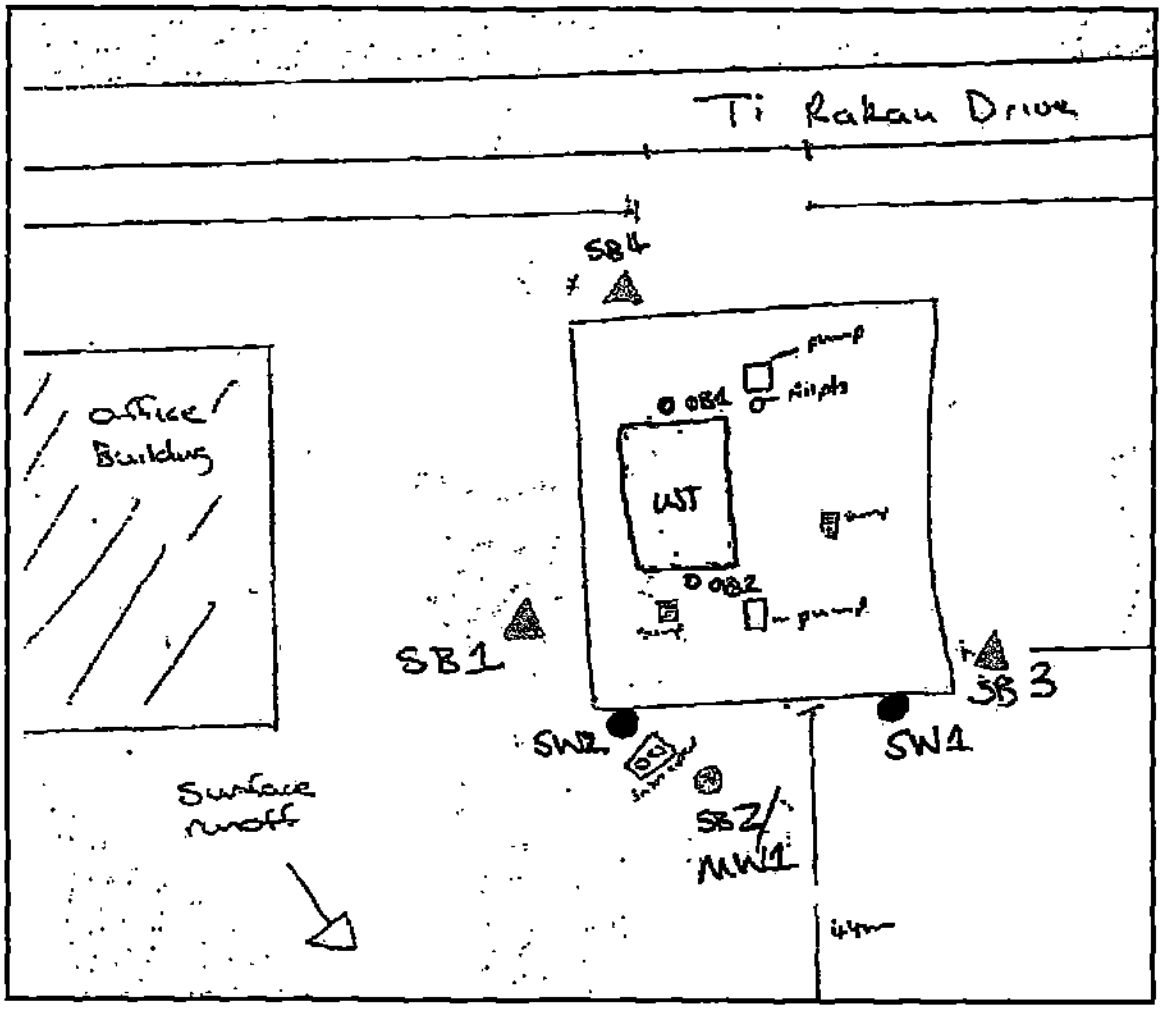
Over the last few months the rate of recovery of product from the tank pit has reduced significantly, as the product thicknesses in the tank pit have been reduced. In recent weeks the system has recovered minimal additional product (within the error of measurement in the holding tank), and it appears that the system has recovered as much product as it is efficiently capable of in its current configuration. The most effective options for future works are considered to be:

- Cycle the system on and off to attempt to enhance product movement to the skimmer in OB2; or
- Relocate the skimmer to OB1, where product thicknesses have consistently been slightly larger, in an attempt to increase the rate of recovery; or
- Decommission and the system and allow the residual product to attenuate naturally (dependent on approval from the Auckland Regional Council).

Regards,

Shane Moore

URS

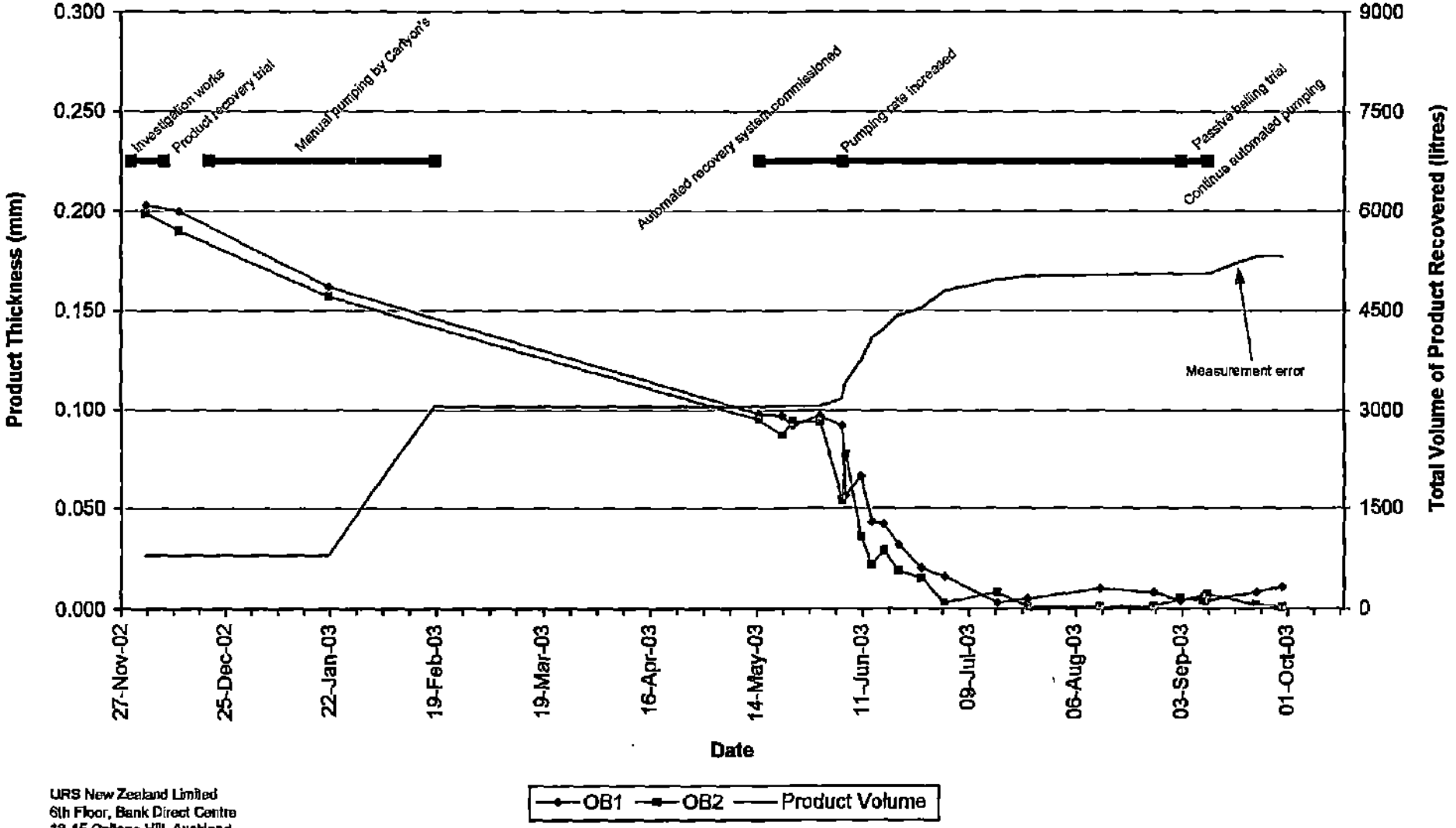


Site Layout Sketch

URS New Zealand Limited
6th Floor, Bank Direct Centre
13-15 College Hill, Auckland
PO Box 821, Auckland New Zealand
Tel: 64 9 355 1300

URS

Howick & Eastern Bus Depot
Summary of Product Recovery Works



URS New Zealand Limited
6th Floor, Bank Direct Centre
13-15 College Hill, Auckland
PO Box 821, Auckland New Zealand
Tel: 64 9 355 1300
Fax: 64 9 355 1333

FILE COPY

Auckland
Regional Council
TE RAUHITANGA TAIAO

28 May 2003

Attention: Simon Hunt
EHS Country Co-ordinator
CaltexNew Zealand Limited
PO Box 684
AUCKLAND

Vodafone House, 21 Pitt Street
Private Bag 92 012, Auckland
New Zealand
DX CP 28 008 Pitt St
Telephone +64 9 366 2000
Facsimile +64 9 366 2155
www.arc.govt.nz

Dear Simon

Dont require a consent

Caltex: Howick and Eastern Buses Depot

Thank you for the 25 March 2003 information from URS New Zealand Limited in relation to this site.

File Ref 6-03-2157

The conclusions of our letter of 28 January 2003 stand.

Yours sincerely

C. Couldwell

Clive Couldwell
ARC consultant
(Land and Water Quality)

URS

RECEIVED
25 MAR 2003

Fax Transmittal

To:	Clive Cauldwell, Regional Council	From:	Shane Moore
Company:	Auckland Regional Council	URS Project No:	48213-167
Facsimile:	366 2155	Date:	25 March 2003
cc:	Simon Hunt (Caltex) - 529 4881	Page 1 of:	6
Your Ref:			

Special Instructions: ☐ Confidential ☐ Urgent ☐ Please Reply ☑ For Your Information ☐ For Follow-up

If you do not receive all pages or transmission is illegible, please contact the originator to re-send. Should the facsimile be sent to the wrong fax number, would receiver please destroy this copy and notify URS immediately. Thank you.

Subject: **Caltex: Howick and Eastern Buses Depot**

Message:

Dear Clive,

Further to your letter to Caltex dated 13 March 2003 regarding the status of the tank pit at the above site, please find following copies of the borelogs for all of the soil borings completed at the site. The investigation locations are presented on the attached sketch map. We would like to confirm that the tanks at this site are installed in natural materials and that no concrete lined tank pit is present. However, we would like to reiterate our findings to date, in summary these are:

- Product and water appears to be perched and contained within the tank pit as a result of the low permeabilities of the surrounding silt and clay soils.
- There is no evidence that hydrocarbon product has migrated within either the shallow granular basecourse fill materials or stormwater services.
- The soils adjacent to the tank pit have not been impacted by the presence of product in the tank pit;
- Low concentrations of dissolved phase contaminants were detected in groundwater adjacent to the tank pit, however these concentrations maybe an artefact of the limited development able to be achieved. Furthermore, the dissolved phase concentrations would be expected to be rapidly attenuated within the fine grained soils surrounding the tank pit.

(?) What was this

Please do not hesitate to contact either Simon Hunt or myself if you have any further queries regarding this site.

Regards,

Shane Moore
Senior Hydrogeologist

URS New Zealand Limited
6th Floor, Bank Direct Centre
13-15 College Hill, Auckland
PO Box 821, Auckland New Zealand
Tel: 64 9 355 1300
Fax: 64 9 355 1333

S:\JOBS\48213\167\ARC - TANK PIT STATUS.DOC

URS

Sheet 1 of 1

DRILL HOLE LOG SB1

URS New Zealand Limited.
13-15 College Hill, Ponsonby, Auckland
Phone 09 3551900
Fax 09 3551933

Project No.: 46213-167

Project Reference: Howick & Eastern Bus Depot

Drilling Contractor: Geotech Drilling

Drill Type: Mobile Drill B53

Logged By: S Thomson
Checked By:
Date Started: 29-11-02
Date Finished: 29-11-02

Relative Level: mRL
Coordinates: mN
mE
Permit No:

Client: Caltex New Zealand Limited

SAMPLE TYPE	DRILL RUN (m)	FIELD SHEAR STRENGTH (kPA)	PENETROMETER BLOWS (N)	SAMPLING AND OTHER TESTING	GROUND WATER DATA AND COMMENTS	PIEZOMETER CONSTRUCTION	DEPTH (m)	LEGEND	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
150mm HOLLOW STEM AUGER WITH PUSH TUBE SAMPLING	0.00						0		Asphalt	
	0.70								Dark grey silty, sandy GRAVEL, dry (basecourse) [no odour]	FILL
				K858 (0.0-0.8m			1		Light grey CLAY, firm, dry [no odour]	
	1.20								Dark grey/black silty CLAY, damp [no odour]	
	2.00			K859 (1.8-2.0m			2			
	3.00			K860 (3.0-3.1m			3		Black, sandy SILT, soft, very moist, highly plastic [no odour]	
	4.80						4			
							5		Dark grey, silty CLAY, damp [no odour]	TAURANGA GROUP ALLUVIUM
	6.00						6			
				K861 (7.0-7.2m			7		Black, sandy SILT, soft (paleosol?) [no odour]	
	7.50								Dark grey, silty CLAY, highly plastic, moist [no odour]	
	9.00						8			
							9			
	10.00				Water level recovered to ~9.5m bgl at midday		10		Dark brown sandy SILT, with organic/fibrous pieces to 20-30mm in length [no odour]	
				K862 (10.2-10.4					Dark grey SILT, very wet at 9.3m [no odour]	
									END OF HOLE AT 10.4m	
							11			

REMARKS: Very wet, free water @ 9.3m

AUGER LOGS.GPJ WGONZ.GDT 25/7/03

Sheet 1 of 1

DRILL HOLE LOG MW1 (SB2)

URS
Worley Parsons Group
URS New Zealand Limited,
12-18 College Hill, Ponsonby, Auckland
Phone 09 3551300
Fax 09 3551333

Drilling Contractor: Geotech Drilling		Project No.: 48213-167	Project Reference: Howick & Eastern Bus Depot
Drill Type: Mobile Drill B53	Logged by: S Thomson Checked By: Date Started: 29-11-02 Date Finished: 2-12-02	Relative Level: mRL Coordinates: mN mE Permit No:	Client: Caltex New Zealand Limited

SAMPLE TYPE	SAMPLING AND TESTING	WELL CONSTRUCTION DETAILS	DEPTH (m)	LEGEND	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
150mm HOLLOW STEM AUGER WITH PUSH TUBE SAMPLING	K852 (0.8-0.9m) K853 (1.1-1.2m) K854 (1.4-1.5m) K855 (2.0-2.1m) K856 (3.3-3.4m) K857 (5.5-5.6m) K858 (7.1-7.2m) K859 (10.2-10.3m)	Flush mounted wellhead PVC end cap Backfill Bentonite Pellets Washed Sand Walton Park 7/14 Filter Gravel 50mm Machine Slotted PVC Screen	0 1 2 3 4 5 6 7 8 9 10 11		Asphalt Dark grey, silty, sandy GRAVEL, dry (basecourse) [no odour] Light yellow CLAY, firm, dry to damp [no odour] Light yellow CLAY, very firm, damp [no odour] Light grey CLAY, very firm, dry. Grades to silty clay with depth [no odour] Light grey, silty CLAY, soft [no odour] Dark grey CLAY, damp, soft [no odour] Dark brown, sandy SILT, dry (paleosol) [no odour] Light grey SILT with some sand, firm, dry, some sand layers [no odour] END OF HOLE AT 11.5m	FILL TAURANGA GROUP ALLUVIUM

REMARKS: Water level as at 3/12/02.

WELL LOGS.GPJ WCONZ.GDT 25/3/03

Sheet 1 of 1

URS

DRILL HOLE LOG SB3

URS New Zealand Limited.
13-15 College Hill, Ponsonby, Auckland
Phone 09 3551300
Fax 09 3551333

Drilling Contractor: Geotech Drilling		Project No.: 48213-167	Project Reference: Howick & Eastern Bus Depot
Drill Type: Mobile Drill B53	Logged By: S Thomson Checked By: Date Started: 2-12-02 Date Finished: 2-12-02	Relative Level: mRL Coordinates: mN mE Permit No:	Client: Caltex New Zealand Limited

SAMPLE TYPE	DRILL RUN (m)	FIELD SHEAR STRENGTH (kPA)	PENETROMETER BLOWS (N)	SAMPLING AND OTHER TESTING	GROUND WATER DATA AND COMMENTS	PIEZOMETER CONSTRUCTION	DEPTH (m)	LEGEND	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
180mm HOLLOW STEM AUGER WITH PUSH TUBE SAMPLING	0.00						0		Asphalt	
									Dark grey silty, sandy GRAVEL, dry (basecourse) (no odour)	FILL
	0.50								Dark grey CLAY, moist, firm (no odour)	TAURANGA GROUP ALLUVIUM
				K663 (0.7-0.8m)						
	1.00						1		Light yellow SILT, damp, plastic (no odour)	
	1.50			K664 (1.4-1.5m)						
							2			
	3.00			K665 (2.9-3.0m)			3			
				K666 (3.9-4.0m)			4		END OF HOLE AT 4.0m	

REMARKS:

AUGER LOGS.GPJ WCCNZ.GDT 25/3/03

URS

DRILL HOLE LOG SB4

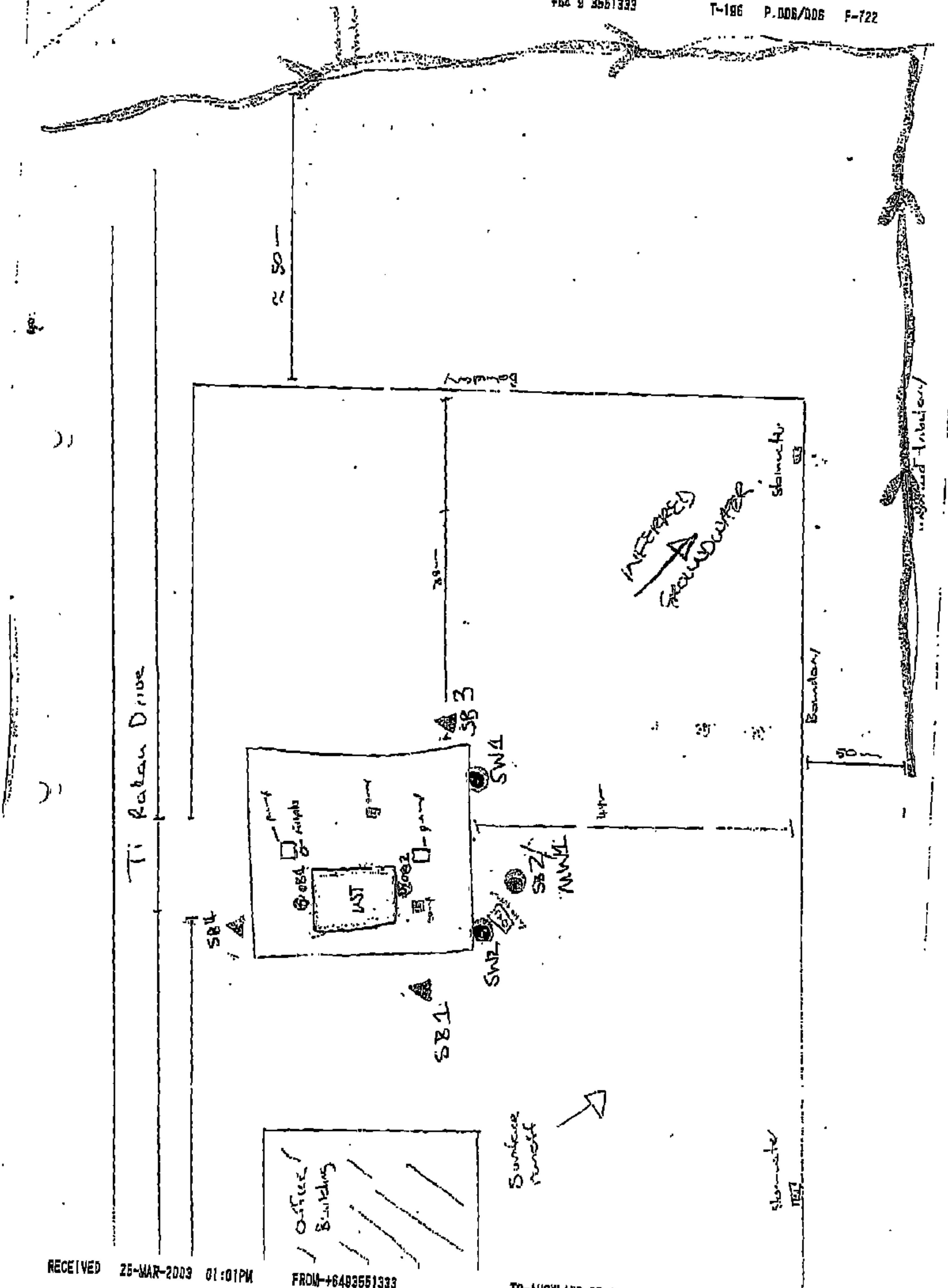
URS New Zealand Limited, 13-15 College Hill, Ponsonby, Auckland — Phone 09 3551300 Fax 09 3551333

Drilling Contractor: Geotech Drilling		Project No.: 48213-167	Project Reference: Howick & Eastern Bus Depot
Drill Type: Mobile Drill B53	Logged By: S Thomson Checked By: Date Started: 2-12-02 Date Finished: 2-12-02	Relative Level: mRL Coordinates: mN, mE Permit No:	Client: Caltex New Zealand Limited

SAMPLE TYPE	DRILL RUN (m)	FIELD SHEAR STRENGTH (kPA)	PENETROMETER BLOWS (N)	SAMPLING AND OTHER TESTING	GROUND WATER DATA AND COMMENTS	PIEZOMETER CONSTRUCTION	DEPTH (m)	LEGEND	DESCRIPTION OF STRATA	GEOLOGICAL DESCRIPTION
100mm FOLLOW STEM AUGER WITH PUSH TUBE SAMPLING	0.00						0		Asphalt	
									Dark grey silty, sandy GRAVEL, dry (basecourse) [no odour]	FILL
	0.60								Light grey CLAY, very firm, dry [no odour]	TAURANGA GROUP ALLUVIUM
				K868 (0.9-1.0m)			1			
	1.50								Light grey clayey SILT, crumbly [no odour]	
	2.00			K869 (1.9-2.0m)			2			
									Black, sandy SILT, soft (paleosol?) [no odour]	
	3.00						3		Grey CLAY, moist, soft [no odour]	
				K870 (3.9-4.0m)			4		END OF HOLE AT 4.0m	

REMARKS:

AUGER LOGS.GPJ WCCNZ.GDT 25/3/03


Ti Rakau Drive
SB1
SB2/MW1
SB3
SB4
SW1
SW2
UST
INFERRED GROUNDWATER
Surface runoff
Office/Building
Boundary
~50m
50m

FILE COPY

Auckland Regional Council
TE RAUHITANGA TAIAO

Vodafone House, 21 Pitt Street
Private Bag 92 012, Auckland
New Zealand
DX CP 28 008 Pitt St
Telephone +64 9 379 4420
Facsimile +64 9 366 2155
www.arc.govt.nz

13 March 2003

Attention: Simon Hunt
EHS Country Co-ordinator
Caltex New Zealand Limited
PO Box 684
AUCKLAND

File Ref 6-03-2157

Dear Simon

Caltex: Howick and Eastern Buses Depot

Further to the meeting at the Auckland Regional Council on Tuesday 04 March when we briefly mentioned this site and the ARC's letter of 28 January 2003.

It would appear that there is some conflicting information in respect of the tank pit at this site. Notes on the ARC file from telephone conversations with the URS New Zealand Limited field staff indicate that the tanks were in a "*concrete lined pit, 6 years old*". However, at the meeting on the 4th it transpired that the tank pit was natural materials with no secondary containment. This could put the situation in a different perspective.

Could you please forward a bore log of the two deep soil bores at the site and confirm the status of the tank pit.

Yours sincerely,

C. Couldwell

Clive Couldwell
ARC consultant
(Land and Water Quality)

2003, 2002 COMMENDATION AWARD WINNER
NEW ZEALAND BUSINESS EXCELLENCE FOUNDATION

IS Ref I:\cc\contaminated sites\oil industry\tank pits\letters\6-03-2157 letter02.doc

FILE COPY

Auckland Regional Council
TE RAUHITANGA TAIAO

Vodafone House, 21 Pitt Street
Private Bag 92 012, Auckland
New Zealand
DX CP 28 008 Pitt St
Telephone +64 9 379 4420
Facsimile +64 9 366 2155
www.arc.govt.nz

File Ref 6-03-2157

28 January 2003

Attention: Simon Hunt
EHS Country Co-ordinator
Caltex New Zealand Limited
PO Box 684
AUCKLAND

Dear Simon

Site Contamination at the Howick and Eastern Buses Depot, Auckland

The Auckland Regional Council (ARC) acknowledges the receipt of the information from URS New Zealand Limited (URS) regarding the ground contamination that has been detected at the Howick and Eastern Buses depot at 380 Ti Rakau Drive, East Tamaki.

The information which has been received by the ARC is as follows:

i. URS Summary of Works report dated 19 December 2002.

This information provides reference data with respect to levels of ground contamination present at the site both prior and subsequent to remedial works being undertaken. The site is currently zoned as .... in the Manukau City – Operative District Plan.

Would you request URS to forward documentation to enable the sample numbers to be correlated with the sampling sites.

Human Health Considerations:
The ARC notes from the results contained in the information detailed above that low levels of residual contamination remain in the ground at the site. These levels fall below recommended guideline concentrations for soil (which considers, primarily, the protection of human health and, to a limited extent, aesthetic considerations) for continuing commercial/industrial land use in accordance with the "Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand," promulgated by the Ministry for the Environment, and dated August 1999. Therefore, risks posed at this site to human health by petroleum contaminants are currently minimal due to concentrations below guideline values.

Groundwater Considerations:
The levels of residual contamination in soil also fall below the recommended guideline concentrations for the soil acceptance criteria for protection of groundwater quality (MfE, 1999). Therefore, risks posed at this site to groundwater quality by petroleum contaminants are considered to be minimal. One groundwater sample was also taken. The levels of residual contamination in groundwater are at or fall below the tier 1 acceptance criteria for potable use (MfE, 1999).

On the basis of the information received above, the ARC does not currently require a resource consent for this site to authorise the discharge of residual contaminants from this site to ground.

Copies of the above report will be forwarded to the TLA for inclusion on their files relating to the site, with the recommendation that all Land and Property Information

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NEW ZEALAND BUSINESS EXCELLENCE FOUNDATION

Memoranda (LIM/PIM) made available by their Council will include the following statement:

This site has been used for fuel storage and dispensing for an unknown period until December 2002. As a result of this land use, soil in the vicinity of the facilities investigated has been contaminated with petroleum hydrocarbons. Remediation has reduced the risks to human health and the environment posed by petroleum hydrocarbon contamination at these locations to levels acceptable to the Auckland Regional Council at 03 December 2002 provided the long-term site land use remains commercial/industrial. Details of the site, contamination and risk assessment are contained within:

i. "Report" by URS New Zealand Limited Project No. 48213\167, dated 19 December 2002.

It is noted that there may be other facilities at the site (other than those investigated) which could have the potential for soil and/or groundwater contamination.

If you have any queries regarding this correspondence please do not hesitate to contact the writer on (0-9) 298 0279 (Integrated Waste Solutions office) or mobile 027-280 3820.

Yours sincerely

C. Couldwell

Clive Couldwell
ARC Consultant
(Land and Water Quality)

cc: TLA – Manukau City Council
URS New Zealand Limited

TANK PULL REPORT ASSESSMENT

Date of Assessment:	20 JAN 2003
File Reference:	
Site Name:	HOWICK + EASTERN BUS DEPOT
Site Address:	380 TI RAKAU DRIVE PAKURANGA / EAST TAMAKI
Date of Covering Letter:	19 DECEMBER 2002
Pit Details	**Lined/Unlined** NOT STATED
Groundwater at Site:	2.76 m
Zoning:	
Guidelines Used:	**Applicable – Yes/No** NO SOIL CONT.
Samples:	**Number as per guidelines – (Yes)/No** FOUR CONFIRM SAMPLES #2
	Location as per guidelines – (Yes)/No " " " "
	Analyses as per guidelines – (Yes)/No TPH - ALL < D.L.
	Validation Sampling – (Yes)/No
Recommendation	**Sign off/Further Investigation**

C_{10} - C_{14} CORE = OIL INDUSTRY POTABLE LIMIT.
OTHER C BANDS LESS THAN GUIDE LINE.

6-03-2157

URS

Date: 19 December 2002

To: Simon Hunt - Caltex

From: Shane Moore

Subject: Caltex: Howick & Eastern Bus Deport - Summary of Works

Please find following an outline of the works completed to date at the above site:

1. Summary of Works

The following works were completed at the site between 29 November and 12 December:

- Drilling of two deep (~10m bgl) and two shallow (~4m bgl) soil bores using hollow stem augering techniques. One soil bore was located on each of the four sides of the tank pit (see attached site location sketch).
- Two soil samples, were selected for TPH analysis from each soil boring location. At each location the soil samples were selected at a depth corresponding to the surface of the natural ground, immediately underlying basecourse fill materials and at the approximate elevation of the groundwater table.
- Installation of one deep (10m bgl) and two shallow (0.8m bgl) groundwater monitoring wells. The deep groundwater monitoring well was located down interpreted hydraulic gradient (based on topography and likely groundwater discharge areas) from the tank pit and adjacent to the interceptor. Two shallow monitoring wells were installed to intercept the shallow basecourse fill, extending down to the natural ground surface to assess any shallow preferential migration pathways.
- A groundwater sample was collected from the deep monitoring well and submitted to the Hill Laboratories for TPH analysis.
- The elevations of all soil bores, monitoring well and services were surveyed.
- The presence of separate phase product and depth to water was determined in all monitoring wells.
- A product recovery trial was conducted on 8 December. Approximately 1250 l of product and liquid was pumped, by skimming, from the tank pit. An estimated volume of approximately 800l of product was recovered.

URS New Zealand Limited
6th Floor, Bank Direct Centre
13-15 College Hill, Auckland
PO Box 821, Auckland New Zealand
Tel: 64 9 355 1300
Fax: 64 9 355 1333

2. Summary of Findings

The following findings have been made based the works conducted to date:

- The drilling works have shown that the geology beneath the site can be summarised as follows:

  0 to 0.6m Paving and basecourse gravels

  0.6 to >10m Alluvial sediments predominantly silts and clays with some sandy silt (paleosol) horizons observed at depth (~3m and 7m bgl).

- The water levels measured at the site, as at 12 December, are tabulated below. A draft cross-section presenting the relative levels of the site facilities and water levels is attached.

Location	Depth to Product (m bgl)	Depth to Water (m bgl)
Deep Well (MW1)	ND	2.76
Shallow well 1 (SW1)	ND	0.70 (surface water)
Shallow well 2 (SW2)	ND	DRY
Tank Pit Observation Well 1 (OB1)	0.68	0.88
Tank Pit Observation Well 2 (OB2)	0.62	0.81

Apparent product thicknesses of approximately 200mm were observed within the tank pit observation wells. However, no separate phase product was reported outside the tank pit within either the shallow or deep monitoring wells.

It can be seen from the attached cross section that the water and product level within the tank pit is perched relative to the natural groundwater level outside the tank pit area.

Stormwater services (associated with the interceptor) in the vicinity tank pit are located at elevations close to or below the elevation of the product within the tank pit. However, no shallow groundwater or product was observed within the shallow basecourse fill or adjacent to these service lines.

Sampling of the deep groundwater monitoring well showed that groundwater yields were low with the well rapidly bailing dry. These observations are consistent with

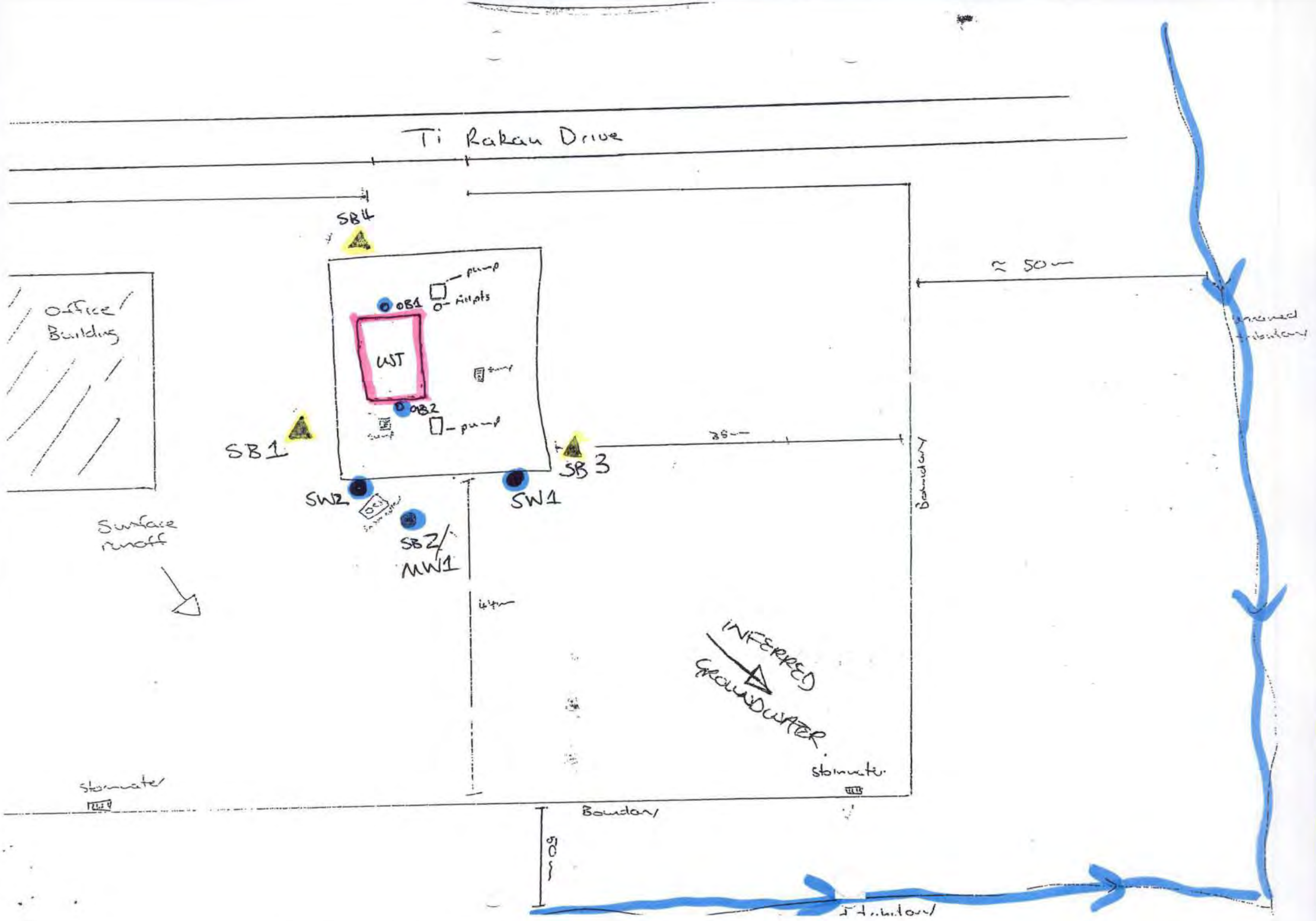
the predominantly very low permeability nature of the sediments surrounding the tank pit.

- The laboratory analytical results are attached, in summary:
  - All soil samples yielded TPH concentrations below the level of analytical detection.
  - The groundwater sample collected from the deep monitoring well yielded a low TPH concentration of 3.4 g/m^3. However, the low groundwater yield limited development of this well prior to sampling. Furthermore, these dissolved phase concentrations would be expected to be rapidly attenuated within the fine grained soils surrounding the tank pit.

3. Summary

In summary:

- Product and water appears to be perched and coutained within the tank pit as a result of the low permeabilities of the surrounding silt and clay soils.
- There is no evidence that hydrocarbon product has migrated within either the shallow granular basecourse fill materials or stormwater services.
- The soils adjacent to the tank pit have not been impacted by the presence of product in the tank pit;
- Low concentrations of dissolved phase contaminants were detected in groundwater adjacent to the tank pit, however these concentrations maybe an artefact of the limited development able to be achieved. Furthermore, the dissolved phase concentrations would be expected to be rapidly attenuated within the fine grained soils surrounding the tank pit.



Ti Rakau Drive
SB4
pump
OB1
fill pts
Office Building
UST
sump
OB2
pump
SB1
SB3
35m
≈ 50m
Boundary
SW2
SW1
SB2/
MW1
Surface runoff
44m
INFERRED
GROUNDWATER
stormwater
Stormwater
Boundary
50m

URS

Project Notes

Subject: Caltex : Howick & Eastern Buses

By: Date:

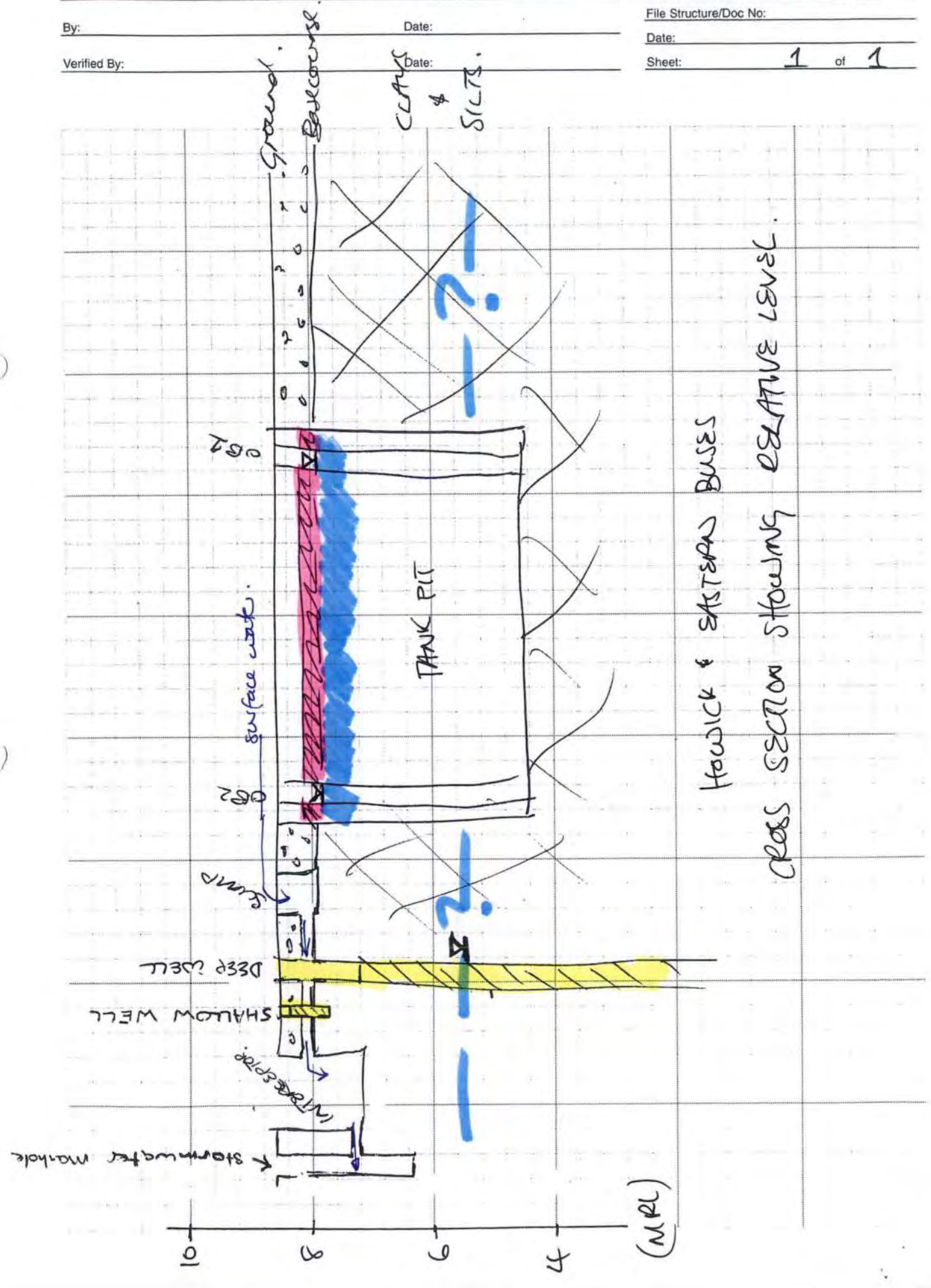
Verified By: Date:

Project/Task No: 48213-167

File Structure/Doc No:

Date:

Sheet: 1 of 1



Hill Laboratories

13 DEC 2002

R J Hill Laboratories Limited

Address:
1 Clyde Street,
Private Bag 3205,
Hamilton, New Zealand

Telephone:
+64 (7) 858-2000
Facsimile:
+64 (7) 858-2001

Email:
mail@hill-labs.co.nz
Internet:
www.hill-labs.co.nz

Client: *URS New Zealand Limited*
Address: *P O Box 821,*
AUCKLAND
Contact: *Stephen Thomson*

Laboratory No: *199087*
Date Registered: *4/12/2002*
Date Completed: *11/12/2002*
Page Number: *1 of 3*

Client's Reference: H&E Bus Depot

The results for the analyses you requested are as follows:

Sample Type: Environmental Solids, Soil

Sample Name	Lab No	Dry matter (g/100g as rcvd)
K852 29/11/02	199087/1	83.2
K856 29/11/02	199087/2	71.4
K863 29/11/02	199087/3	79.2
K865 29/11/02	199087/4	77.5
K858 29/11/02	199087/5	82.9
K860 29/11/02	199087/6	50.0
K868 2/12/02	199087/7	81.5
K869 2/12/02	199087/8	74.3

Total Hydrocarbons by GC-FID [OIEWG carbon bands]

Sample Name	K852 29/11/02	K856 29/11/02	K863 29/11/02	K865 29/11/02	K858 29/11/02
Lab No	199087/1	199087/2	199087/3	199087/4	199087/5
Units	(mg/kg dry wt)	(mg/kg dry wt)	(mg/kg dry wt)	(mg/kg dry wt)	(mg/kg dry wt)
C7-C9	< 5	< 6	< 5	< 5	< 5
C10-C14	< 10	< 10	< 9	< 10	< 9
C15-C36	< 20	< 20	< 20	< 20	< 20
TOTAL	< 30	< 40	< 30	< 30	< 30

Total Hydrocarbons by GC-FID [OIEWG carbon bands]

Sample Name	K860 29/11/02	K868 2/12/02	K869 2/12/02
Lab No	199087/6	199087/7	199087/8
Units	(mg/kg dry wt)	(mg/kg dry wt)	(mg/kg dry wt)
C7-C9	< 8	< 5	< 5
C10-C14	< 20	< 9	< 10
C15-C36	< 30	< 20	< 20
TOTAL	< 60	< 30	< 40

Sample Type: Water,

Total Hydrocarbons by GC-FID [OIEWG carbon bands]

Sample Name	K871 3/12/02
Lab No	199087/9
Units	(g.m-3)
C7-C9	< 0.03
C10-C14	0.36
C15-C36	3.1
TOTAL	3.4

Sample Containers

The following table shows the sample containers that were associated with this job.

Container Description	Container Size (mL)	Number of Containers
Glass Jar (Soils)	500	8
Glass, unpreserved for Organics (500 or 1,000 mL)	500	1

Details of sample bottle preparation procedures are available upon request.

Summary of Methods Used and Detection Limits

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 clean 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.

Substance Type: Environmental Solids

Parameter	Method Used	Detection Limit
Dry matter	Dried at 103°C, gravimetric (removes 3-5% more water than air dry)	0.1 g/100g as rcvd
Total Hydrocarbons by GC-FID [OIEWG carbon bands]	ASE or Sonication Extraction, GC-FID Quantitation US EPA 8015B/NZ OIEWG	N/A

Substance Type: Water

Parameter	Method Used	Detection Limit
Total Hydrocarbons by GC-FID [OIEWG carbon bands]	Solvent (hexane) extraction, GC-FID US EPA 8015B/NZ OIEWG	N/A

Analyst's Comments:

These samples were collected by yourselves and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the submitter.

T.J. Cooney

Peter Robinson, MSc(Hons), PhD FNZIC
Environmental Division Manager

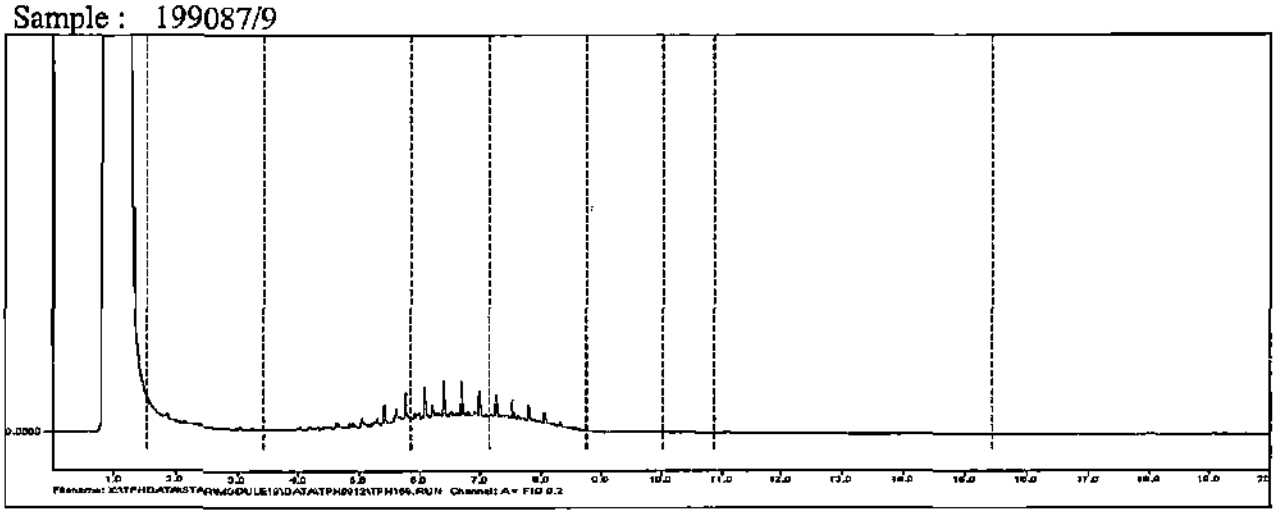
Terry Cooney, MSc(Hons), PhD MNZIC
General Manager

Hill Laboratories, Hamilton, NZ

Total Petroleum Hydrocarbon Chromatograms

Appendix

Sample : 199087/9



C7 C10 C15 C20 C25 C30 C34 C44

AECOM Imagine it. Delivered.

AMETI EASTERN BUSWAY 2 AND 3

DRAFT ENVIRONMENTAL ASSESSMENT (CONTAMINATION)

DOCUMENT NUMBER. AMETI-SD-RPT-ALL-163-0030-A

CONTRACT NO. 344-17-782-PS

Prepared for Auckland Transport | 15-Apr-2019

Auckland Transport
An Auckland Council Organisation

D R A F T

Draft Environmental Assessment (Contamination)

AMETI Eastern Busway 2 and 3 Design and Consenting

Client: Auckland Transport

Co No.: N/A

Prepared by

AECOM New Zealand Limited
8 Mahuhu Crescent, Auckland 1010, PO Box 4241, Auckland 1140, New Zealand
T +64 9 967 9200 F +64 9 967 9201 www.aecom.com

15-Apr-2019

Job No.: 60563280

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

D R A F T

Quality Information

Document Draft Environmental Assessment (Contamination)

Date 15-Apr-2019

Prepared by Matthew Hartley

Reviewed by Emma Trembath

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	15-Apr-2019	Draft For Client Review	Alan Lees Technical Director - Transportation	

D R A F T

Table of Contents

D R A F T

D R A F T

1.0 Introduction

1.1 Preface

AECOM New Zealand Limited (AECOM) has been engaged by Auckland Transport (AT) to complete an environmental assessment of contaminated land related aspects (gap analysis of existing Preliminary Site Investigation (PSI)) and Detailed Site Investigation (DSI) in support of the design for the proposed Auckland Manukau Eastern Transport Initiative (AMETI) Eastern Busway 2 (EB2) and 3 (EB3) packages (referenced in this report as the 'proposed transport improvement works area').

1.2 Summary of Proposed Development

The AMETI programme aims to improve transport for Auckland's eastern suburbs by 2025. The programme is divided into a number of packages and this report focuses on packages EB2 and EB3 (**Figure 1**). Refer to **Appendix A** for further figures outlining the development. In summary:

- Package EB2:
  - A bus station within the Pakuranga town centre.
  - A flyover from Pakuranga Road to the Pakuranga Highway following the alignment of the existing Reeves Road.
- Package EB3:
  - A dedicated busway running between the dual carriageways of Ti Rakau Drive through to the Te Koha intersection.
  - Ti Rakau Drive being widened to the south of the existing road through the mainly residential area north west of the Pakuranga Creek Bridge.
  - The replacement and widening of Ti Rakau Bridge.
  - Ti Rakau Drive being widened approximately evenly on both sides of the road through the mainly commercial area South-East of the Pakuranga Creek Bridge.
  - In addition to the above, it has been identified that Riverhills Park (located within the EB3 footprint) may be utilised as a potential temporary laydown area to facilitate the construction of both Package EB2 and EB3 and the replacement and widening of Ti Rakau Bridge.

1.3 Objective

The objectives of the environmental assessment (contaminated land) were the following:

- Provide an understanding of the nature and extent of the current and historical Hazardous Activities and Industries List (HAIL) landuse activities within the vicinity of the proposed transport improvement works area, including the temporary laydown area.
- Provide a conceptual site model (CSM) including an exposure pathway assessment.
- Understand potential contaminant conditions of spoil materials scheduled for land disturbance as part of the proposed transport improvement works.
- Confirm contaminated land resource consent requirements under the following legislation:
  - Auckland Unitary Plan Operative in part (AUPOIP).
  - Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations, 2011 (NES Soil).
- Provide waste spoil classification advice for spoil materials to be disposed of off-site as part of the proposed transport improvement works.

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1.4 Scope of Work

In order to meet the objective, the following scope of works was completed:

- Data Gap Review:
  - Review of the Phase 1 PSI for the Pakuranga Scheme Assessment of the Auckland Manukau Eastern Transport Initiative (AMETI) Alignment, prepared by GHD Limited (GHD), dated 7 December 2012.
  - Identification of data gaps (related to contaminated land aspects) considered pertinent to the proposed transport improvement works.
  - Review of the following data sources for the period between the issue of the GHD PSI report (December 2012) and the present day (August 2018):
    - Publicly available historical aerial photographs.
    - Auckland Council (AC) contaminated land enquiry.
- Intrusive Investigation:
  - Collection of environmental soil samples from six boreholes (advanced for geotechnical purposes) along the length of the proposed transport improvement works area.
  - Advancement of 21 environmental hand augers and collection of soil samples along the length of the proposed transport improvement works area.
  - Advancement of 12 environmental hand augers and collection of soil samples within in the proposed temporary laydown area.
  - Collection of environmental sediment samples at two locations adjacent to the Tamaki River.
  - Analysis of selected soil samples for a range of potential contaminants of concern including:
    - Heavy metals,
    - Total petroleum hydrocarbons (TPH),
    - Volatile organic compounds (VOCs),
    - Semi-volatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs) and pesticides,
    - Pentachlorophenol (PCP), and
    - Asbestos containing materials (ACM).
- Preparation of this environmental assessment report including:
  - Comparison of soil and sediment analytical results against relevant human health and environmental guideline criteria.
  - Identification of preliminary contaminated land resource consent requirements.
  - Provision of soil classification advice with respect to reuse or disposal.

1.5 Project Exclusions

It is acknowledged that a number of residential homes and commercial buildings, including service stations, will need to be demolished and removed in order for the EB2 and EB3 works programme to progress. Full hazardous materials surveys will need to be completed, with potential risks mitigated (i.e., removal of asbestos, decommissioning of underground storage tanks), prior to the commencement of the physical works programme. Further commentary on this matter is outside of the scope of this report.

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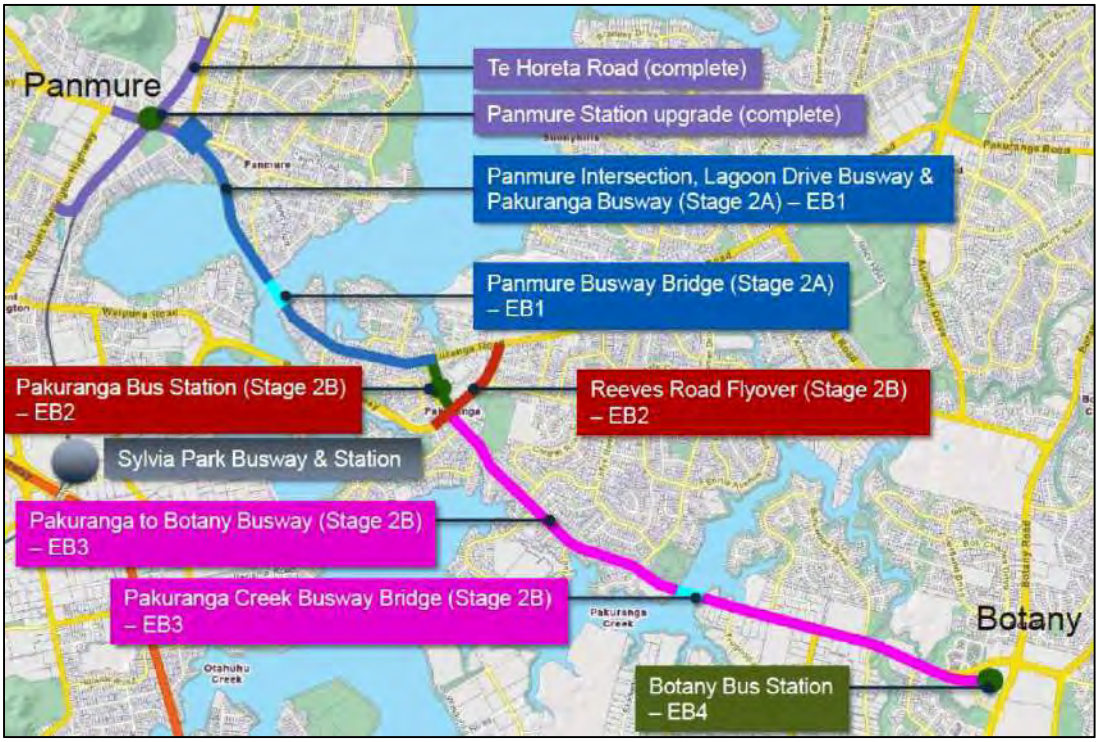
Figure 1 AMETI Stage 2B Location (sourced from tender documents)



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2.0 Site and Environmental Setting

2.1 Site Description

Figure 1 presents an overview of the extent of EB2 and EB3. In summary:

- Package EB2:
  - The proposed location of the Pakuranga Bus Station is on Ti Rakau Drive near Pakuranga Town Centre. The area is generally level.
  - The proposed Reeves Road Flyover runs from Pakuranga Highway in the west across Ti Rakau Drive, along Reeves Road adjacent to William Roberts Road and joins Pakuranga Road to the north. The ground rises gently from Reeves Rd to Pakuranga Rd in the north through residential properties.
- Package EB3:
  - The proposed Pakuranga to Botany Busway runs along Ti Rakau Drive from the Mattson Road intersection to Te Irirangi Drive and includes the replacement and widening of Ti Rakau Bridge.
  - The road is generally level from Pakuranga Rd to Huntington Drive near the eastern end of the project where the alignment dips gently into two creek crossings. There are mangroves along the edge of Pakuranga Creek and its tributaries. Landuse is residential housing and open ground to Pakuranga Creek then commercial property to the end of the busway.
  - A temporary laydown area for the proposed works is located at Riverhills Park, situated on the corner of Ti Rakau Drive and Gossamer Drive; adjacent to the Ti Rakau Drive bridge. The majority of the area is an open grassed area currently used as recreational sports fields (soccer). The park is relatively flat, the carpark and ground on the western edge of the reserve risesgradually to meet Gossamer Drive. The ground drops down from the edge of the playing fields on the eastern side approximately 10 meters (m) to Pakuranga Creek..

2.2 Environmental Setting

2.2.1 Geology

The published geological map of the area (Kermode, 1992), illustrates that the proposed transport improvement works area is underlain by seven mapped geological strata (refer **Figure 2**). A summary of the geological strata mapped along the routes is presented in **Table 1**. Refer to the first column of **Table 1** below for descriptions of mapped strata.

2.2.2 Hydrogeology

Beca Limited (Beca) reported on groundwater levels across the proposed transport improvement area for the months of July and August 2014. It was noted that groundwater was generally encountered between 2 m to 3 m below ground level (bgl).

GHD further noted that the entire transport improvement works area was underlain by a relatively shallow groundwater table (< 5 m bgl) that appeared to be generally consistent with topography (GHD, 2012). Given the proximity to coastal areas, regional groundwater flow is anticipated to be in a generally north, north east and north west direction towards the inner Waitemata Harbour. Localised groundwater flows will also be expected towards the Tamaki Basin, Tamaki River, and the Pakuranga Creek. Groundwater was encountered environmental assessment.

Groundwater was recorded at depths ranging from 0.7 to 3.3. m bgl as part of the AECOM environmental assessment (refer **Section 6**).

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2.2.3 Ecology

The following potentially sensitive ecological receptors have been identified along the length of the proposed transport improvement works area:

- The Tamaki River within the vicinity of Ti Rakau Bridge and Riverhills Park
- A stream/creek to the north of the fuel service station at 386 Ti Rakau Drive.

Figure 2 Geological Map Extract 1:50,000 (Kermode, 1992)

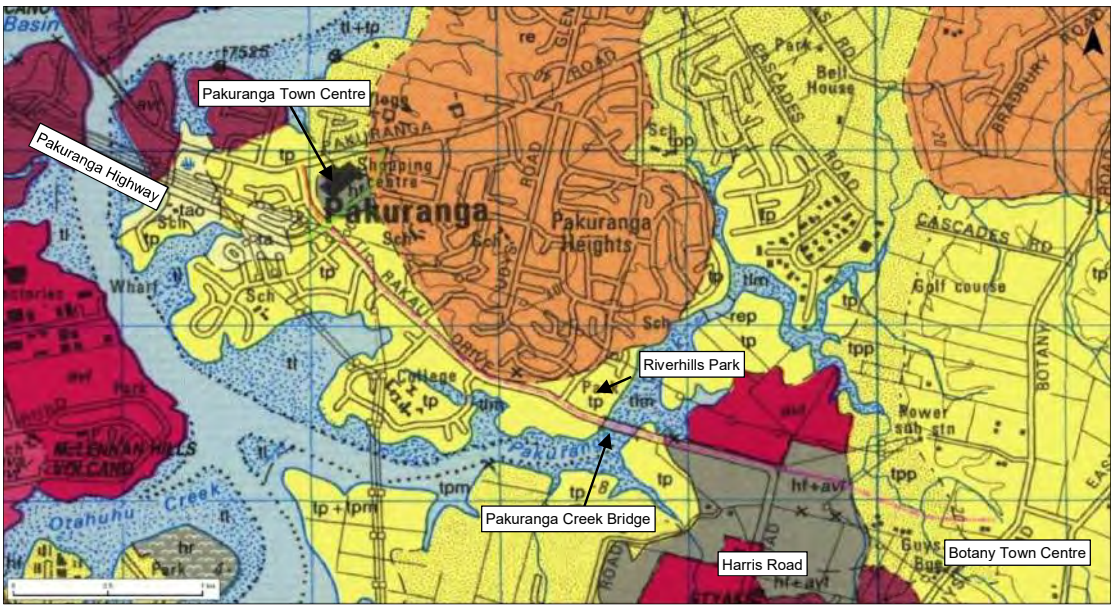

Table 1 Mapped Geological Strata Summary

Strata Map Code	Strata Name	Strata Description	Approximate Locations
hf+avl	Construction Fill & Basalt Lava	Construction fill: re-compacted clay to gravel sized materials may include demolition debris. Basalt lava: grey, dense, fine grained lava	Ti Rakau Drive between Trugood Drive and Greenmount Drive, and around Pakuranga Town Centre
tlm	Intertidal Mud	Grey to black, indistinctly bedded	Beneath Pakuranga Creek Bridge
ta	Undifferentiated Alluvium	Mud, sand and gravel	Pakuranga Highway
avl	Basalt & Basanite Lava	Grey, dense, fine grained lava	North of Ti Rakau Drive between Burswood Drive and Harris Road
tp	Puketoka Formation	Pumiceous deposits: light grey to orange brown, pumiceous mud, sand and gravel with black muddy peat lignite	Pakuranga Highway, southern end of Reeves Road, Ti Rakau Drive between Pakuranga Town Centre and Trugood Drive
tpp	Puketoka Formation	Rhyolite pumice: light grey, massive to finely laminated, mud to sand sized pumice, includes non-welded ignimbrite, tephra and alluvial pumice deposits	Ti Rakau Drive between Greenmount Drive and Botany Town Centre
re	East Coast Bays Formation	Greenish grey, alternating muddy sandstone and mudstone with occasional interbedded lenses of grit	Pakuranga Heights, northern end of William Roberts Road

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3.0 Gap Analysis

As part of the gap analysis a review of the GHD PSI was completed. The review was undertaken for the purposes of identifying data gaps (related to contaminated land aspects) considered pertinent to the proposed transport improvement works.

3.1 Summary Review

3.1.1 Background

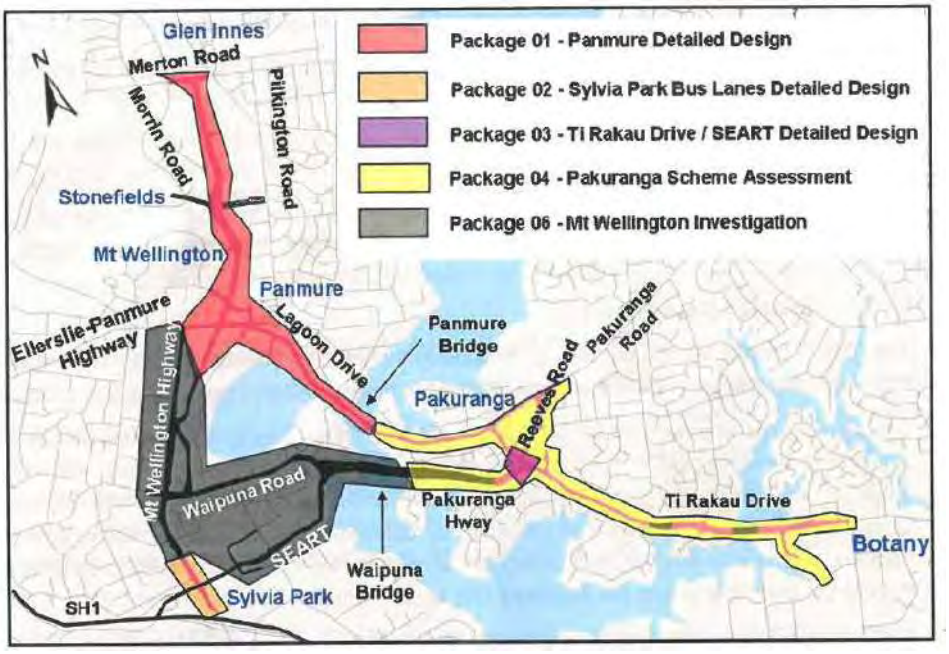
GHD completed a PSI (2012) in support of the proposed Package 4 portion (running between Pakuranga and Botany) of the AMETI Alignment (detailed on **Figure 3**, hereinafter referred to in this section as 'the alignment').

The Package 4 Scheme Assessment is noted to comprise five segments, and these are summarised in **Table 2**Error! Reference source not found.. The entire Package 4 Scheme (including each of the five segments) forms the subject of the GHD PSI and encompasses packages EB2 and EB3 (which are the focus of this environmental assessment). The review of the GHD PSI indicates that Package 4 appears to generally align with packages EB2 and EB3 of the current AMETI programme.

Table 2 Package 4 Scheme Assessment

Segment	Description
One	Pakuranga Road between the eastern abutment of the Panmure Bridge and Ti Rakau Drive.
Two	Pakuranga Town Centre and immediate surrounding corridors. These include Pakuranga Road, between Ti Rakau Drive (including the Pakuranga Road intersection) and St Kentigerns signalised entrance; Ti Rakau Drive, between Pakuranga Road and Reeves Road (including the Reeves Road intersection); and Reeves Road, between William Roberts Road and Ti Rakau Drive.
Three	Ti Rakau Drive between Reeves Road and Gossamer Drive.
Four	Ti Rakau Drive between Gossamer Drive and Greenmount Drive.
Five	Ti Rakau Drive between Greenmount Drive and Botany Road.

Figure 3 AMETI Alignment Entire Scheme Assessment



Source: GHD, 2012.

3.1.2 Purpose

The GHD PSI was undertaken to support AT in meeting the requirements of the NES Soil. The NES Soil applies to any site where a potentially hazardous activity or industry (historically or current) is identified on the HAIL. As such, the objective of the GHD PSI was to assess the likelihood of the presence of soil contamination resulting from historic and/or current landuse activity within or adjacent to the alignment.

3.1.3 Scope

The GHD PSI comprised a review of information from the following sources:

- Draft alignment plans as of October 2012 developed by GHD/Aurecon.
- Publicly available historical aerial photographs from 1940 to 2010.
- Collection of photographs as part of a walkover.
- AC contaminated sites register.
- AC groundwater borehole register.
- Readily available site investigation reports resulting from site register search.
- Walkover inspection conducted on 26 September 2012.
- Readily available geology and hydrogeology information.
- Determination of surrounding landuses to assess potential environmental impacts from off-site sources.
- Identification of potential contaminants of concern.
- Publicly available information on the environmental fate of contaminants.
- Identification of sensitive human and/or environmental receptors.

3.1.4 Key Findings and Conclusions

The key findings and conclusions of the GHD PSI were as follows:

- Along the length of the alignment there are a number of geological units present with the most prominent being rhyolitic pumiceous deposits of the Tauranga Group.
- Engineered construction fill (likely comprising re-compacted clay/gravel and may include construction and demolition wastes) is noted to a large complex between Ti Rakau Drive and Pakuranga Road. Construction fill is also noted as a geological component to the industrial zone between Trugood Drive and Burswood Drive.
- A site contamination enquiry was completed seeking records from AC. A number of items were identified including pollution incidents, records of discharge consents, submittal of a tank pull report, submittal of two environmental site assessment (ESA) reports for service station facilities, and borehole installation records for environmental monitoring or investigation purposes at three sites (two service stations and one chemical supplier facility). The report notes that the two ESA reports were requested from AC but one was still outstanding at the time that the GHD PSI report was issued.
- A walkover identified no sensitive receptors in close proximity to the proposed transport improvement works area with the exception of the tributary of the Pakuranga Creek flowing at the back of the fuel service station located at 386 Ti Rakau Drive.
- Adjacent to the alignment up to twenty sites with landuses included on the HAIL were identified. It was stated that, given surface soils will be disturbed along the alignment corridor through significant soil disturbance the regulations of the NES Soil apply on the basis of HAIL category H adjacent sites. Category H is defined as ‘any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment’. The identified HAIL sites are detailed in **Table 3**.

The report recommended that the following are considered to minimise risks associated with contaminated land along the alignment:

- Obtain environmental site investigation reports from AC.
- Engage with AC contaminated site officers to present the planned strategy to assess potential contamination from adjacent sites.
- Undertake intrusive soil investigations to assess potential contamination along the project route, at locations where the adjacent landuse has been identified as having current or historic HAIL activities and where the likelihood of contamination has been assessed as medium to high.

Table 3 Summary of Identified HAIL Sites (GHD, 2012)

Site Name	Landuse Activity	HAIL Category
11 Cortina Place / 64B Ti Rakau Drive	Former Caltex branded service station, now a vacant site	F7 – Service stations including retail or commercial refuelling activities
Aylesbury Street, Pakuranga Town Centre	New Zealand Dry Cleaners	A5 – Dry-cleaning plants including dry-cleaning premises or the bulk storage of dry cleaning solvents
12 Cortina Place	Pakuranga Panel Beaters	F4 – Motor vehicle workshops
16 Cortina Place	Pakuranga Automotive	F4 – Motor vehicle workshops
16D Cortina Place	Pakuranga Auto Transport	F4 – Motor vehicle workshops
3 Reeves Road	Gull branded service station	F7 – Service stations including retail or commercial refuelling activities
242 Ti Rakau Drive	Mobil branded service station	F7 – Service stations including retail or commercial refuelling activities
269 Ti Rakau Drive	Sandvik Materials Technology (metal supplier/fabrication)	D5 – Engineering workshops with metal fabrication
279 Ti Rakau Drive	Former Timber Storage Yard	A18 – Wood treatment or preservation including the commercial use of anti-sapstain chemicals during milling, or bulk storage of treated timber outside
Corner Ti Rakau Drive and Burswood Drive	Z branded service station	F7 – Service stations including retail or commercial refuelling activities
179D Harris Road	Jireh Auto Tyres	F4 – Motor vehicle workshops
Corner Ti Rakau Drive and Harris Road	BP branded service station	F7 – Service stations including retail or commercial refuelling activities
293 Ti Rakau Drive	Forging Ahead (Foundry)	D2 – Foundry operations including the commercial production of metal products by injecting or pouring molten metal into moulds
333 Ti Rakau Drive	Blue n Green Dry Cleaners	A5 – Dry-cleaning plants including dry-cleaning premises or the bulk storage of dry cleaning solvents
380 Ti Rakau Drive	Howick and Eastern Bus Depot	F8 – Transport depots or yards including areas used for refuelling or the bulk storage of hazardous substances
386 Ti Rakau Drive	Gull branded service station	F7 – Service stations including retail or commercial refuelling

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Site Name	Landuse Activity	HAIL Category
		activities
550 T Irirangi Drive	Z branded service station	F7 – Service stations including retail or commercial refuelling activities

3.2 Data Gap Summary

At the time of issue and given the associated status of the AMETI scheme at the time, the GHD PSI report would have been considered generally sufficient for the purposes of supporting the proposed transport improvement works. However, it is noted that the identified HAIL sites (**Table 3**) are outside of the current proposed transport improvement works area. Given that only shallow soils (i.e. up to 0.5 m bgl) are likely to disturbed as part of the current proposed works, the HAIL sites are not considered relevant as it is unlikely that they have contributed to the migration of hazardous substances in a sufficient quantity in shallow soils that could result in a risk to human health or the environment.

Even so, given the passage of time since the development of the GHD PSI report (almost six years), and the progression of the planning/design of the overall AMETI scheme, it is considered that there is scope for data gaps to exist with respect to understanding of potential risks associated with contaminated land.

To address the existence of potential data gaps the following sources were selected to be reviewed to specifically address the period between the issue of the GHD PSI report (December 2012) and the present day (August 2018):

- Publicly available historical and current aerial photographs.
- AC contaminated site enquiry.

A summary review of each of the above data sources is provided in **Section 4**.

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4.0 Data Source Review

4.1 Aerial Photographs

Historical and current aerial photographs were obtained through the AC Geomaps online portal, the Retrolens online portal and Google Maps/Streetview 2018 imagery. In addition to covering the identified data gap period (December 2012 to present day) a review of aerial photographs was undertaken for the period 1939 through to the present day. This allowed for the determination of landuse changes and the identification of any pertinent items that have become apparent since December 2012 but also to allow for the identification of any pertinent landuses that may have been omitted during the development of the GHD PSI. The aerial photographs are included in **Appendix B**.

In addition to items identified by the GHD PSI the review of aerial photographs highlighted the following key items:

- On the 1968 aerial photograph there are buildings present to the south west of Ti Rakau Drive at the junction of the current Highway 10. A number of these buildings are no longer present on the 1972 aerial photograph as infilling of the current Highway 10 location to the south west of Ti Rakau Drive is evident.
- The 1980 aerial photograph records Highway 10 having been constructed.
- The site at 64B Ti Rakau Drive is noted as a former Caltex branded service station and 'vacant' in the GHD PSI. The site has been redeveloped and is now occupied by the 'Pakuranga Medical Centre' which comprises of a two-storey building and associated car park.
- The BP branded service station on the corner of Ti Rakau Drive and Harris Road (as noted in the GHD PSI) is now a car showroom and sales centre.
- Blue n Green Dry Cleaners noted as located at 333 Ti Rakau Drive in the GHD PSI appears to be currently located at 317 Ti Rakau Drive.
- Two reclaimed inlets of the Tamaki River were infilled between 1959 and 1996 (to form Riverhills Park).

4.2 Auckland Council Contaminated Site Enquiry

The AC contaminated site enquiry gathers information from the former Auckland Regional Council (ARC) records system and information currently held by the AC Natural Resources and Specialist Input Unit. Records include closed landfills, bores, air discharge, industrial and trade process consents, contaminated site discharge consents, and environmental assessments within approximately 200 m either side of the proposed transport improvement works area. A copy of the report (for the period 2012 to present day) is provided in **Appendix C**.

The report identified the following:

- There are three closed landfill sites within the vicinity of the Site which are noted as being located at Riverhills Park, Ti Rakau Park and Dale Crescent.
- Records of two discharge consents for the site at 11 Cortina Place/64B Ti Rakau Drive for a former petrol filling station. The consents relate to closure of the site and discharge to land and water from remediation of contaminated land, and are dated April 2011 and March 2016, respectively.
- Five sites identified as included on the HAIL for what appears to be reasons of contamination. Four of the sites appear to be aligned to the locations of the three closed landfills detailed above with the fifth location recorded as a site approximately 125 m to the south west of Ti Rakau Drive.

5.0 Intrusive Works Methodology

5.1 Areas of Potential Concern and Investigation Rationale

The review of the GHD PSI and current/more recent historical information, along with the proposed transport improvement activities has highlighted the following:

- An activity or industry included on the HAIL has more likely than not (historical), and is not currently being undertaken along the length of the proposed transport improvement works area.
- Soil disturbance activities (albeit shallow) are anticipated as part of the proposed works. As such there is a need to understand potential soil contaminant conditions where soil disturbance works are anticipated.
- Sediment disturbance activities are anticipated as part of the proposed works. As such there is a need to understand potential sediment contaminant conditions where soil disturbance works are anticipated.

Based on the above, the AECOM environmental assessment focussed on the collection of soil and sediment samples for laboratory analysis from materials within anticipated areas of soil disturbance.

5.2 Environmental Soil and Sediment Sampling

Table 4 presents a summary of the works completed between April and August 2019 and in February 2019. Investigation locations are presented on **Figure 4** in **Appendix A**.

Table 4 Summary of Field Methodologies

Scope of Works Completed	Methodology
Service Mark-out	• Prior to mobilising, before you dig searches of relevant services were conducted by AECOM staff and locations were chosen to avoid these services. • Onsite service location was carried out by Underground Service Locators (USL) under AECOM supervision, using a ground penetrating radar (GPR) and cable avoidance tool (CAT) scanner. • Once excavation locations had been cleared by USL approval for breaking ground was cleared by an AECOM service identification and clearance (SIC) approver in discussion with the AECOM site supervisor.
Borehole advancement	• Six boreholes (locations DH102 to DH104 and DH107 to DH109) advanced as part of the AECOM geotechnical investigation. Initial progression (as part of service clearance requirements) utilised hydrovac excavation processes to depths of up to 2 m bgl. Environmental sampling was conducted during this process.
Hand auger advancement	• 21 hand augured boreholes (locations EHA101 to EHA108 and EHA111 to EHA123) were advanced for the purposes of environmental sampling to depths of up to 3.4 m bgl along EB2 and EB3. • 12 hand augured boreholes (locations HA1 to HA12) were advanced or environmental sampling to depths of up to 5 m bgl within Riverhills Park.
Soil and sediment sample collection	• During the advancement of the boreholes and hand augers, 135 soil samples were collected for potential laboratory analysis. • Field screening of select soil samples was completed with a photoionisation detector (PID) for VOCs. • Collection of two sediment samples adjacent to Ti Rakau Bridge. • Samples were placed directly into laboratory supplied containers and stored on ice in a chilled container while onsite and during transit to either Hill Laboratories Limited (Hills) or Analytica Laboratories Limited (Analytica). • Samples were transported to the laboratories under standard AECOM chain of custody (CoC) procedures. • To prevent cross contamination, a new pair of disposable nitrile gloves was used for each soil sample collected and the hand auger was decontaminated between each sample and between boreholes using a three-step process involving Decon90 and

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Scope of Works Completed	Methodology
	potable water. • Selected soil samples were analysed for a range of potential contaminants as detailed in **Table 5**. • The two sediment samples were analysed for heavy metals, TPH, PAHs and asbestos. • Spoil generated during the advancement of the works was reinstated at the completion of soil sampling.

Table 5 Soil Sample Analysis

Analyte	No. of Samples Analysed
Heavy Metals	52
Total Petroleum Hydrocarbons (TPH)	22
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)	10
Polycyclic Aromatic Hydrocarbons (PAH) (other than as part of the SVOC suite)	10
Volatile Organic Compounds (VOC)	11
Semi-Volatile Organic Compounds (SVOC)	11
Pentachlorophenol (PCP)	1
Pesticides (other than as part of the SVOC suite)	3
Asbestos (screen for presence/absence of fibres)	16

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6.0 Intrusive Works Results

6.1 Field Observations

Key observations recorded as part of the environmental assessment are summarised below, with copies of borehole logs DH102 to DH109, EHA101 to EHA108, EHA111 to EHA123 and HA1 to HA12 provided in **Appendix D**. In summary:

- Aside from two investigation locations (DH108 and EHA101), where a gravel surface was present, observed surface coverings at the investigation locations comprised topsoil (generally comprising brown sandy silt).
- Fill (generally comprising reworked material) was encountered at the majority of locations (to a maximum depth of 3 m bgl). The exceptions to this were in the vicinity of the Pakuranga Highway/Ti Rakau Drive junction, adjacent to Ti Rakau Drive between Roseburn Place and Edgewater Drive, and adjacent to 279 Ti Rakau Drive, where clayey silt was recorded.
- At depth, silt (with varying components of sand and clay) was recorded at all investigation locations.
- No significant visual or olfactory evidence of contamination was recorded as part of this investigation.
- No refuse was observed in boreholes advanced across Riverhills Park.
- Groundwater was encountered in approximately half of the investigation locations. Groundwater was recorded at depths ranging from 0.7 to 3.3. m bgl. Refer to **Table 6** for a summary.
- Sediment samples collected from the Tamaki Strait adjacent to Ti Rakau Bridge comprised saturated brown/grey silty clay including the presence of rootlets.

Table 6 Summary of Groundwater Level Recordings

Environmental Assessment Location	Date Advanced	Recorded Groundwater Depth (metres below ground level)	Total Depth of Borehole (metres below ground level)
DH102	May 2018	2.2	2.2
DH103	May 2018	Not observed	2.0
DH104	May 2018	1.6	1.6
DH107	May 2018	Not observed	2.0
DH108	May 2018	Not observed	3.4
DH109	May 2018	Not observed	2.0
EHA101	August 2018	0.7	1.5
EHA102	August 2018	1.7	2.0
EHA103	August 2018	1.8	2.0
EHA104	August 2018	1.0	2.0
EHA105	August 2018	1.3	2.0
EHA106	August 2018	Not observed	2.8
EHA107	August 2018	1.6	2.0
EHA108	August 2018	3.3	3.4
EHA110	August 2018	1.9	2.0
EHA111	August 2018	Not observed	2.0
EHA112	August 2018	1.2	3.0

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Environmental Assessment Location	Date Advanced	Recorded Groundwater Depth (metres below ground level)	Total Depth of Borehole (metres below ground level)
EHA113	August 2018	Not observed	2.0
EHA114	August 2018	Not observed	1.6
EHA115	August 2018	Not observed	0.7
EHA116	August 2018	1.0	2.0
EHA117	August 2018	Not observed	2.8
EHA118	August 2018	Not observed	2.5
EHA119	August 2018	1.2	3.0
EHA120	August 2018	Not observed	2.0
EHA121	August 2018	Not observed	2.0
EHA122	August 2018	Not observed	1.5
EHA123	August 2018	1.2	2.0
HA1	February 2019	Not observed	3.0
HA2	February 2019	2.6	4.5
HA3	February 2019	Not observed	3.0
HA4	February 2019	Not observed	4.1
HA5	February 2019	2.1	3.0
HA6	February 2019	1.4	3.0
HA7	February 2019	Not observed	3.0
HA8	February 2019	2.5	3.0
HA9	February 2019	Not observed	3.0
HA10	February 2019	2.6	5.0
HA11	February 2019	2.5	4.2
HA12	February 2019	2.5	3.0

6.2 Adopted Acceptance Criteria

The adopted acceptance criteria for soil quality results have been adopted in accordance with the hierarchy defined by Ministry for the Environment Contaminated Land Management Guidelines No.2 (MfE, 2003, revised 2011) and are summarised below:

- Soil:
  - Resource Management Act (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations, 2011. Soil contaminant standards for commercial / industrial outdoor worker (unpaved) landuse scenario have been adopted allowing for exposure of workers during any ground disturbance activities associated with the proposed development. Hereinafter referred to as the **NES SCS**.
  - Auckland Council, 2017. Auckland Unitary Plan (Operative in Part) (AUPOiP). Reference Table E30.6.1.4.1 Permitted Activity Soil Acceptance Criteria. Hereinafter referred to as the **AC Permitted Activity Criteria**.
  - Auckland Council, 2017. AUPOiP. Reference Table E30.6.1.4.2 Background ranges of trace elements in Auckland soils sources from Table 3 of TP153:2001 Background Concentrations of Inorganic Elements in Soils from the Auckland Region. Background ranges for naturally

occurring heavy metal concentrations in non-volcanic range soils were adopted. Hereinafter referred to as the **Auckland Background Concentrations**.

- MfE, 1999 (revised 2011). Guidelines for Assessing and Managing Petroleum Hydrocarbon contaminated Sites in New Zealand. Tier 1 soil acceptance criteria for petroleum hydrocarbon concentrations in soil under a commercial / industrial outdoor worker (unpaved) landuse scenario. Hereinafter referred to as the **Oil Industry Guidelines**.

- Sediment:
  - Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (updated 2018): Revised toxicant default guideline values for sediment quality (Table 1). Hereinafter referred to as the **Sediment Quality Guidelines (SQG) - Default Guideline Values (DGV) and Upper Guideline Values (UGV)**.

6.3 Analytical Results

Analytical results for heavy metals in shallow soils and the sediment sample results are summarised in **Table G1** and **Table G2** in **Appendix G**. TPH, BTEX, VOCs, SVOCs, PCP, pesticides and asbestos are not summarised in the tables as these analytes were not detected above the method detection limited (MDL) during laboratory analysis, or were only recorded at trace levels in a minimal number of locations. Full results however, are presented in the associate laboratory certificates (**Appendix H**). Key findings of the analysis of soil materials are summarised as follows:

- No exceedances of the NES SCS or AC Permitted Activity Criteria were recorded.
- A number of heavy metals were detected at concentrations exceeding Auckland Background Concentrations. A summary of these results is provided in **Table 7**.
- The presence of asbestos was not detected in any of the samples analysed.
- Organic compounds were only recorded at a concentration which exceeded the MDL in two of 62 samples analysed as part of this investigation.
  - One soil sample collected from 0.5 m bgl in EHA106 recorded a benzo(a)pyrene (BaP) toxic equivalency (TEQ) of 7.7 mg/kg. The recorded concentration did not exceed the adopted acceptance criteria.
  - One soil sample collected from 0.2 m bgl in HA9 recorded a minor detection of TPH of 62 mg/kg. The recorded concentration did not exceed the adopted acceptance criteria.
- One sediment sample (SEDIMENT 01) recorded lead, nickel and zinc at concentrations which marginally exceeded the SQG DGV whilst the other sediment sample (SEDIMENT 02) recorded zinc at concentrations which marginally exceeding the SQG DGV. Sediment sample SEDIMENT 01 also recorded TPH concentrations which marginally exceeded the SQG UGV.

Table 7 Summary of Heavy Metals Results and Auckland Background Concentrations

Analyte	No. of Samples Analysed	Auckland Background Concentration (Non-Volcanic Range) (mg/kg)	Recorded Concentration (mg/kg)			Number of Exceedances
			Minimum	Maximum	Average	
Arsenic	52	0.4 – 12	<2	6.48	2.57	0
Cadmium		<0.1 – 0.65	<0.10	0.6	0.06	0
Chromium		2 – 55	3.0	51.0	25.5	0
Copper		1 – 45	3.0	50.0	10.63	1
Lead		<5 – 65	4.8	103.0	14.11	2
Nickel		0.9 – 35	4.0	61.0	16.90	4
Zinc		9 – 180	5	157	32.24	0

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6.4 Quality Assurance and Quality Control

Refer to **Appendix E** for a summary of QA/QC procedures. The QA/QC procedures employed indicate that the reported analytical results are representative of shallow soil conditions at the sample locations and that the overall quality of the analytical data produced is acceptably reliable for the purpose of this investigation.

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7.0 Discussion

7.1 Conceptual Site Model

Based on the results of the investigation a basic CSM has been developed for the completion of land disturbance activities within the proposed transport improvement works area. In summary:

- The review of available information indicates that a HAIL activity or industry has more likely than not (historical), and is not currently being undertaken within the piece of land covered by this assessment (i.e., the proposed transport improvement works area).
- A soil sampling exercise was completed to provide a preliminary understanding of contaminant conditions along the length of the proposed transport improvement works area including the proposed temporary laydown area.
- Observed shallow soil conditions generally comprised fill (largely reworked material) at the majority of locations (to a maximum depth of 3 m bgl). The exceptions to this were in the vicinity of the Pakuranga Highway/Ti Rakau Drive junction, adjacent to Ti Rakau Drive between Roseburn Place and Edgewater Drive, and adjacent to 279 Ti Rakau Drive, where clayey silt was recorded. At depth, silt (with varying components of sand and clay) was recorded at all investigation locations.
- The results of the soil sampling programme completed as part of this assessment indicate that the disturbance of soil and sediment materials within the proposed transport improvement works area are unlikely to present a risk to human health or the environment during the works programme. No exposure pathways are considered to be complete. Importantly:
  - No exceedances of the NES SCS or AC Permitted Activity Criteria were recorded.
  - The presence of ACM was not detected in any of the samples analysed.

7.2 Regulatory Assessment (Contaminated Land)

7.2.1 National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES)

This assessment concludes that the NES Soil does not apply (Regulation 5[9]) to land disturbance within the proposed transport improvement works area. No HAIL activities undertaken adjacent to or within the piece of land covered by this assessment have impacted soil quality within the proposed land disturbance areas in a sufficient quantity that could result in a risk to human health or the environment.

7.2.2 Auckland Unitary Plan Operative in Part (AUPOiP)

This assessment concludes that the proposal meets the requirements of Permitted Activity Standard E30.6.1.4 and consent is not required. The results of the DSI have indicated that the concentration of contaminants in soil do not exceed the Permitted Activity Criteria.

7.3 Spoil Reuse and Disposal Recommendations

Spoil materials generated as part of land disturbance activities can be reused as required. However, it is anticipated that soil will need to be removed from the transport improvement works area. This soil should be disposed of at a licensed facility. With the contaminant concentrations detected being generally low, the soil could potentially be disposed of as cleanfill or managed fill; subject to meeting the disposal facility's consented waste acceptance criteria.

7.4 Site Management Planning

Although the potential risk of encountering significantly impacted soil materials during the proposed transport improvement works is considered low, it is appropriate that a Site Management Plan (SMP) be provided to the Contractor engaged to complete the physical works programme. The intent of this plan would be to provide guidance and procedures should unexpected soil contamination be encountered.

D R A F T

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Appendix A

Figures

ISO A3 297mm x 420mm

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Map features depicted in terms of NZTM 2000 projection.

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Checked	CS	Date	16/10/2018
Designed	SS	Date	16/10/2018
Drawn	SS	Date	16/10/2018

ISSUE/REVISION

Rev	Date	Description
A	16/10/2018	DRAFT

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FIGURE 4A

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Drawn	SS	Date	16/10/2018

ISSUE/REVISION

Rev	Date	Description
A	16/10/2018	DRAFT

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FIGURE 4B

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Designed	SS	Date	16/10/2018
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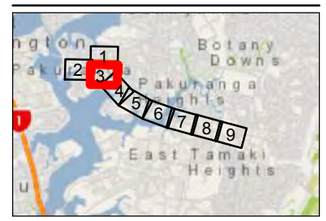

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FIGURE 4C

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Checked	CS	Date	16/10/2018
Designed	SS	Date	16/10/2018
Drawn	SS	Date	16/10/2018

ISSUE/REVISION

Rev	Date	Description
A	16/10/2018	DRAFT

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FIGURE 4D

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Checked	CS	Date	16/10/2018
Designed	SS	Date	16/10/2018
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A	16/10/2018	DRAFT

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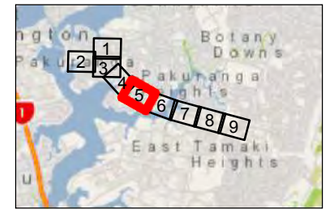

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FIGURE 4E

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Approved	ET	Date	20/03/2019
Checked	CS	Date	20/03/2019
Designed	SS	Date	20/03/2019
Drawn	SS	Date	20/03/2019

ISSUE/REVISION

Rev	Date	Description
A	20/03/2019	DRAFT

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FIGURE 4F

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Checked	CS	Date	16/10/2018
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A	16/10/2018	DRAFT

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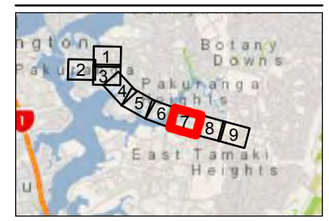

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FIGURE 4G

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Checked	CS	Date	16/10/2018
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Drawn	SS	Date	16/10/2018

ISSUE/REVISION

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FIGURE 4H

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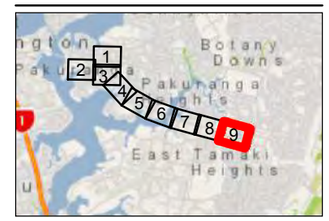

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FIGURE 4I

Appendix B

Aerial Photographs

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Appendix B Aerial Photographs

Package EB2 and EB3

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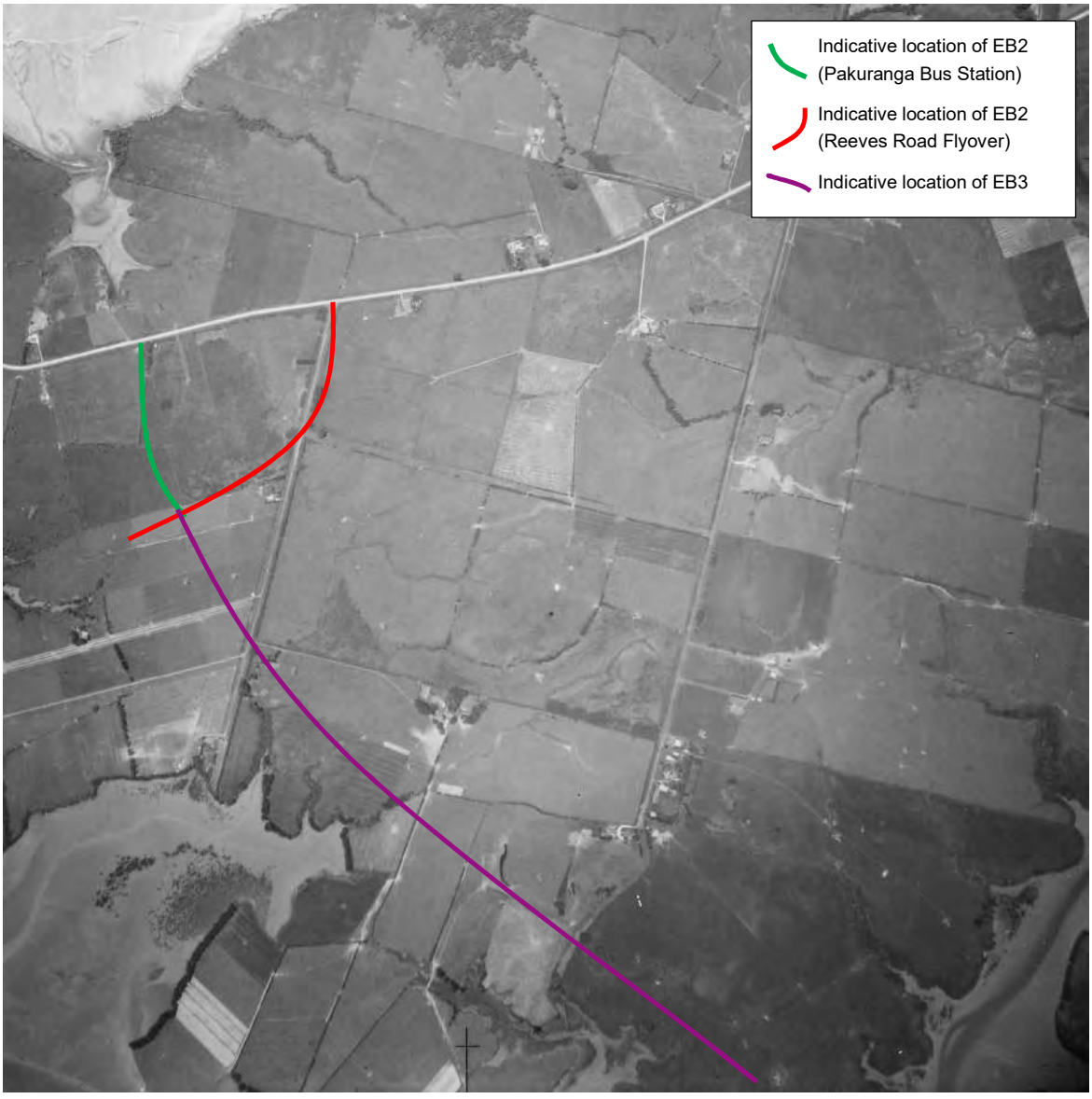

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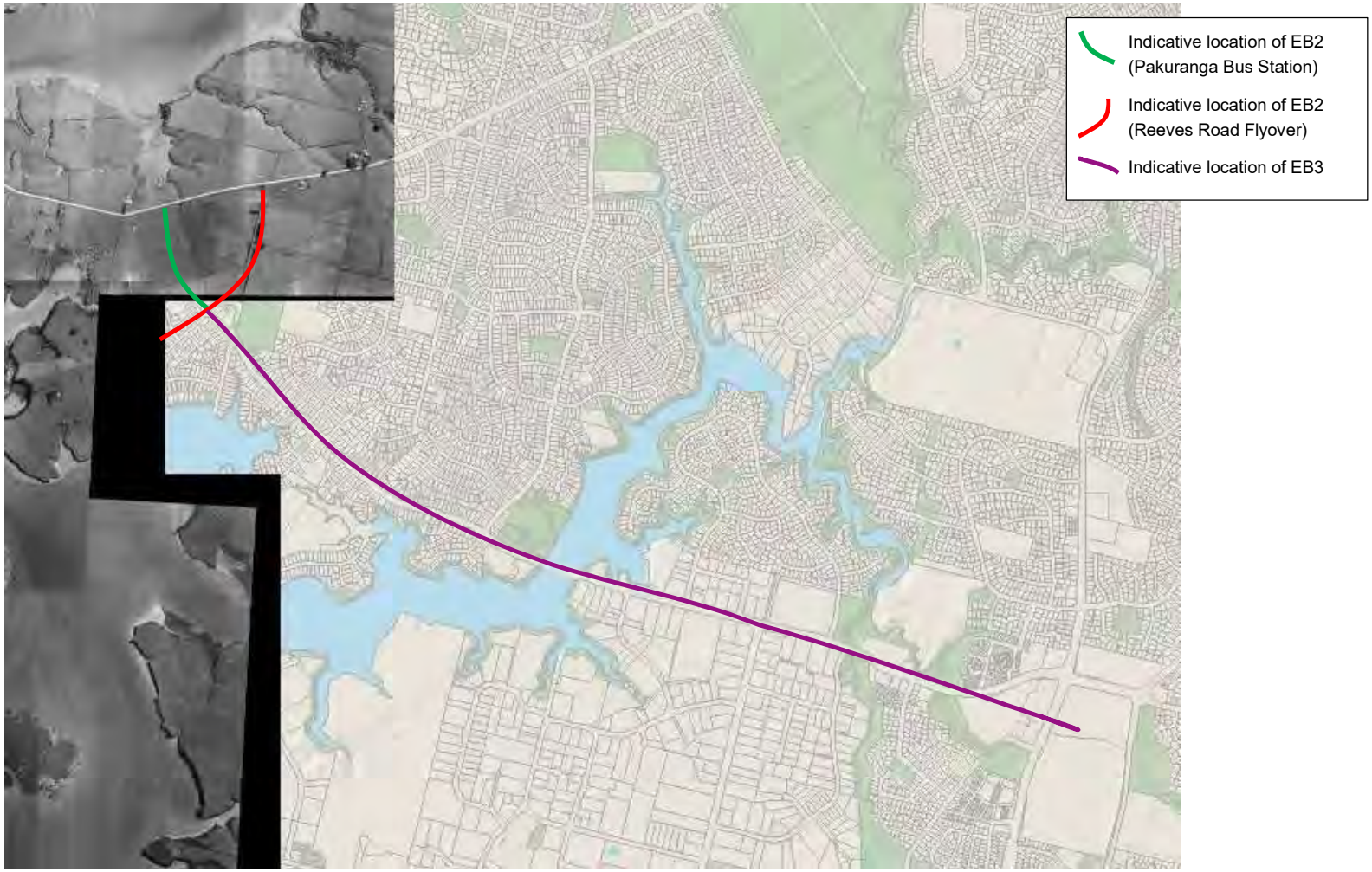

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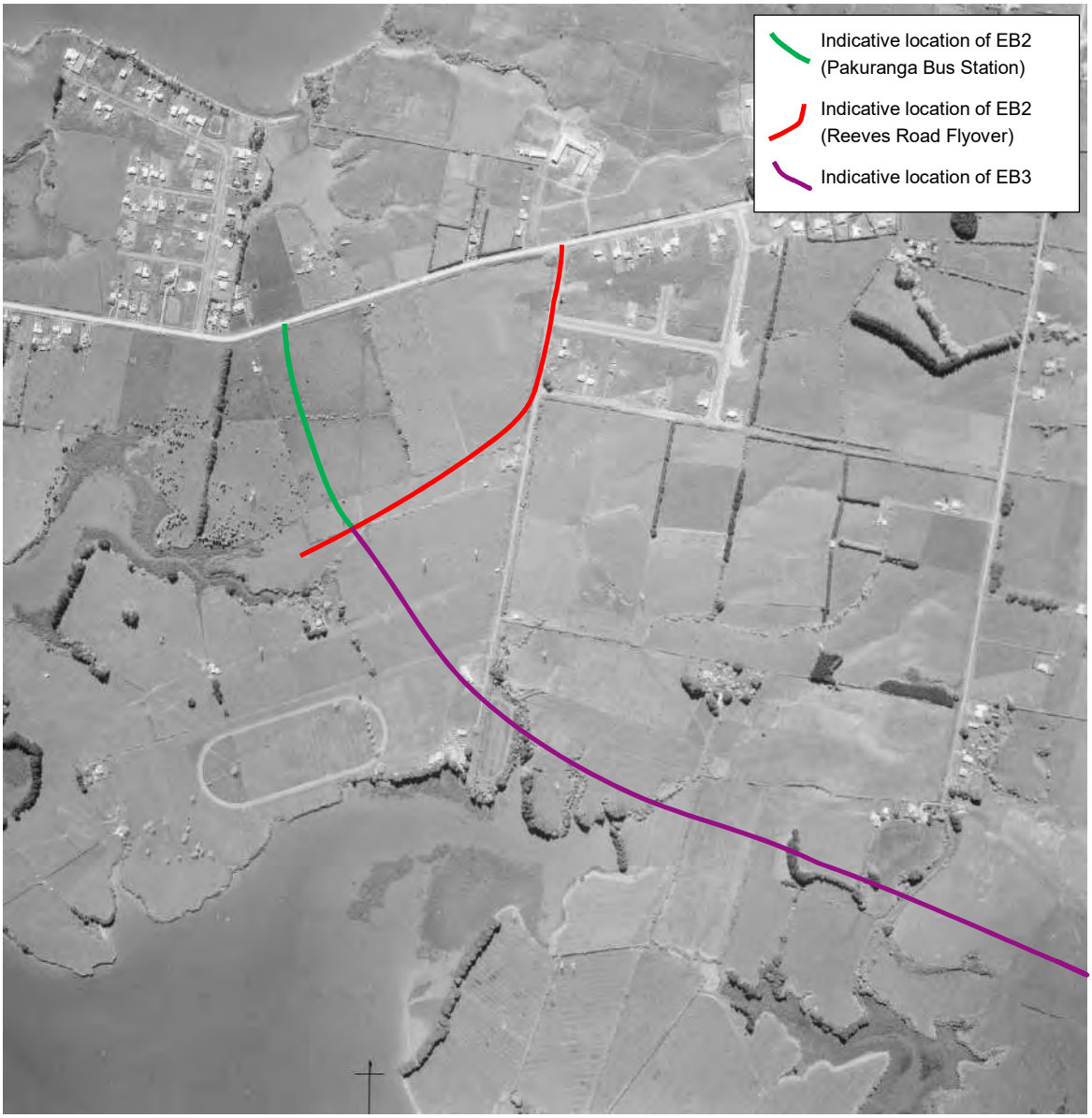

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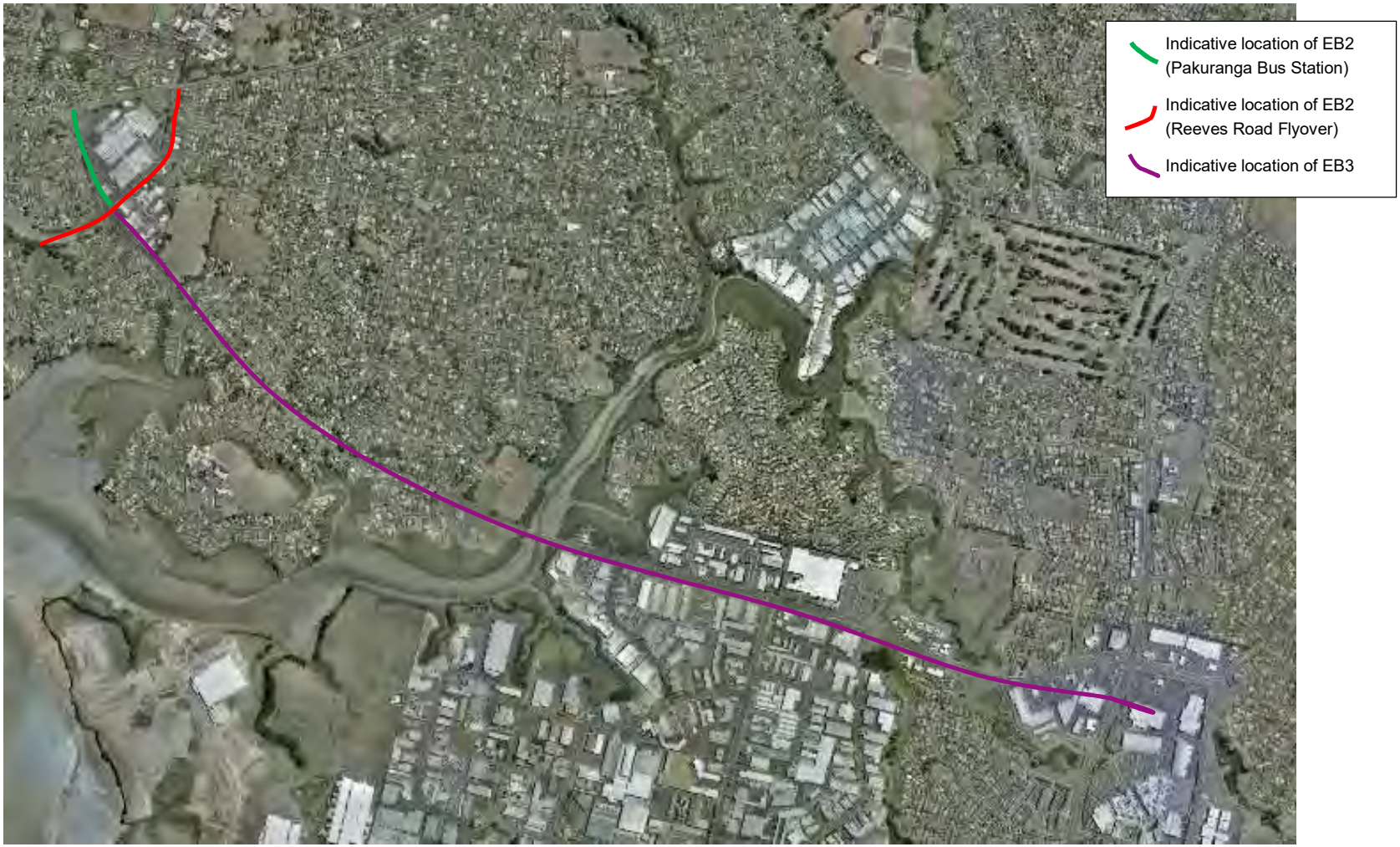

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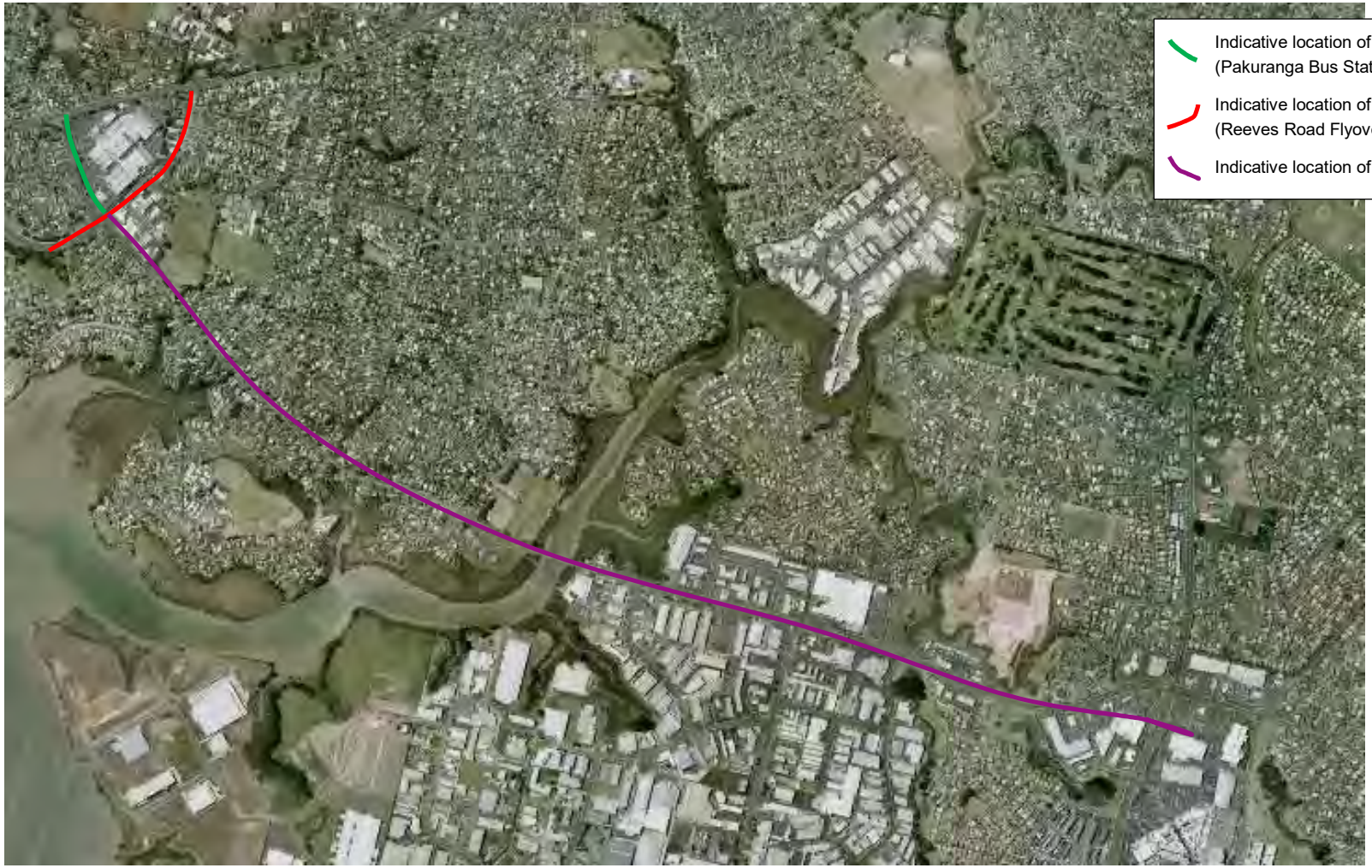

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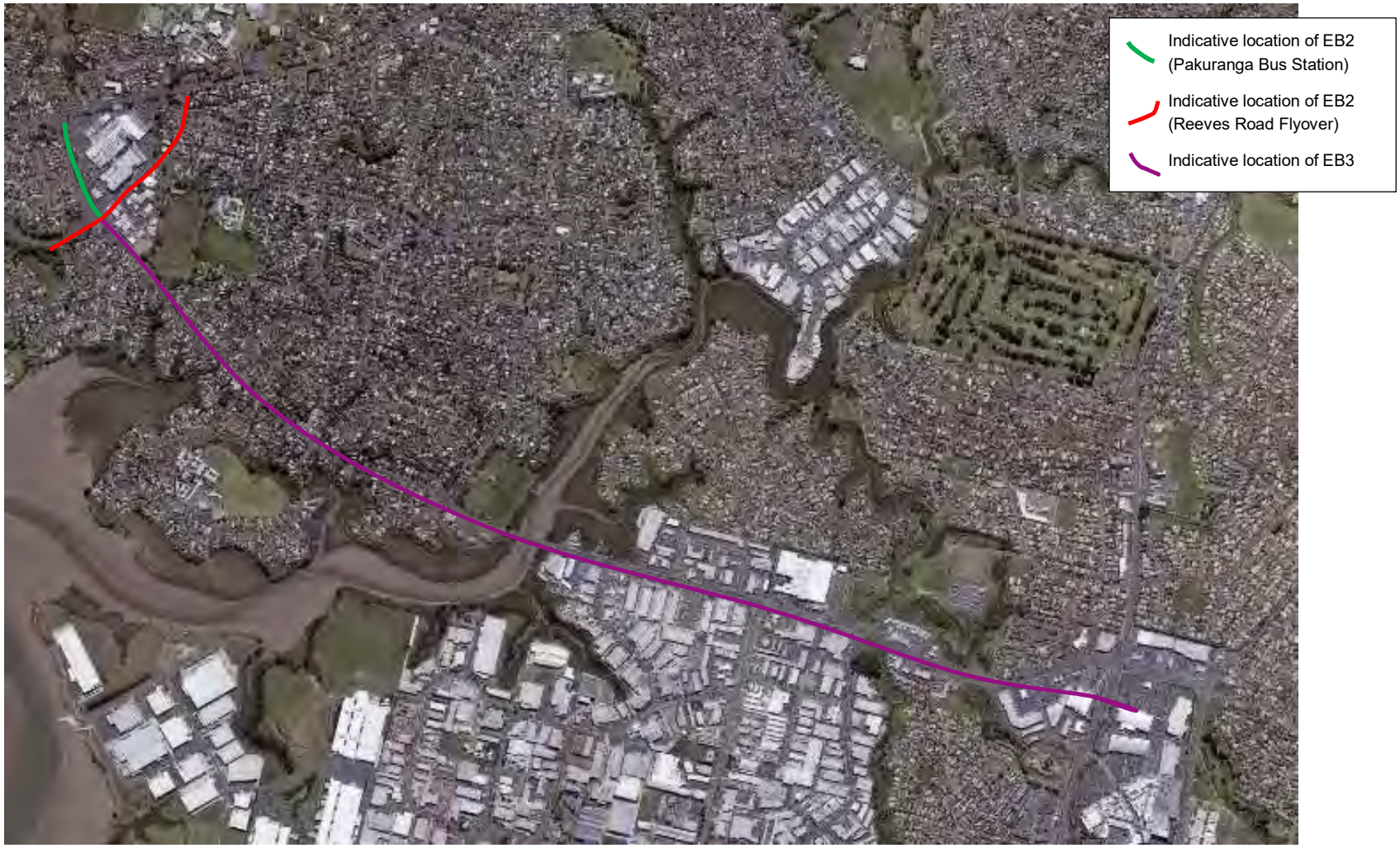

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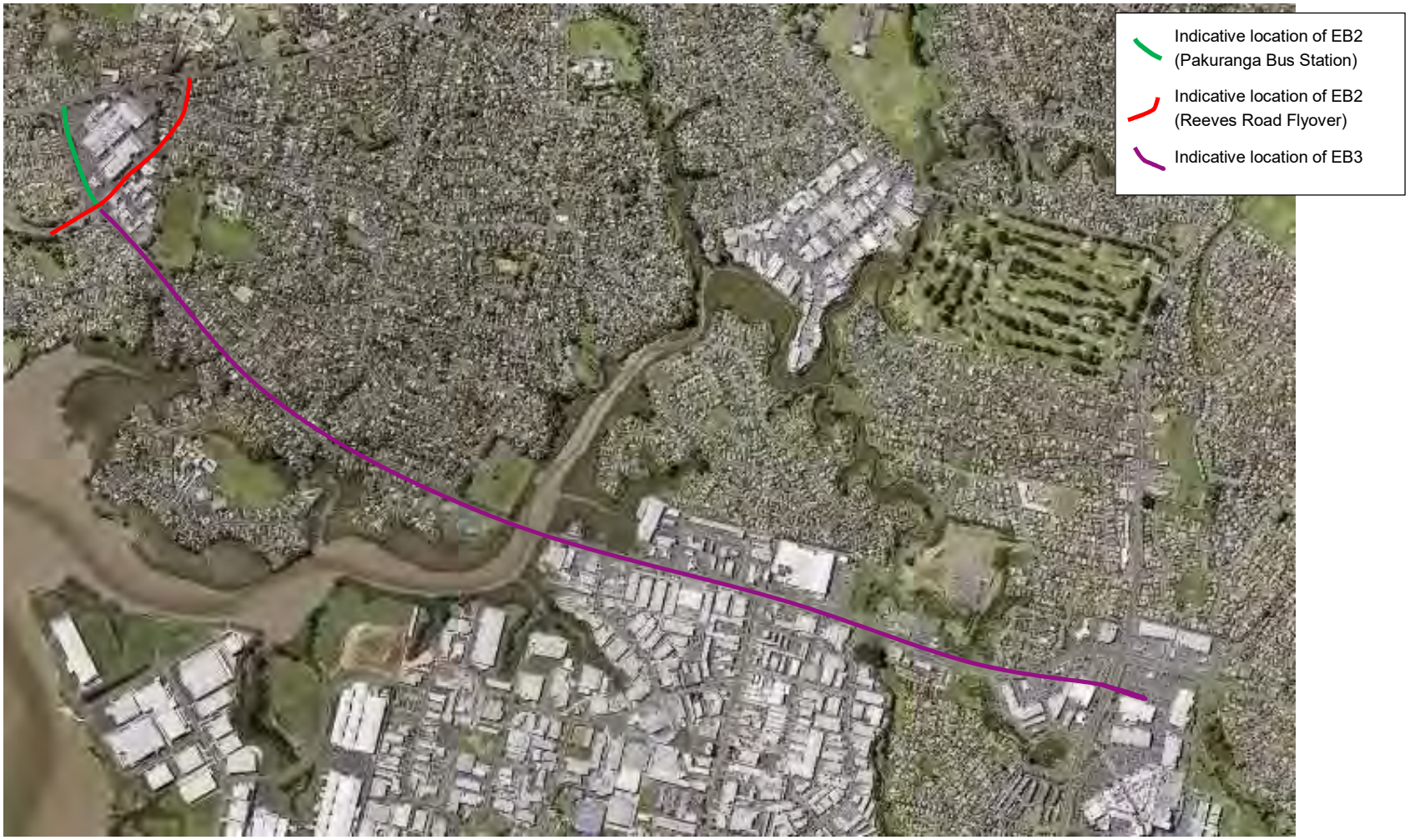
Date: 2017
Sourced from https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html and owned by / licensed to Auckland Council



D R A F T

Date: 2018
Sourced from Imagery ©2018 Google, Map data ©2018 Google, Map Data Sciences Pty Ltd, PSMA

Riverhills Park

Reference	Photograph
Date: 1959 **Sourced from:** Auckland Council GeoMAPS (Red line is only an indication of the Site boundary)	
Date: 1996 **Sourced from:** Auckland Council GeoMAPS (Red line is only an indication	
Date: 2001 **Sourced from:** Auckland Council GeoMAPS (Red line is only an indication of the Site boundary)	

Reference	Photograph
Date: 2006 **Sourced from:** Auckland Council GeoMAPS (Red line is only an indication of the Site boundary)	
Date: 2008 **Sourced from:** Auckland Council GeoMAPS (Red line is only an indication of the Site boundary)	
Date: 2017 **Sourced from:** Auckland Council GeoMAPS (Red line is only an indication of the Site boundary)	

Appendix C

Data Searches

14 June 2021

Aecom NZ Limited
OI Box 4241
AUCKLAND 1140

Attention: Kerryn Mclellan

Dear Kerryn

Site Contamination Enquiry – *Ti Rakau Drive*

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:

- 168R Gossamer Drive, Pakuranga Heights
- 33R Edgewater Drive, Pakuranga
- 27R William Roberts Road, Pakuranga

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 (200m radius of the selected site)

The Council database was searched for records of the following activities within approximately 200 metres of the site:

- 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

A map of relevant records can be found appended to this letter (Attachment B).

Relevant details of any pollution incidents and consents are appended to this letter (Attachment A). Please refer to the column titled 'Property Address' on the spreadsheet to aid in identifying corresponding data on the map.

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


Legend
Buffered
ClosedLandfill
ContaminatedSubTypes
PossibleContamRecords
PropertyNotesFromSAP
LegacyApplicationsAll
LegacyBores
LegacyConsentsAll
LegacyPermittedActivities
OAS_CONS_D_CONTAMINATED_SITE
SIIEDPollution
Ti Rakau Drive
Dolphin Street
Mattson Road
Aurea Avenue
Roseburn Place
Carole Crescent
Cardiff Road
Udys Road
Reeves Road
Downsview Road
Blyton Lane
Parkview Place
Marriott Road
Chatsworth Crescent
Ennis Avenue
Heron Place
Gossamer Drive
Miramar Place
Okareka Place
Te Anau Place
Riverhills Avenue
Rotoiti Avenue
Ellesmere Crescent
Edgewater Drive
Mangos Place
Riverina Avenue
Raewyn Place
Fremantle Place
Trugood Drive

18 May 2021

AECOM
PO Box 434
HAMILTON 3240

Attention: Kerryn Mclellan

Dear Kerryn

Site Contamination Enquiry – *Ameti Eastern Busway Route*

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:

- 27R William Roberts Road, Pakuranga

For more information on these sites, please the tab 'Property Notes From SAP' within Attachment A.

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 (200m radius of the selected site)

The Council database was searched for records of the following activities within approximately 200 metres of the site:

- 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

A map of the search area is included within Attachment B.

Relevant details of any pollution incidents and consents are appended to this letter (Attachment A). Please refer to the column titled 'Property Address' on the spreadsheet to aid in identifying corresponding data on the map.

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


Williams Avenue
Dowling Place
Tamaki Bay Drive
Pakuranga Road
Pakuranga Road
Pakuranga Road
Pakuranga Road
Pakuranga Road
Pakuranga Road
Pakuranga Road
William Roberts Road
Bennett Road
Lewis Road
Ayr Road
Ayr Road
Lewis Road
Paul Place
Dale Crescent
Dale Crescent
Dale Crescent
Ti Rakau Drive
Ti Rakau Drive
Ti Rakau Drive
Reeves Road
Reeves Road
Reeves Road
Reeves Road
Reeves Road
Anthony Place
Palm Avenue
Reeves Road
Reeves Road
Dale Crescent
Dale Crescent
Pakuranga Highway
Cortina Place
Rosina Place
Seven Oaks Drive
Pakuranga Highway
Ti Rakau Drive
Ti Rakau Drive
Tiraumea Drive
Bolina Crescent
Dolphin Street
Pandora Place
Pandora Place
Osprey Street
Undine Street
Tiraumea Drive
Tiraumea Drive
Mattson Road
Ti Rakau Drive
Cindy Place
Legend
Buffered
ClosedLandfill
ContaminatedSubTypes
PossibleContamRecords
PropertyNotesFromSAP
LegacyApplicationsAll
LegacyBores
LegacyConsentsAll
LegacyPermittedActivities
OAS_CONS_D_CONTAMINATED_SITE
Land Outside
Sea Outside
Water
Sea Outside

Appendix D

Borehole Logs

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **DH102**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Sandy SILT with organics; brown.	TOPSOIL			
SAH035-0.2	ACM Metals				Silty CLAY; dark brown with orange mottling.				
SAH035-0.5	None		1		Some gravels present at 1.4mbgl	FILL			
SAH035-1.4	None		2		SILT, with clay; grey/brown; wet	SILT	wet at 2.2 mbgl	▽	
SAH035-2.2	None								
			3						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
2.2m 29/05/2018

Date logged
29/05/2018
Logged
MN
Checked
SN2

Remarks
No visual or olfactory evidence of impact observed.

Driller McMillan
Method Hydrovac / HandAuger
Started 29/05/2018
Finished 29/05/2018

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

Date Printed:
9/04/2019

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **DH103**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					SILT, with organics; brown.	TOPSOIL			
SAH011_0.2	None				SILT, with sands and gravels; light brown. some evidence of reworking.	FILL			
SAH011_0.5	Metals PAH SVOC				Clayey SILT; brown	CLAYey SILT			
SAH011_1.0	Metals		1		sand lenses; moderate grey, grades to light brown				
SAH011_2.0	None		2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 09/05/2018
Logged MN
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.
No ground water encountered

Driller McMillan
Method Hydrovac / HandAuger
Started 9/05/2018
Finished 9/05/2018

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

Date Printed: 9/04/2019

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **DH104**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Sandy clayey SILT, with organics; brown.	TOPSOIL			
SAH010_0.2	Metals				SILT, with gravel and scoria; brown/grey.	FILL			
SAH010_0.5	None				Silty CLAY; grey with orange mottling.	Silty CLAY			
SAH010_1.0	None		1		Sandy SILT, with gravels; very moist/wet.	Sandy SILT		▽	
SAH010_1.6	Metals		2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1.6m 9/05/2018

Date logged 09/05/2018
Logged MN
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.
SAH010_0.2: Pesticide analysis

Driller McMillan
Method Hydrovac / HandAuger
Started 9/05/2018
Finished 9/05/2018

Date Printed: 9/04/2019

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **DH107**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Sandy SILT, with organics and roootlets; dark brown.	TOPSOIL			
SAH012_0.2	None				Sandy SILT, with gravels; dark brown.				
SAH012_0.5	Metals Asb				Silty CLAY, some sand and black organics; light brown and grey.				
SAH012_1.0	Metals		1			FILL			
					Silty CLAY; grey/orange	S.C.			
SAH012_2.0	None		2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 09/05/2018
Logged MN
Checked SN2

Remarks
S.C.=Silty CLAY; no visual or olfactory evidence of impact.

No ground water encountered

Driller McMillan
Method Hydrovac / HandAuger
Started 9/05/2018
Finished 9/05/2018

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

Date Printed: 9/04/2019

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **DH108**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Sandy SILT, some fill material; brown.				
SAH017_0.2	Metals				SILT, light brown with grey and orange mottling.				
SAH017_0.6	None								
			1						
SAH017_1.1	None				some gravel				
						FILL			
			2						
			3						
SAH017_3.0-3.1	None				SILT, minor clay; light grey; moist	SILT			
			4						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 14/05/2018
Logged MN
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.
No ground water encountered

Driller McMillan
Method Hydrovac / HandAuger
Started 14/05/2018
Finished 14/05/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **DH109**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Sandy SILT with rootlets; brown.	TOPSOIL			
SAH030_0.2	None				Silty SAND; gravels; light brown.	FILL			
SAH030_0.5	Metals TPH BTEX				SILT, minor clay and organics; grey with brown and orange mottling.				
SAH030_1.0	None		1		Clayey SILT, organics; dark grey with mottled brown.				
SAH030_1.5	None				SILT, minor clay; light grey.	SILT			
SAH030_2.0	TPH BTEX		2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 18/05/2018
Logged MN
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.
No ground water encountered

Driller McMillan
Method Hydrovac / HandAuger
Started 18/05/2018
Finished 18/05/2018

Date Printed: 9/04/2019

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA101**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
HA101_0.1-0.2	Metals				Silty CLAY, some fine gravel, trace fine sand; orange; stiff; moist; high plasticity.	FILL			
HA101_0.8-0.9	TPH BTEX		1		Silty CLAY, trace fine sand; grey; stiff; moist; high plasticity.	Silty CLAY	Sulphur like odour at 0.8-1.0 mbgl		
					Silty fine SAND; light grey; loose; saturated, non plastic. poor recovery from 1.1-1.5 mbgl	Silty SAND			
			2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
0.7m 20/08/2018

Date logged 20/08/2018
Logged SN
Checked NM

Remarks

Driller AECOM
Method Hand Auger
Started 20/08/2018
Finished 20/08/2018

Date Printed: 9/04/2019

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA102**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Sandy SILT, with rootlets; dark brown.	TOPSOIL			
SAH013_0.3					Clayey SILT; light brown with orange mottling. grey sand lenses throughout; evidence of reworking.	FILL			
SAH013_0.9			1		Grades to grey/white sands.				
SAH013_1.3-1.5					Grades to dark brown with light brown mottling.				
					Gravels present (not collected by hand auger).			▽	
					Fine to medium GRAVEL; dark brown; very moist	C.G.			
SAH013_1.8-2.0					Clayey GRAVEL; dark brown; wet				
			2		grey sands evident				

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1.7m -

Date logged 14/05/2018
Logged MN
Checked SN2

Remarks
C.G. = Clayey GRAVEL; No visual or olfactory evidence of impact.

Driller AECOM
Method Hand Auger
Started 14/05/2018
Finished 14/05/2018

Date Printed: 9/04/2019

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA103**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
HA103_0.1-0.2	Metals ACM				SILT, rootlets; dark brown; moist.	TOPSOIL			
					Clayey SILT; grey/orange; firm; moist, low plasticity.	FILL			
					SILT, some clay; dark grey/brown; soft; moist; non plastic.				
					Clayey SILT; grey with orange staining; stiff; moist; low plasticity.				
					Grades to orange mottles.				
HA103_0.9-1.0	Metals PAH		1		Silty CLAY, white with orange staining; stiff; moist; low plasticity.	Silty CLAY			
					Grades to soft.				
HA103_1.7-1.8	None				Grades to wet.			▽	
			2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1.8m 20/08/2018

Date logged 20/08/2018
Logged CS
Checked SN2

Remarks
C.S. = Clayey SILT; No visual or olfactory evidence of impact.

Driller AECOM
Method Hand Auger
Started 20/08/2018
Finished 20/08/2018

Date Printed: 9/04/2019

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA104**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					SILT, rootlets; dark brown; moist.	T.S.			
HA104_0.1-0.2	Metals				Clayey SILT; light grey/orange; firm; moist; high plasticity.	Clayey SILT			
HA104_0.4-0.5	None				Grades to lighter grey.				
HA104_0.8-0.9	TPH BTEX				Silty fine SAND; white/light grey; loose; moist; non plastic.	Silty SAND	Sulphur like odour at 0.8-1.0m.	▽	
			1		Grades to wet.				
					Poor recovery.				
					Grades to light grey.				
HA104_1.8-2.0	None		2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1m 20/08/2018

Date logged 20/08/2018
Logged CS
Checked SN2

Remarks
T.S. = TOPSOIL

Driller AECOM
Method Hand Auger
Started 20/08/2018
Finished 20/08/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA105**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Fine sandy SILT, minor clay, trace rootlets; brown; soft; moist; low plasticity. Glass fragments were noticed in the core.	T.S.			
HA105_0.2-0.3	Metals				SILT, some fine sand, minor clay, trace rootlets; grey/brown with orange mottles; stiff; moist, high plasticity. Grades to brown. Grades to grey/brown with orange mottles.	FILL			
HA105_0.8-0.9	Metals PAH		1		Clayey SILT, trace fine sand, trace rootlets; grey with orange mottling; stiff; moist, high plasticity.				
HA105_1.3-1.4	None				Fine to medium sandy SILT, trace clay; light grey; soft; wet, low plasticity.	S.S.		▽	
					Silty fine SAND, trace clay; light grey; saturated; very loose, non plastic.	Silty SAND			
			2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1.3m 21/08/2018

Date logged 21/08/2018
Logged SN
Checked NM

Remarks
T.S. = TOPSOIL and S.S. = Sandy SILT;
No visual of olfactory evidence of impact observed.
Poor recovery between 1.5-2.0 mbgl.

Driller AECOM
Method Hand Auger
Started 21/08/2018
Finished 21/08/2018

Date Printed: 9/04/2019

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA106**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
SAH014_0.1	None				Sandy SILT, with organics (rootlets); dark brown.	T.S.			
					Sandy SILT, with fine gravels and sand; dark brown.	FILL			
SAH014_0.5	Metals PAH				Clayey SILT, with cobbles (>10mm); brown with orange mottling.				
					Increasing gravels.				
			1		Silty CLAY, with gravels (>10mm); light brown with white nd orange mottling; low plasticity.				
					some gravels; grades to grey/brown; moist; moderate to low plasticity.				
SAH014_1.5	None				Grades to orange mottling.				
			2		Grades to orange with grey.				
SAH014_2.6	None				Silty CLAY, some sand; grey; moist; moderate plasticity.	S.C.			
			3						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 14/05/2018
Logged MN
Checked SN2

Remarks
T.S. = TOPSOIL, S.S = Sandy SILT, S.C. = Silty CLAY;
No visual or olfactory evidence of impact observed.

No ground water encountered

Driller AECOM
Method Hand Auger
Started 14/05/2018
Finished 14/05/2018

Date Printed: 9/04/2019

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA107**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
SAH015_0.1	Metals				Silty SAND, with organics and rootlets; brown.	TS			
					Silty CLAY; light brown with orange mottling.				
SAH015_0.5	Metals				Grades to grey; low to moderate plasticity.	FILL			
SAH015_0.9	None		1						
					Clayey SILT; light grey; moist.				
					Becomes wet. Poor recovery with hand auger due to increased water content.	Clayey SILT		▽	
SAH015_1.8	None		2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1.6m 14/05/2018

Date logged 14/05/2018
Logged MN
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.

Driller AECOM
Method Hand Auger
Started 14/05/2018
Finished 14/05/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA108**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
SAH016_0.1	None				Sandy SILT; organics; brown.	T.S.			
SAH016_0.5	Metals				SILT, with clays and sand; brown, orange staining	FILL			
					Silty CLAY; orange.				
			1		Calyey SILT; grey, orange staining.				
SAH016_1.1	Metals								
					Silty CLAY; grey; moist. Increasing moisture content.	Silty CLAY			
			2						
SAH016_2.3	None								
SAH016_3.0	None		3		Sandy SILT; grey with minor orange mottling; moist.	Sandy SILT		▽	
					Saturated				
			4						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
3.3m -

Date logged 14/05/2018
Logged MN
Checked SN2

Remarks
T.S. = TOPSOIL and S.C. = Silty CLAY;
No visual or olfactory evidence of impact observed.

Driller AECOM
Method Hand Auger
Started 14/05/2018
Finished 14/05/2018

Date Printed: 9/04/2019

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA110**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
HA110_0.2-0.3	None				SILT, rootlets; dark brown; moist. Woodchips were observed in the core.	TOPSOIL	No odours observed.		
					Trace coarse gravels.				
HA110_0.5-0.6	None				Silty CLAY; light grey with yellow/orange mottles; firm; moist, high plasticity.	FILL	Fragments of plastic refuse observed at 1.0mbgl.		
			1						
HA110_1.3-1.4	None				Clayey SILT; light grey; stiff; moist, high plasticity.	Clayey SILT			
					Grades to white/grey with black streaks.				
HA110_1.7-1.8	None							▽	
HA110_1.9-2.0	None				Wet.				
			2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1.85m -

Date logged 20/08/2018
Logged CS
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.

Driller AECOM
Method Hand Auger
Started 20/08/2018
Finished 20/08/2018

Date Printed: 9/04/2019

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA111**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					SILT, rootlets; dark brown; moist.	T.S.			
HA111_0.2-0.3	Metals				Clayey SILT; dark grey with white/orange mottling; soft; moist; low plasticity.	C.S.			
					Silty CLAY; grey; stiff; moist, low plasticity.	Silty CLAY			
HA111_0.5-0.6	Metals								
					Silty SAND; light greyish orange; loose; moist, non plastic.	Silty SAND			
HA111_0.9-1.0	Metals		1		Silty CLAY; grey/orange; stiff; moist, low plasticity.	Silty CLAY			
					Silty SAND, trace clay; white; loose; moist, non plastic.	Silty SAND			
					Clayey SILT, trace fine sand; white; firm; moist, low plastic.	Calyey SILT			
HA111_1.75-1.85	None		2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 20/08/2018
Logged CS
Checked SN2

Remarks
T.S. = TOPSOIL and C.S. = Clayey SILT;
No visual or olfactory evidence of impact observed.

No ground water encountered

Driller AECOM
Method Hand Auger
Started 20/08/2018
Finished 20/08/2018

Date Printed: 9/04/2019

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA112**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Fine sandy SILT, minor clay, trace rootlets; brown; soft; moist, low plasticity.	T.S.			
HA112_0.15	Metals				Clayey SILT, some fine sand, trace rootlets; orange with mottled grey; stiff; moist, high plasticity.	Clayey SILT			
					Grades to grey with mottled orange.				
					Sandy SILT, minor clay, fine to medium sand; grey; soft; moist, low plasticity.	Sandy SILT			
HA112_0.9	Metals PAH		1					▽	
					Silty SAND, medium sand; loose; orange; moist, non plastic. Friable.	S.S.			
					Silty CLAY, some fine sand; greyish brown; stiff; moist, high plasticity.	Silty CLAY			
HA112_1.9	None		2		Grades to bluish grey.				
HA112_2.9	None		3						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1.2m 21/08/2018

Date logged 21/08/2018
Logged MB
Checked SN2

Remarks
T.S. = TOPSOIL and S.S = Silty SAND;
No visual or olfactory evidence of impact observed.

Driller AECOM
Method Hand Auger
Started 21/08/2018
Finished 21/08/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA113**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
HA113_0.1	Metals				SILT, trace clay, trace rootlets; dark brown; moist.	TOPSOIL			
					Coarse GRAVEL, trace silt. Gravels are 5cm diameter.	FILL			
HA113_0.9	TPH BTEX		1		Silty CLAY; grey with orange mottles; stiff; wet, low plasticity.				
HA113_1.4	None				Silty CLAY, trace fine sand; bluish grey; stiff; moist, highplasticity.	Silty CLAY			
HA113_1.9	None		2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 21/08/2018
Logged CS
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.
No ground water encountered

Driller AECOM
Method Hand Auger
Started 21/08/2018
Finished 21/08/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA114**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
HA114_0.1	Metals				SILT, trace clay, trace rootlets; brown; moist.	TOPSOIL			
					Coarse GRAVEL (4-5cm diameter), trace silt, trace sand.	FILL			
HA114_0.7	TPH BTEX		1		Fine to medium gravelly fine to coarse sandy SILT; dark grey; firm; moist, low plasticity.				
					Silty CLAY, trace rootlets; grey with orange mottling; firm; moist, high plasticity.				
HA114_1.4	TPH BTEX				Silty CLAY; light grey; firm; moist, high plasticity.	Silty CLAY			
			2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 21/08/2018
Logged CS
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.
No ground water encountered

Driller AECOM
Method Hand Auger
Started 21/08/2018
Finished 21/08/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA115**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
HA115_0.1	Metals Asb				SILT, some clay, rootlets; dark brown; moist, low plasticity.	TOPSOIL			
					Clayey SILT, some fine to medium gravels, trace brick fragments; brown/orange; soft; moist, low plasticity.	FILL			
HA115_0.6	TPH BTEX		1						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 22/08/2018
Logged MB
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.
No ground water encountered

Driller AECOM
Method Hand Auger
Started 22/08/2018
Finished 22/08/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA116**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Clayey SILT, trace sand, trace rootlets; brown; soft; moist, high plasticity.	TOPSOIL			
HA116_0.25	Metals				Silty CLAY, fine sand; greyish brown; soft; moist, high plasticity.	FILL			
					light grey; stiff; moist.				
HA116_0.8	Metals TPH PAH							▽	
			1		grades to wet at 1.0 mbgl.				
					Silty CLAY, minor sand; grey; friable; non plastic.	Silty CLAY			
HA116_1.6	None				trace organics (amorphous); dark brown; firm, high plasticity.				
HA116_1.9	None				Grades to greyish blue.				
			2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1m -

Date logged 22/08/2018
Logged MB
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.

Driller AECOM
Method Hand Auger
Started 22/08/2018
Finished 22/08/2018

Date Printed: 9/04/2019

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA117**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Clayey sandy SILT, trace rootlets; brown; friable, non plastic.	TOPSOIL			
HA117_0.3	Metals				Silty CLAY, trace rootlets; orange with grey mottling; firm; moist, low plasticity.	FILL			
			1		Clayey SILT, some medium sand, some gravel, trace brick fragments, trace organics; dark grey; friable; moist, non plastic.				
					Silty CLAY, trace organics and rootlets; grey with brown/orange mottling; stiff; moist, low plasticity.				
HA117_1.7	Metals PAH				Grades to brown.				
			2		Silty CLAY, trace fine sand; light grey, mottled orange; stiff; moist, high plasticity.	Silty CLAY			
HA117_2.5	None								
			3						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 22/08/2018
Logged MB
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.
No ground water encountered

Driller AECOM
Method Hand Auger
Started 22/08/2018
Finished 22/08/2018

Date Printed: 9/04/2019

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA118**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					SILT, with organics; brown.	TOPSOIL			
SAH031_0.2	None				SILT, some clay; light brown with orange mottling.	FILL			
SAH031_0.5	Metals				Grades to brown/orange with sand.				
SAH031_0.9	None		1						
SAH031_1.3	BTEX				white/grey sands				
					Silty SAND; white/grey.	Silty SAND			
SAH031_2.5	None		2						
			3						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 18/05/2018
Logged MN
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.
No ground water encountered

Driller AECOM
Method Hand Auger
Started 18/05/2018
Finished 18/05/2018

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

Date Printed: 9/04/2019

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA119**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Clayey SILT, trace bark and rootlets; dark brown; soft, moist.	T.S.			
HA119_0.15	Metals Asb				Clayey SILT, minor sand, trace rootlets, brown; friable; moist, low plasticity.				
					Silty CLAY, trace organics (amorphous); dark brown with mottled orange; firm; moist, high plasticity.				
			1		grey; soft; moist to wet, high plasticity.			▽	
					Grades to dark grey.				
HA119_1.2	Metals					FILL			
			2		Grades to mottled blue.				
HA119_2.5	None				Clayey SILT, trace fine sand; bluish grey; firm; wet, high plasticity.	Calyey SILT			
			3						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1.1m -

Date logged 22/08/2018
Logged MB
Checked SN2

Remarks
T.S. = TOPSOIL;
No visual or olfactory evidence of impact observed.

Driller AECOM
Method Hand Auger
Started 22/08/2018
Finished 22/08/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA120**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					SILT with clay, trace rootlets; dark brown; moist, low plasticity.	TOPSOIL			
					Silty CLAY; light grey with orange mottles; firm; moist.	Silty CLAY			
HA120_0.4	Metals PCB		1						
					Clayey SILT; light grey with orange; soft; moist.	Clayey SILT			
HA120_1.1	None								
					Silty CLAY; light grey; stiff; moist.	Silty CLAY			
HA120_1.9	None		2						
					End of hole.				

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 22/08/2018
Logged CS
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.
No ground water encountered

Driller AECOM
Method Hand Auger
Started 22/08/2018
Finished 22/08/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA121**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					SILT, rootlets; dark brown; moist.	TOPSOIL			
HA121_0.2	Metals ACM				SILT, some fine gravels, trace clay, trace shell fragments; dark brown; moist.	FILL			
					Clayey SILT; grey/brown with orange mottles; firm; moist, low plasticity.	Clayey SILT			
HA121_0.8	TPH		1		Clayey SILT, trace sand; dark brown; mottled orange; soft; moist.				
					Silty CLAY; orange/grey; stiff; moist; low plasticity.	Silty CLAY			
HA121_1.4	None				Grades to grey.				
HA121_1.9	None		2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 20/08/2018
Logged CS
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.
No ground water encountered

Driller AECOM
Method Hand Auger
Started 20/08/2018
Finished 20/08/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA122**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					SILT; rootlets; dark brown; moist.	T.S.			
HA122_0.15	Metals				Clayey SILT with sand; grey/brown with orange mottling; stiff; moist, low plasticity.	Clayey SILT			
HA122_0.8	None		1		Silty fine SAND; white/grey; moist; very loose, non plastic.	Silty SAND			
HA122_1.4	None				Poor recovery, medium sand. Wet.			▽	
			2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1.5m -

Date logged 21/08/2018
Logged CS
Checked SN2

Remarks
T.S. = TOPSOIL;
No visual or olfactory evidence of impact observed.

Driller AECOM
Method Hand Auger
Started 21/08/2018
Finished 21/08/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **EHA123**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates
Orientation -90° Elevation
Location Pakuranga and Botany, Auckland

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					SILT with clay; dark brown; moist, low plasticity.	TOPSOIL			
HA123_0.2	Metals				SILT with clay; grey/dark brown with orange mottling; moist, low plasticity.	FILL			
					Silty CLAY, minor fine sand; grey/brown; soft, high plasticity.				
HA123_0.85	Metals PAH		1		Fine to medium sandy CLAY; light brown/grey; moist, high plasticity.	Sandy CLAY			
HA123_1.2	Metals PAH				Grades to wet.			▽	
HA123_1.5	None				Grades to saturated.				
			2						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1.3m -

Date logged 22/08/2018
Logged CS
Checked SN2

Remarks
No visual or olfactory evidence of impact observed.

Driller AECOM
Method Hand Auger
Started 22/08/2018
Finished 22/08/2018

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL BH_LOG.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA1**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678501.1mE 6473730.5mN
Orientation -90° Elevation 11m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Silty SAND with organics; light brown. Dry.				
RH_HA1_0.2-0.4	Metals TPH VOC Asbestos	0.9			Silty CLAY; grey/brown. Dry, low plasticity.				
					Sandy SILT with minor clays; light grey. Mottled orange. Sands decreasing.				
RH_HA1_0.9-1.1		0.8	1		Silty CLAY; grey. Firm, low placticity, mottled orange.				
					Silty CLAY; light brown. Moderate placticity, moist, mottled orange.				
			2						
					Clayey SILT with minor sands; light grey. High plasticity, soft, moist, dark orange mottling.				
RH_HA1_2.8-3.0		0.8	3						
			4						
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 19/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 19/02/2019
Finished 19/02/2019

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL RIVERHILLS ENVIRO LOGS.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA2**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678566.1mE 6473715.4mN
Orientation -90° Elevation 10m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Sandy SILT with organics; dark brown. Dry.				
RH_HA2_0.2-0.4		0.0			Clayey SILT; brownish grey. Dry, stiff, no plasiticity, mottled orange.				
RH_HA2_0.7-0.9		0.1	1		Silty CLAY; light grey. Dry, fim, low plasticity, mottled orange.				
			2		Lense of sandy SILT.			▽	
RH_HA2_2.7-2.9		0.0	3		Clayey SILT; grey. Moist, high plasticity. Moisture increasing to saturated.				
			4		Trace of black organics.				
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
2.6m -

Date logged 19/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 19/02/2019
Finished 19/02/2019

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL RIVERHILLS ENVIRO LOGS.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA3**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678585mE 6473690.3mN
Orientation -90° Elevation 9m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					SILT with organics; dark brown. Dry.				
RH_HA3_0.3-0.5		1.0			Clayey SILT with minor sands; brownish grey. Non plastic, brittle, mottled orange.				
			1		Grades to low plasticity. Gravels and organics.				
RH_HA3_1.4-1.6		1.9			Clayey SILT with minor sands and gravels (pebbles and scoria); dark brown.				
					Silty CLAY with gravels; dark grey. Slightly moist, low plasticity.		Evidence of reworking.		
RH_HA3_2.0-2.2		2.4	2		Silty CLAY with fine sand; grey/blue. Moderate plasticity, moist.				
					Lense of gravels.				
			3						
			4						
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 20/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 20/02/2019
Finished 20/02/2019

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL RIVERHILLS ENVIRO LOGS.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA4**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678639.9mE 6473661.2mN
Orientation -90° Elevation 8m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
RH_HA4_0.1-0.2	Metals TPH VOC Asbestos	0.0			Sandy SILT with organics and rootlets; brown. Dry.				
			1		Clayey SILT; light grey. Dry, no plasticity, brittle, mottled orange.				
					Silty CLAY; light grey. Dry, low pasticity, black organics, mottled orange.				
RH_HA4_1.8-2.0	Metals TPH VOC Asbestos	0.0	2		Silty CLAY; grey/blue. Moist, moderate plasticity.				
					Silty CLAY with gravels; dark grey. High plasticity, moist.				
			3		Orange mottling.				
			4						
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 20/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 20/02/2019
Finished 20/02/2019

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL RIVERHILLS ENVIRO LOGS.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA5**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678493mE 6473706.5mN
Orientation -90° Elevation 11m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					SILT with minor sand, organics and rootlets; light brown. Dry.				
					Silty CLAY; light grey. Dry, stiff, low plasticity.				
RH_HA5_0.3-0.5		0.0							
RH_HA5_0.5-0.7		0.1			Sandy SILT; light grey. Low plasticity, moist, mottled orange.				
			1		Grades to dark grey. Moisture increasing.				
RH_HA5_1.5-1.7		0.0							
					Silty CLAY with minor sands; grey. Mosit, moderate plasticity.				
			2		Sands increasing. Moisture increasing.			▽	
					Clayey SILT with minor sands and black organics; grey with green staining.				
			3						
			4						
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
2.1m -

Date logged 19/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 19/02/2019
Finished 19/02/2019

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL RIVERHILLS ENVIRO LOGS.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA6**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678523mE 6473679.5mN
Orientation -90° Elevation 10m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
					Sandy SILT with organics and rootlets; dark brown.				
RH_HA6_0.2-0.4		0.0			Clayey SILT; grey. Dry, mottled orange.				
			1		Silty CLAY; orange/brown. Dry, low plasticity.			▽	
RH_HA6_1.4-1.6		0.0			Silty CLAY; grey. Soft, wet, high plasticity, mottled orange.				
			2		SILT; grey/brown. Wet, soft, high plasticity.				
					Silty CLAY; grey/blue. Firm, moist, low plasticity.				
			3						
			4						
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
1.4m -

Date logged 19/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 19/02/2019
Finished 19/02/2019

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL RIVERHILLS ENVIRO LOGS.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA7**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678522.9mE 6473670mN
Orientation -90° Elevation 9m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
RH_HA7_0.2-0.4	Metals TPH VOC Asbestos	0.1			SILT; with organics and rootlets; dark brown.				
					Clayey SILT with sand; brownish-grey. Brittle, dry.				
					Silty CLAY; light grey with orange mottling. Firm, low plasticity, dry.				
			1		Grades to moist, moderate plasticity.				
RH_HA7_1.8-2.0		0.0							
			2		Clayey SILT; grey/pale green. Dry.				
					Clayey SILT with fine sands; pale blue. Moist, moderate plasticity.				
			3						
			4						
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 21/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 21/02/2019
Finished 21/02/2019

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL RIVERHILLS ENVIRO LOGS.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA8**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678616.8mE 6473607.3mN
Orientation -90° Elevation 8m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
RH_HA8_0.1-0.3		1.1			SILT with some sands, rootlets and organics; dark brown.				
					SILT with some clays; dark brown. Dry, no plasticity.				
					Clayey SILT; brownish-grey with orange mottling. No plasticity, dry, brittle.				
RH_HA8_0.9-1.1		1.1	1						
					Clayey SILT with gravels; brown, mottled orange.				
					Silty CLAY; light brown with orange mottling.				
					Silty SAND; light grey.				
RH_HA8_1.8-2.0		1.8			Silty CLAY; grey with slight green colouration. Low to medium plasticity, moist.				
			2		Grades to saturated.			▽	
			3						
			4						
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
2.5m -

Date logged 20/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 20/02/2019
Finished 20/02/2019

Date Printed: 9/04/2019

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA9**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678535.2mE 6473600.1mN
Orientation -90° Elevation 9m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
RH_HA9_0.2-0.4	Metals TPH VOC Asbestos	0.0			SILT with some sands, rootlets and organics; dark brown. Dry.				
					Clayey SILT with some sand; brown. Dry, no plasticity.				
RH_HA9_0.6-0.8	Metals TPH VOC Asbestos	0.1			Silty CLAY; brownish-grey with orange mottling. Dry, firm, no plasticity.				
					Silty SAND with some gravels; brown. Dry, weak.				
			1		Clayey SILT; brown. Slightly moist.				
					Moisture increasing.				
			2		Silty CLAY; pale green. Moist, low to moderate plasticity.				
					Clayey SILT; blue. Moist, high plasticity, soft.				
			3						
			4						
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date

Date logged 21/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 21/02/2019
Finished 21/02/2019

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL RIVERHILLS ENVIRO LOGS.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA10**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678595.8mE 6473573.3mN
Orientation -90° Elevation 8m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
RH_HA10_0.3-0.5	Metals TPH VOC Asbestos	0.1			SILT with sands, organics and rootlets; dark brown. Dry.				
					SILT with some clay; dark brown. Dry, no plasticity.				
			1		Clayey SILT; brownish-grey. Moist, low plasticity.				
					Silty CLAY; grey. Moist, low plasticity.				
					Clayey SILT with minor sands and gravels; grey, mottled orange. Slightly moist.				
RH_HA10_2.1-2.3		0.0	2						
RH_HA10_2.6-2.8		0.1			CLAY with minor silts and organics; dark Grey. Moist, low to moderate plasticity. Grading to stiff.			▽	
			3						
					Silty CLAY; blue-grey. Stiff, low plasticity, moist.				
			4						
					Clayey SAND; blue-grey. Wet.				
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
2.6m -

Date logged 20/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 20/02/2019
Finished 20/02/2019

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL RIVERHILLS ENVIRO LOGS.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

AECOM

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA11**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678496.9mE 6473532.5mN
Orientation -90° Elevation 10m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
RH_HA11_0.2-0.4	Metals TPH VOC Asbestos	0.0			SILT with some sands, organics and rootlets; dark brown.				
					Silty SAND; light brown/grey. Dry, sands are fine.				
			1		Silty SAND with trace clays and gravels; brown. Soft, moist, no plasticity.				
RH_HA11_1.1-1.3		0.1			Clays increasing.				
					Clayey SAND with black organics; grey with organge/dark red mottling. Low to medium plasticity, soft, moist, slight sulfuric odour.				
RH_HA11_1.6-1.8		0.1							
			2		Silty CLAY; light grey with orange mottling. Firm, no plasticity, dry.				
					Silty CLAY with some sands; orange/grey. Low plasticity, slightly moist, stiff.			▽	
			3		Sands increasing. Moisture increasing.				
			4		Clayey SAND; grey/brown. Saturated.				
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
2.5m -

Date logged 21/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 21/02/2019
Finished 21/02/2019

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL RIVERHILLS ENVIRO LOGS.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

LOG OF AUGERHOLE

HOLE IDENTIFICATION **HA12**

Client Auckland Transport
Project AMETI Eastern Busway 2 and 3
Project number 60563280

Co-ordinates 2678547.3mE 6473505.2mN
Orientation -90° Elevation 8m (Approx)
Location 168 Gossamer Dr

SAMPLING & TESTING			Depth	Graphic Log	MATERIAL DESCRIPTION (consistency, relative density, water content, plasticity, grading, etc)	GEOLOGICAL DESCRIPTION	STAINING/ ODOURS AND COMMENTS	Groundwater	Well Construction
Sample ID	Analysis	PID (ppm)							
RH_HA12_0.1-0.2	Metals TPH VOC Asbestos	0.0			SILT with minor sands, organics and rootlets; dark brown, dry.				
					SAND with some silts and clays; light brown. Weak, unconsolidated.				
RH_HA12_0.8-1.0	Metals TPH VOC Asbestos	0.1	1		Colour becomes grey, moisture increasing.				
					Clayey SILT with trace sands; grey with orange mottling. Moist.				
					Silty SAND; light grey. Moist.				
			2		Clayey SILT; pale blue/green. Moist.				
RH_HA12_2.5-2.7		0.1			Clayey SILT with some gravels and organic material; dark grey with orange mottling. Moist, low plasticity.		Slight sulphur odour.	▽	
			3						
			4						
			5						

GROUNDWATER OBSERVATIONS
Depth _ Reading Date
2.5m -

Date logged 21/02/2019
Logged MN
Checked MH

Remarks

Driller
Method
Started 21/02/2019
Finished 21/02/2019

Date Printed: 9/04/2019

AUGERHOLE LOG ENVIRONMENTAL RIVERHILLS ENVIRO LOGS.GPJ TEST_ENVIRODRILLHOLE.GDT 09/04/19

Appendix E

Data Assurance

D R A F T

Appendix E Data Assurance Results

The data validation procedure employed in the assessment of the field and laboratory Quality Assurance and Quality Control (QA/QC) has indicated that the reported analytical results are representative of conditions at the sample locations and that the overall quality of the analytical data produced is acceptably reliable for the purpose of this investigation.

Field Quality Control

Field QA/QC requirements for the project are summarised in the table below.

Field Control Requirements	Summary of Works Completed
Use of standard procedures for sampling.	AECOM standard procedures for soil sampling were applied. A three stage decontamination procedure of equipment was used between the collection of each sample.
Use new pair of disposable nitrile gloves for each soil sample collected.	A new pair of disposable nitrile gloves was used for each soil sample collected.
Use of laboratory prepared and supplied sampling containers appropriate for each contaminant investigated.	Laboratory prepared sampling containers, supplied by Hills Laboratories Limited (Hills) or Analytica Laboratories Limited (Analytica), were used for sample collection.
Use of appropriate sample Chain of Custody (CoC) documentation.	AECOM CoC procedures were followed and have been supplied as part of this reporting. Copies of the CoCs are included in the laboratory reports (**Appendix H**).

Data Quality Objective

Data Quality Objectives for the project are summarised in the table below.

Data Quality Objective	Summary of Works Completed
Samples to be submitted for metal / organic analysis to be received at the laboratory at a temperature below 15 ºC.	The temperature of the samples upon receipt at the laboratory was not recorded, however samples were stored on ice in chilled containers while completing field works and during transit.
Soil and groundwater samples to be extracted and analysed within acceptable holding times for the contaminant of potential concern. The maximum acceptable sample holding times for organic analyses are 14 days, and 30 days for inorganic analysis.	The samples were received by the laboratories within two days after collection in the field and were then stored in a laboratory controlled environment.
Samples to be appropriately preserved and handled by the laboratory.	Samples were appropriated preserved and handled by the laboratories. A laboratory transcript from Hills noted that replicate analyses performed on two samples as part of the laboratory quality assurance procedures showed greater variation than would normally be expected and the average results of the replicate analyses were reported. This variation is likely to reflect the heterogeneity of the sample which comprised fill materials, and is not considered to compromise the results of the DSI.
Laboratory limits of reporting are to be less than the adopted acceptance criteria for the project.	The laboratory limits of reporting for contaminants of concern for the project are less than the acceptance criteria.

Appendix F

Photographs

DRAFT

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	Site Location:	Project No. 60563280

Photo No. 1	Date: 10 May 2018
Direction: South	
Description: View of location of DH104	

Photo No. 2	Date: 16 Aug 2018
Direction: South East	
Description: View of location of DH108	

D R A F T

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	Site Location:	Project No. 60563280

Photo No. 3	Date: 27 Aug 2018
Direction: South East	
Description: View of location of DH109	

Photo No. 4	Date: 15 Aug 2018
Direction: North	
Description: View of location of EHA101	

D R A F T

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	Site Location:	Project No. 60563280

Photo No. 5	Date: 10 May 2018
Direction: South West	
Description: View of location of EHA102	

Photo No. 6	Date: 8 Aug 2018
Direction: South West	
Description: View of location of EHA103	

DRAFT

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	**Site Location:**	**Project No. 60563280**

Photo No. 7	Date: 8 Aug 2018
Direction: North West	
Description: View of location EHA104	

Photo No. 8	Date: 8 Aug 2018
Direction: South East	
Description: View of location of EHA105	

DRAFT

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	Site Location:	Project No. 60563280

Photo No. 9	Date: 10 May 2018
Direction: South West	
Description: View of location of EHA106	

Photo No. 10	Date: 10 May 2018
Direction: South East	
Description: View of location of EHA107	

D R A F T

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	**Site Location:**	**Project No. 60563280**

Photo No. 11	Date: 10 May 2018
Direction: South East	
Description: View of location of EHA108	

Photo No. 12	Date: 8 Aug 2018
Direction: West	
Description: View of location of EHA111	

D R A F T

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	Site Location:	Project No. 60563280

Photo No. 13	Date: 15 Aug 2018
Direction: South East	
Description: View of location of EHA112	

Photo No. 14	Date: 8 Aug 2018
Direction: East	
Description: View of location of EHA113	

DRAFT

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	Site Location:	Project No. 60563280

Photo No. 15	Date: 15 Aug 2018
Direction: South	
Description: View of location of EHA114	

Photo No. 16	Date: 8 Aug 2018
Direction: West	
Description: View of location of EHA115	

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	Site Location:	Project No. 60563280

Photo No. 17	Date: 8 Aug 2018
Direction: West	
Description: View of location of EHA116	

Photo No. 18	Date: 8 Aug 2018
Direction: North West	
Description: View of location of EHA117	

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	Site Location:	Project No. 60563280

Photo No. 19	Date: 10 May 2018
Direction: East	
Description: View of location of EHA118	

Photo No. 20	Date: 8 Aug 2018
Direction: East	
Description: View of location of EHA120	

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	Site Location:	Project No. 60563280

Photo No. 21	Date: 8 Aug 2018
Direction: West	
Description: View of location of EHA121	

Photo No. 22	Date: 15 Aug 2018
Direction: East	
Description: View of location of EHA122	

PHOTOGRAPHIC LOG		
Client Name: Auckland Transport	Site Location:	Project No. 60563280

Photo No.	Date:
23	8 Aug 2018

Direction:
North West

Description:
View of location of EHA123

Photo No.	Date:
24	18 Feb 2019

Direction:
North West

Description:
View from HA4 facing Ti Rakau Drive and Tamaki River.

Appendix G

Soil Analytical Results

AECOM Imagine it. Delivered.

Table G1 - EB2 and EB3
Soil Analytical Results

Sample Location	DH102	DH103		DH104		DH107		DH108	DH109	EHA101	EHA102	Environmental Guideline Values		
AECOM Sample Reference	DH102_0.2	DH103_0.5	DH103_1.0	DH104_0.2	DH104_1.6	DH107_0.5	DH107_1.0	DH108_0.2	DH109_0.5	AME_EHA101_0.1	SAH013_0.3			
Laboratory Sample Reference	1991296.1	1979897.6	1979897.7	1979897.1	1979897.4	1979897.1	1979897.11	1984837.1	1985842.2	2035377.1	1981512.1	Auckland Background Concentrations [1]	Auckland Council Permitted Activity Criteria [2]	NES Guidelines [3]
Sample Date	29-May-18	9-May-18		9-May-18		9-May-18		14-May-18	18-May-18	20-Aug-18	11-May-18			
Sample Depth	0.2	0.5	1.0	0.2	1.6	0.5	1.0	0.2	0.5	0.1-0.2	0.3	Non Volcanic Range		Commercial / Industrial Outdoor Worker (Unpaved)
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Heavy Metals														
Total Recoverable Arsenic	< 2	2.0	3.0	2.0	3.0	< 2	3.0	3.0	4.0	3.0	4.0	0.4 - 12	**100**	70
Total Recoverable Cadmium	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.2	< 0.10	< 0.10	< 0.10	<0.10	0.2	< 0.1 - 0.65	**7.5**	1300
Total Recoverable Chromium	35.0	23.0	22.0	16.0	26.0	41.0	40.0	25.0	21.0	30.0	28.0	2 - 55	**400**	6300
Total Recoverable Copper	24.0	11.0	9.0	7.0	12.0	14.0	18.0	13.0	25.0	14.0	11.0	1 - 45	**325**	> 10000
Total Recoverable Lead	14.0	6.8	6.8	8.3	9.6	20.0	12.8	11.9	16.4	9.2	15.6	< 5 - 65	**250**	3300
Total Recoverable Mercury	-	-	-	-	-	-	-	-	-	-	-	< 0.03 - 0.45	**0.75**	
Total Recoverable Nickel	32.0	10.0	9.0	8.0	12.0	34.0	22.0	22.0	26.0	29.0	16.0	0.9 - 35	**105**	-
Total Recoverable Zinc	55.0	27.0	22.0	16.0	35.0	53.0	40.0	34.0	89.0	45.0	42.0	9 - 180	**400**	-

Sample Location	EHA103		EHA104	EHA105		EHA106	EHA107		EHA108		Environmental Guideline Values		
AECOM Sample Reference	AME_EHA103_0.1	AME_EHA103_0.9	AME_EHA104-0.1	AME_HA105_0.2	AME_HA105_0.8	AME_EHA106_0.5	AME_EHA107_0.1	AME_EHA107_0.5	AME_EHA108_0.5	AME_EHA108_1.1			
Laboratory Sample Reference	2035377.4	2035377.5	2035377.7	2035379.15	2035379.16	1981512.6	1981512.8	1981512.9	1981512.13	1981512.14	Auckland Background Concentrations [1]	Auckland Council Permitted Activity Criteria [2]	NES Guidelines [3]
Sample Date	20-Aug-18		20-Aug-18	21-Aug-18		11-May-18	11-May-18		11-May-18				
Sample Depth	0.1-0.2	0.9-1.0	0.1-0.2	0.2-0.3	0.8-0.9	0.5	0.1	0.5	0.5	1.1	Non Volcanic Range		Commercial / Industrial Outdoor Worker (Unpaved)
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Heavy Metals													
Total Recoverable Arsenic	3.0	2.0	2.0	< 2	< 2	4.0	3.0	4.0	4.0	< 2	0.4 - 12	**100**	70
Total Recoverable Cadmium	<0.10	<0.10	<0.10	0.1	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.1 - 0.65	**7.5**	1300
Total Recoverable Chromium	32.0	7.0	27.0	23.0	23.0	32.0	30.0	36.0	36.0	8.0	2 - 55	**400**	6300
Total Recoverable Copper	7.0	6.0	9.0	13.0	13.0	19.0	19.0	10.0	12.0	3.0	1 - 45	**325**	> 10000
Total Recoverable Lead	10.0	13.8	13.8	17.2	9.5	12.9	103.0	12.8	10.4	5.3	< 5 - 65	**250**	3300
Total Recoverable Mercury	-	-	-	-	-	-	-	-	-	-	< 0.03 - 0.45	**0.75**	
Total Recoverable Nickel	15.0	10.0	14.0	16.0	12.0	31.0	33.0	19.0	17.0	6.0	0.9 - 35	**105**	-
Total Recoverable Zinc	38.0	16.0	36.0	36.0	30.0	47.0	61.0	32.0	32.0	5.0	9 - 180	**400**	-

Sample Location	EHA111			EHA112		EHA113	EHA114	EHA115	Environmental Guideline Values		
AECOM Sample Reference	AME_EHA111_0.2	AME_EHA111_0.5	AME_EHA111_0.9	AME_HA112_0.15	AME_HA112_0.9	AME_HA113_0.1	AME_HA114_0.1	AME_HA115_0.1			
Laboratory Sample Reference	2035377.11	2035377.12	2035377.13	2035379.4	2035379.5	2035379.11	2035379.8	2036105.1	Auckland Background Concentrations [1]	Auckland Council Permitted Activity Criteria [2]	NES Guidelines [3]
Sample Date	20-Aug-18			21-Aug-18		21-Aug-18	21-Aug-18	22-Aug-18			
Sample Depth	0.2-0.3	0.5-0.6	0.9-1.0	0.15-0.3	0.9-1.0	0.1-0.2	0.1-0.2	0.1-0.2	Non Volcanic Range		Commercial / Industrial Outdoor Worker (Unpaved)
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Heavy Metals											
Total Recoverable Arsenic	5.0	3.0	3.0	3.0	< 2	4.0	4.0	4.0	0.4 - 12	**100**	70
Total Recoverable Cadmium	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.6	0.2	0.2	< 0.1 - 0.65	**7.5**	1300
Total Recoverable Chromium	25.0	31.0	38.0	24.0	27.0	40.0	37.0	37.0	2 - 55	**400**	6300
Total Recoverable Copper	12.0	13.0	6.0	5.0	10.0	43.0	35.0	21.0	1 - 45	**325**	> 10000
Total Recoverable Lead	33.0	10.6	11.0	7.8	4.8	71.0	27.0	37.0	< 5 - 65	**250**	3300
Total Recoverable Nickel	20.0	18.0	7.0	8.0	21.0	61.0	55.0	27.0	0.9 - 35	**105**	-
Total Recoverable Zinc	44.0	30.0	10.0	25.0	25.0	157.0	96.0	80.0	9 - 180	**400**	-

Notes

All results are presented in mg/kg unless otherwise stated.

- Sample not analysed for compound and/or no criteria adopted.

Underlined, bolded, coloured and italicised text represents exceedances of adopted acceptance criteria.

1. Auckland Council, 2017. Auckland Unitary Plan - Operative in part (AUPOP). Table E30.6.1.4.2 Background ranges of trace elements in Auckland soils sources from Table 3 of TP153:2001 Background Concentrations of Inorganic Elements in Soils from the Auckland Region. (Auckland Background Concentrations).
2. Auckland Council, 2017. Auckland Unitary Plan - Operative in part (AUPOP). Table E30.6.1.4.1, Permitted Activity Soil Acceptance Criteria.
3. Ministry for the Environment, 2012. Users' Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Values taken from Appendix B Soil Contaminant Standards, Tables B2 and B3 (NES Guidelines).

Project Number: 60582939
Prepared by: SN
Reviewed by: ZL
Last modified: 13 September 2018

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Table G2 - EB2 and EB3
Soil Analytical Results - Heavy Metals

Sample Location	EHA116		EHA117		EHA118	EHA119		EHA120	Environmental Guideline Values		
AECOM Sample Reference	AME_HA116_0.25	AME_HA116_0.8	AME_HA117_0.3	AME_HA117_1.7	AME_EHA118_0.5	AME_HA119_0.15	AME_HA119_1.2	AME_HA120_0.4			
Laboratory Sample Reference	2036105.6	2036105.7	2036105.3	2036105.4	1985842.7	2036105.1	2036105.11	2036105.13			
Sample Date	22-Aug-18		22-Aug-18		18-May-18	18-Aug-18		22-Aug-18	Auckland Background Concentrations [1]	Auckland Council Permitted Activity Criteria [2]	NES Guidelines [3]
Sample Depth	0.25-0.35	0.8-0.9	0.3-0.4	1.7-1.8	0.5	0.15-0.25	1.2-1.3	0.4-0.5	Non Volcanic Range		Commercial / Industrial Outdoor Worker (Unpaved)
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Heavy Metals											
Total Recoverable Arsenic	< 2	3.0	3.0	4.0	5.0	3.0	2.0	2.0	0.4 - 12	**100**	70
Total Recoverable Cadmium	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.12	< 0.10	< 0.1 - 0.65	**7.5**	1300
Total Recoverable Chromium	13.0	3.0	47.0	51.0	32.0	32.0	31.0	41.0	2 - 55	**400**	6300
Total Recoverable Copper	7.0	9.0	15.0	23.0	12.0	11.0	12.0	9.0	1 - 45	**325**	> 10000
Total Recoverable Lead	11.3	42.0	11.1	16.9	16.0	14.0	22.0	12.3	< 5 - 65	**250**	3300
Total Recoverable Nickel	10.0	4.0	25.0	37.0	22.0	19.0	16.0	16.0	0.9 - 35	**105**	-
Total Recoverable Zinc	19.0	12.0	38.0	32.0	41.0	26.0	40.0	27.0	9 - 180	**400**	-

Sample Location	EHA121	EHA122	EHA123			HA1	HA4		Environmental Guideline Values		
AECOM Sample Reference	AME_EHA121_0.2	AME_HA122_0.15	AME_HA123_0.2	AME_HA123_0.85	AME_HA123_1.2	RH_HA1_0.2-0.4	RH_HA4_0.1-0.3	RH_HA4_1.8-2.0			
Laboratory Sample Reference	2035377.2	2035379.1	2036105.16	2036105.17	2036105.18	19-05381-1	19-05381-12	19-05381-13			
Sample Date	20-Aug-18	21-Aug-18	22-Aug-18			19-Feb-19	20-Feb-19	20-Feb-19	Auckland Background Concentrations [1]	Auckland Council Permitted Activity Criteria [2]	NES Guidelines [3]
Sample Depth	0.2-0.3	0.15-0.25	0.2-0.3	0.85-0.95	1.2-1.3	0.2-0.4	0.1-0.3	1.8-2.0	Non Volcanic Range		Commercial / Industrial Outdoor Worker (Unpaved)
Sample Type	Soil	Soil	Soil	Soil	Soil	SAND	SILT	SiltyCLAY			
Heavy Metals											
Total Recoverable Arsenic	5.0	3.0	< 2	< 2	< 2	1.6	6.5	1.8	0.4 - 12	**100**	70
Total Recoverable Cadmium	0.3	< 0.10	< 0.10	< 0.10	< 0.10	0.024	0.150	0.031	< 0.1 - 0.65	**7.5**	1300
Total Recoverable Chromium	31.0	30.0	13.0	13.0	11.0	16.4	30.0	24.9	2 - 55	**400**	6300
Total Recoverable Copper	50.0	11.0	8.0	3.0	3.0	6.3	10.3	10.8	1 - 45	**325**	> 10000
Total Recoverable Lead	58.0	39.0	9.6	5.7	4.4	8.7	14.8	6.9	< 5 - 65	**250**	3300
Total Recoverable Nickel	56.0	25.0	15.0	7.0	6.0	12.7	14.0	18.1	0.9 - 35	**105**	-
Total Recoverable Zinc	78.0	42.0	19.0	18.0	16.0	21.7	40.4	28.1	9 - 180	**400**	-

Sample Location	HA7	HA9		HA10	HA11	HA12		Environmental Guideline Values		
AECOM Sample Reference	RH_HA7_0.2-0.4	RH_HA9_0.2-0.4	RH_HA9_0.6-0.8	RH_HA10_0.3-0.5	RH_HA11_0.2-0.4	RH_HA12_0.1-0.3	RH_HA12_0.8-1.0			
Laboratory Sample Reference	19-05381-26	19-05381-28	19-05381-29	19-05381-17	19-05381-20	19-05381-23	19-05381-24			
Sample Date	21-Feb-19	21-Feb-19	21-Feb-19	20-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	Auckland Background Concentrations [1]	Auckland Council Permitted Activity Criteria [2]	NES Guidelines [3]
Sample Depth	0.2-0.4	0.2-0.4	0.6-0.8	0.3-0.5	0.2-0.4	0.1-0.3	0.8-1.0	Non Volcanic Range		Commercial / Industrial Outdoor Worker (Unpaved)
Sample Type	ClayeySILT	SILT	SiltyCLAY	SILT	SILT	SILT	SiltySAND			
Heavy Metals										
Total Recoverable Arsenic	1.3	5.0	2.0	1.1	2.1	3.8	1.2	0.4 - 12	**100**	70
Total Recoverable Cadmium	0.015	0.120	0.023	0.035	0.045	0.120	0.017	< 0.1 - 0.65	**7.5**	1300
Total Recoverable Chromium	20.7	25.4	18.1	29.2	20.3	30.8	16.1	2 - 55	**400**	6300
Total Recoverable Copper	5.3	8.2	4.4	5.7	6.8	9.4	5.7	1 - 45	**325**	> 10000
Total Recoverable Lead	6.0	11.6	9.3	10.9	6.7	11.0	4.7	< 5 - 65	**250**	3300
Total Recoverable Nickel	9.8	13.7	11.4	18.0	10.5	15.1	7.9	0.9 - 35	**105**	-
Total Recoverable Zinc	12.8	33.7	16.8	25.9	20.0	34.0	14.6	9 - 180	**400**	-

Notes
All results are presented in mg/kg unless otherwise stated.
- Sample not analysed for compound and/or no criteria adopted.
Underlined, bolded, coloured and italicised text represents exceedances of adopted acceptance criteria.

1. Auckland Council, 2017. Auckland Unitary Plan - Operative in part (AUPOP). Table E30.6.1.4.2 Background ranges of trace elements in Auckland soils sources from Table 3 of TP153:2001 Background Concentrations of Inorganic Elements in Soils from the Auckland Region. (Auckland Background Concentrations).
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Project Number: 60582939
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Reviewed by: ZL
Last modified: 13 September 2018

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Appendix H

Laboratory Documentation

Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

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T +64 7 858 2000
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W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	2036105 SPv2
Contact:	N Macorison	**Date Received:**	23-Aug-2018
	C/- AECOM New Zealand Limited	**Date Reported:**	12-Sep-2018 **(Amended)**
	PO Box 4241	**Quote No:**	81048
	Shortland Street	**Order No:**	60563280/3.3.1
	Auckland 1140	**Client Reference:**	60563280/3.3.1
		Submitted By:	Suresh Nuthalapati

Sample Type: Soil

Sample Name:		AME_HA115_0.1-0.2 22-Aug-2018	AME_HA115_0.6-0.7 22-Aug-2018	AME_HA117_0.3-0.4 22-Aug-2018	AME_HA117_1.7-1.8 22-Aug-2018	AME_HA116_0.25-0.35 22-Aug-2018
Lab Number:		2036105.1	2036105.2	2036105.3	2036105.4	2036105.6
Individual Tests						
Dry Matter	g/100g as rcvd	-	73	-	71	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	-	3	4	< 2
Total Recoverable Cadmium	mg/kg dry wt	0.20	-	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	37	-	47	51	13
Total Recoverable Copper	mg/kg dry wt	21	-	15	23	7
Total Recoverable Lead	mg/kg dry wt	37	-	11.1	16.9	11.3
Total Recoverable Nickel	mg/kg dry wt	27	-	25	37	10
Total Recoverable Zinc	mg/kg dry wt	80	-	38	32	19
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	-	< 0.06	-	-	-
Toluene	mg/kg dry wt	-	< 0.06	-	-	-
Ethylbenzene	mg/kg dry wt	-	< 0.06	-	-	-
m&p-Xylene	mg/kg dry wt	-	< 0.12	-	-	-
o-Xylene	mg/kg dry wt	-	< 0.06	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	-	-	-	< 0.014	-
2-Methylnaphthalene	mg/kg dry wt	-	-	-	< 0.014	-
Perylene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	-	-	< 0.04	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	-	-	< 0.04	-
Acenaphthylene	mg/kg dry wt	-	-	-	< 0.014	-
Acenaphthene	mg/kg dry wt	-	-	-	< 0.014	-
Anthracene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[a]anthracene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[e]pyrene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[k]fluoranthene	mg/kg dry wt	-	-	-	< 0.014	-
Chrysene	mg/kg dry wt	-	-	-	< 0.014	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	-	< 0.014	-
Fluoranthene	mg/kg dry wt	-	-	-	< 0.014	-
Fluorene	mg/kg dry wt	-	-	-	< 0.014	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	-	< 0.014	-

Sample Type: Soil						
Sample Name:		AME_HA115_0.1-0.2 22-Aug-2018	AME_HA115_0.6-0.7 22-Aug-2018	AME_HA117_0.3-0.4 22-Aug-2018	AME_HA117_1.7-1.8 22-Aug-2018	AME_HA116_0.25-0.35 22-Aug-2018
Lab Number:		2036105.1	2036105.2	2036105.3	2036105.4	2036105.6
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Naphthalene	mg/kg dry wt	-	-	-	< 0.07	-
Phenanthrene	mg/kg dry wt	-	-	-	< 0.014	-
Pyrene	mg/kg dry wt	-	-	-	< 0.014	-
Total of Reported PAHs in Soil*	mg/kg	-	-	-	< 0.4	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	-	< 9	-	-	-
C10 - C14	mg/kg dry wt	-	< 20	-	-	-
C15 - C36	mg/kg dry wt	-	< 40	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	-	< 70	-	-	-
BTEX in VOC Soils by Headspace GC-MS						
Benzene	mg/kg dry wt	-	< 0.3	-	-	-
Ethylbenzene	mg/kg dry wt	-	< 0.3	-	-	-
Toluene	mg/kg dry wt	-	< 0.3	-	-	-
m&p-Xylene	mg/kg dry wt	-	< 0.5	-	-	-
o-Xylene	mg/kg dry wt	-	< 0.3	-	-	-
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
Bromomethane (Methyl Bromide)	mg/kg dry wt	-	< 0.3	-	-	-
Carbon tetrachloride	mg/kg dry wt	-	< 0.3	-	-	-
Chloroethane	mg/kg dry wt	-	< 0.3	-	-	-
Chloromethane	mg/kg dry wt	-	< 0.3	-	-	-
1,2-Dibromo-3-chloropropane	mg/kg dry wt	-	< 0.5	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	-	< 0.3	-	-	-
Dibromomethane	mg/kg dry wt	-	< 0.3	-	-	-
1,3-Dichloropropane	mg/kg dry wt	-	< 0.3	-	-	-
Dichlorodifluoromethane	mg/kg dry wt	-	< 0.5	-	-	-
1,1-Dichloroethane	mg/kg dry wt	-	< 0.3	-	-	-
1,2-Dichloroethane	mg/kg dry wt	-	< 0.5	-	-	-
1,1-Dichloroethene	mg/kg dry wt	-	< 0.3	-	-	-
cis-1,2-Dichloroethene	mg/kg dry wt	-	< 0.3	-	-	-
trans-1,2-Dichloroethene	mg/kg dry wt	-	< 0.3	-	-	-
Dichloromethane (methylene chloride)	mg/kg dry wt	-	< 3	-	-	-
1,2-Dichloropropane	mg/kg dry wt	-	< 0.3	-	-	-
1,1-Dichloropropene	mg/kg dry wt	-	< 0.3	-	-	-
cis-1,3-Dichloropropene	mg/kg dry wt	-	< 0.3	-	-	-
trans-1,3-Dichloropropene	mg/kg dry wt	-	< 0.3	-	-	-
Hexachlorobutadiene	mg/kg dry wt	-	< 0.3	-	-	-
1,1,1,2-Tetrachloroethane	mg/kg dry wt	-	< 0.3	-	-	-
1,1,2,2-Tetrachloroethane	mg/kg dry wt	-	< 0.3	-	-	-
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	-	< 0.3	-	-	-
1,1,1-Trichloroethane	mg/kg dry wt	-	< 0.3	-	-	-
1,1,2-Trichloroethane	mg/kg dry wt	-	< 0.3	-	-	-
Trichloroethene (trichloroethylene)	mg/kg dry wt	-	< 0.3	-	-	-
Trichlorofluoromethane	mg/kg dry wt	-	< 0.3	-	-	-
1,2,3-Trichloropropane	mg/kg dry wt	-	< 0.5	-	-	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	-	< 0.3	-	-	-
Vinyl chloride	mg/kg dry wt	-	< 0.3	-	-	-
Haloaromatics in VOC Soils by Headspace GC-MS						
Bromobenzene	mg/kg dry wt	-	< 0.3	-	-	-
1,3-Dichlorobenzene	mg/kg dry wt	-	< 0.3	-	-	-
4-Chlorotoluene	mg/kg dry wt	-	< 0.3	-	-	-

Sample Type: Soil						
Sample Name:		AME_HA115_0.1-0.2 22-Aug-2018	AME_HA115_0.6-0.7 22-Aug-2018	AME_HA117_0.3-0.4 22-Aug-2018	AME_HA117_1.7-1.8 22-Aug-2018	AME_HA116_0.25-0.35 22-Aug-2018
Lab Number:		2036105.1	2036105.2	2036105.3	2036105.4	2036105.6
Haloaromatics in VOC Soils by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	-	< 0.3	-	-	-
1,2-Dichlorobenzene	mg/kg dry wt	-	< 0.3	-	-	-
1,4-Dichlorobenzene	mg/kg dry wt	-	< 0.3	-	-	-
2-Chlorotoluene	mg/kg dry wt	-	< 0.3	-	-	-
1,2,3-Trichlorobenzene	mg/kg dry wt	-	< 0.3	-	-	-
1,2,4-Trichlorobenzene	mg/kg dry wt	-	< 0.3	-	-	-
1,3,5-Trichlorobenzene	mg/kg dry wt	-	< 0.3	-	-	-
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS						
n-Butylbenzene	mg/kg dry wt	-	< 0.3	-	-	-
tert-Butylbenzene	mg/kg dry wt	-	< 0.3	-	-	-
Isopropylbenzene (Cumene)	mg/kg dry wt	-	< 0.3	-	-	-
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	-	< 0.3	-	-	-
n-Propylbenzene	mg/kg dry wt	-	< 0.3	-	-	-
sec-Butylbenzene	mg/kg dry wt	-	< 0.3	-	-	-
Styrene	mg/kg dry wt	-	< 0.3	-	-	-
1,2,4-Trimethylbenzene	mg/kg dry wt	-	< 0.3	-	-	-
1,3,5-Trimethylbenzene	mg/kg dry wt	-	< 0.3	-	-	-
Ketones in VOC Soils by Headspace GC-MS						
2-Butanone (MEK)	mg/kg dry wt	-	< 50	-	-	-
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	-	< 9	-	-	-
Acetone	mg/kg dry wt	-	< 50	-	-	-
Methyl tert-butylether (MTBE)	mg/kg dry wt	-	< 0.3	-	-	-
Trihalomethanes in VOC Soils by Headspace GC-MS						
Bromodichloromethane	mg/kg dry wt	-	< 0.3	-	-	-
Bromoform (tribromomethane)	mg/kg dry wt	-	< 0.5	-	-	-
Chloroform (Trichloromethane)	mg/kg as rcvd	-	< 0.3	-	-	-
Dibromochloromethane	mg/kg dry wt	-	< 0.3	-	-	-
Other VOC in Soils by Headspace GC-MS						
Carbon disulphide	mg/kg dry wt	-	< 0.3	-	-	-
Naphthalene	mg/kg dry wt	-	< 0.3	-	-	-

Sample Name:		AME_HA116_0.8-0.9 22-Aug-2018	AME_HA119_0.15-0.25 22-Aug-2018	AME_HA119_1.2-1.3 22-Aug-2018	AME_HA120_0.4-0.5 22-Aug-2018	AME_HA123_0.2-0.3 22-Aug-2018
Lab Number:		2036105.7	2036105.10	2036105.11	2036105.13	2036105.16
Individual Tests						
Dry Matter	g/100g as rcvd	58	-	-	71	81
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	3	2	2	< 2
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.12	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	3	32	31	41	13
Total Recoverable Copper	mg/kg dry wt	9	11	12	9	8
Total Recoverable Lead	mg/kg dry wt	42	14.0	22	12.3	9.6
Total Recoverable Nickel	mg/kg dry wt	4	19	16	16	15
Total Recoverable Zinc	mg/kg dry wt	12	26	40	27	19
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.017	-	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.017	-	-	-	-
Perylene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.05	-	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.05	-	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.017	-	-	-	-
Acenaphthene	mg/kg dry wt	< 0.017	-	-	-	-

Sample Type: Soil						
Sample Name:		AME_HA116_0.8-0.9 22-Aug-2018	AME_HA119_0.15-0.25 22-Aug-2018	AME_HA119_1.2-1.3 22-Aug-2018	AME_HA120_0.4-0.5 22-Aug-2018	AME_HA123_0.2-0.3 22-Aug-2018
Lab Number:		2036105.7	2036105.10	2036105.11	2036105.13	2036105.16
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Anthracene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.017	-	-	-	-
Chrysene	mg/kg dry wt	< 0.017	-	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.017	-	-	-	-
Fluoranthene	mg/kg dry wt	< 0.017	-	-	-	-
Fluorene	mg/kg dry wt	< 0.017	-	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.017	-	-	-	-
Naphthalene	mg/kg dry wt	< 0.09	-	-	-	-
Phenanthrene	mg/kg dry wt	< 0.017	-	-	-	-
Pyrene	mg/kg dry wt	< 0.017	-	-	-	-
Total of Reported PAHs in Soil*	mg/kg	< 0.4	-	-	-	-
Pentachlorophenol Screening in Soil by LCMSMS						
Pentachlorophenol (PCP)	mg/kg dry wt	-	-	-	< 0.05	< 0.05
2,3,4,6-Tetrachlorophenol (TCP)	mg/kg dry wt	-	-	-	< 0.05	< 0.05
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 10	-	-	-	-
C10 - C14	mg/kg dry wt	< 20	-	-	-	-
C15 - C36	mg/kg dry wt	< 40	-	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	-	-	-	-

Sample Name:		AME_HA123_0.85-0.95 22-Aug-2018	AME_HA123_1.2-1.3 22-Aug-2018			
Lab Number:		2036105.17	2036105.18			
Individual Tests						
Dry Matter	g/100g as rcvd	74	71	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	< 2	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	-	-	-
Total Recoverable Chromium	mg/kg dry wt	13	11	-	-	-
Total Recoverable Copper	mg/kg dry wt	3	3	-	-	-
Total Recoverable Lead	mg/kg dry wt	5.7	4.4	-	-	-
Total Recoverable Nickel	mg/kg dry wt	7	6	-	-	-
Total Recoverable Zinc	mg/kg dry wt	18	16	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Perylene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	< 0.04	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.04	< 0.04	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Acenaphthene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Anthracene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.014	< 0.014	-	-	-

Sample Type: Soil						
Sample Name:		AME_HA123_0.85-0.95 22-Aug-2018	AME_HA123_1.2-1.3 22-Aug-2018			
Lab Number:		2036105.17	2036105.18			
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Chrysene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Fluoranthene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Fluorene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Naphthalene	mg/kg dry wt	< 0.07	< 0.07	-	-	-
Phenanthrene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Pyrene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Total of Reported PAHs in Soil*	mg/kg	< 0.4	< 0.4	-	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces an earlier certificate issued on 29 Aug 2018 at 4:50 pm
Reason for amendment: VOC analysis added to one sample.

Appendix No.1 - Chain of Custody

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 clean 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.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
TPH Oil Industry Profile + PAHscreen	Sonication in DCM extraction, SPE cleanup, GC-FID & GC-MS analysis. Tested on as received sample. US EPA 8015B/MfE Petroleum Industry Guidelines [KBIs:5786,2805,10734;2695]	-	7
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3-4, 6-7, 10-11, 13, 16-18
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample [KBIs:5782,26687,3629]	0.05 - 0.10 mg/kg dry wt	2
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	-	4, 17-18
Pentachlorophenol Screening in Soil by LCMSMS	Solvent extraction with sonication, dilution, analysis by LCMSMS with online SPE. Tested on dried sample	0.010 mg/kg dry wt	13, 16
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample [KBIs:5786,2805,10734]	8 - 60 mg/kg dry wt	2
Volatile Organic Compounds Screening in Soil by Headspace GC-MS	Sonication extraction, Headspace, GC-MS SIM analysis. Tested on as received sample [KBIs:31662,37857,37921]	-	2
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2, 4, 7, 13, 16-18
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benz(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 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + 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.	0.002 mg/kg dry wt	4, 7, 17-18

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Benzo[a]pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k) fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	4, 7, 17-18
Total of Reported PAHs in Soil*	Sonication extraction, SPE cleanup, GC-MS SIM analysis.	0.3 mg/kg	4, 7, 17-18

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Hill Laboratories
BETTER TESTING BETTER RESULTS

ANALYSIS

Job No: **203 6105**

Date Recv: 23-Aug-18 05:27

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Received by: Nathaniel Sue

3120361056

Client

Name AECOM New Zealand Limited

Address 8 Mahuhu Crescent

Phone *Fax*

Client Reference

Quote No *Order Number* 60563280/3.3.1

Primary Contact Naomi Macorison

Submitted By Suresh Nuthalapati

Charge To Aecom Auckland

Results To ☑ Mail Client ☑ Mail Submitter

☐ Fax Results

☑ Email Results Naomi.Macorison@aecom.com

ADDITIONAL INFORMATION

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:* 23/08/2018

Name: Suresh Nuthalapati

☑ *Please tick if you require COC to be faxed back* *Signature:* S.N

Received at Hill Laboratories *Date & Time:*

Name:

Signature:

Condition *Temp:*

☐ *Room Temp* ☐ *Chilled* ☐ *Frozen*

☐ Sample Analysis details checked

Signature:

Priority

☐ **Low** ☑ **Normal** ☐ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2** Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3** Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool** Swimming/Spa Pool
	TW	Trade Waste					
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL** Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM** BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required/COWL/Initial/Final flow/Total Time*
1	AME_HA115_0.1-0.2	22/08/2018	ES	Metals
2	AME_HA115_0.6-0.7	22/08/2018	ES	TPH&BTEX
3	AME_HA117_0.3-0.4	22/08/2018	ES	Metals
3	AME_HA117_1.7-1.8	22/08/2018	ES	Metals & PAH
4	AME_HA117_2.5-2.6	22/08/2018	ES	Hold cold
5	AME_HA116_0.25-0.35	22/08/2018	ES	Metals
6	AME_HA116_0.8-0.9	22/08/2018	ES	Metals, TPH & PAH
7	AME_HA116_1.6-1.7	22/08/2018	ES	Hold cold
8	AME_HA116_1.9-2.0	22/08/2018	ES	Hold cold
9	AME_HA119_0.15-0.25	22/08/2018	ES	Metals
10	AME_HA119_1.2-1.3	22/08/2018	ES	Metals

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required/COWL/Initial/Final flow/Total Time
11	AME_HA119_2.5-2.6	22/08/2018	ES	Hold cold
12	AME_HA120_0.4-0.5	22/08/2018	ES	Metals & PCP
13	AME_HA120_1.1-1.2	22/08/2018	ES	Hold cold
14	AME_HA120_1.9-2.0	22/08/2018	ES	Hold cold
15	AME_HA123_0.2-0.3	22/08/2018	ES	Metals & PCP
16	AME_HA123_0.85-0.95	22/08/2018	ES	Metals & PAH
17	AME_HA123_1.2-1.3	22/08/2018	ES	Metals & PAH
18	AME_HA123_1.5-1.6	22/08/2018	ES	Hold cold
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Report Date: 05 Mar 2019

Certificate Number: P1903011105

Analytica Laboratories
Ruakura Research Centre, 10 Bisley Road, Private Bag 3123

Client Reference: 19-05381

Dear Karla Chapman,

Re: Asbestos Soil Identification Analysis – 19-05381

5 sample(s) received on 01 Mar 2019 by Julie Saia.

The results of fibre analysis were performed by Georgina Jackson of Analytica Laboratories Limited on 05 Mar 2019.

The sample(s) were stated to be from 19-05381.

Sample analysis was performed using polarised light microscopy with dispersion staining in accordance with *AS4964-2004 Method for the qualitative identification of asbestos in soil samples.*

The results of the fibre analysis are presented in the appended table.

Should you require further information please contact Georgina Jackson.

Yours sincerely

Georgina Jackson
LABORATORY IDENTIFIER

Sample Analysis Results

Certificate Number: P1903011105
Report Date: 05 Mar 2019
Site Location: 19-05381

Note 1: The reporting limit for this analysis is 0.1g/kg (0.01%) by application of polarised light microscopy, dispersion staining and trace analysis techniques.

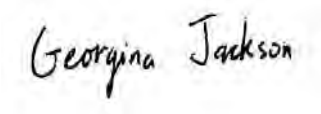
Note 2: If mineral fibres of unknown type are detected (UMF), by PLM and dispersion staining, these may or may not be asbestos fibres. To confirm the identity of this fibre, another independent analytical technique such as XRD analysis is advised.

Note 3: The samples in this report are "As Received". The laboratory does not take responsibility for the sampling procedure or accuracy of sample location description. This document may not be reproduced except in full.

Identified by:

Approved Identifier: Georgina Jackson

Reviewed by:



Key Technical Person: Georgina Jackson

Sample ID	Client Sample ID	Sample Location/Description/Dimensions	Analysis Results
S001	RH_HA1_0.2-0.4	- Non-Homogeneous Soil 144.5g	No Asbestos Detected Organic Fibres
S002	RH_HA4_0.1-0.3	- Non-Homogeneous Soil 119.5g	No Asbestos Detected Organic Fibres
S003	RH_HA4_1.8-2.0	- Non-Homogeneous Soil 124.0g	No Asbestos Detected Organic Fibres
S004	RH_HA12_0.8-1.0	- Non-Homogeneous Soil 103.5g	No Asbestos Detected Organic Fibres
S005	RH_HA7_0.2-0.4	- Non-Homogeneous Soil 134.5g	No Asbestos Detected Organic Fibres

Analytica Laboratories Limited
Unit 1, 30 Greenpark Road, Penrose, Auckland 8023

P: +64 7 974 4740
W: www.analytica.co.nz

Appendix 1: Soil Analysis Raw Data

Certificate Number: P1903011105
Report Date: 05 Mar 2019
Site Location: 19-05381

Sample ID	Client Sample ID	Total Sample Weight (g)	ACM Approximate Dimensions (g)*	Form	Trace Asbestos Detected**
S001	RH_HA1_0.2-0.4	144.5	-	-	N
S002	RH_HA4_0.1-0.3	119.5	-	-	N
S003	RH_HA4_1.8-2.0	124.0	-	-	N
S004	RH_HA12_0.8-1.0	103.5	-	-	N
S005	RH_HA7_0.2-0.4	134.5	-	-	N

* The reporting limit for this standard is 0.1g/kg
** Trace asbestos present is indicative that freely liberated respirable fibres are present and dust control measures should be implemented or increased
*** Asbestos weights listed in this table are indicative only and are outside of IANZ accreditation and is therefore not endorsed by IANZ.

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Certificate of Analysis

AECOM New Zealand Ltd
PO Box 4241, Shortland Street
Auckland 1140
Attention: Matthew Hartley
Phone: 021 562538
Email: matthew.hartley@aecom.com

Lab Reference: 19-05381
Submitted by: Max Nightingale & Chad Salbert
Date Received: 25/02/2019
Date Completed: 7/03/2019
Order Number:
Reference: 60563280

Sampling Site: Ameti Riverhills

Report Comments

Samples were collected by yourselves (or your agent) and analysed as received at Analytica Laboratories. Samples were in acceptable condition unless otherwise noted on this report.

Heavy Metals in Soil

Client Sample ID			RH_HA1_0.2-0.4	RH_HA4_0.1-0.3	RH_HA4_1.8-2.0	RH_HA10_0.3-0.5	RH_HA11_0.2-0.4
Date Sampled							
Analyte	Unit	*Reporting Limit*	19-05381-1	19-05381-12	19-05381-13	19-05381-17	19-05381-20
Arsenic	mg/kg dry wt	*0.125*	1.60	6.48	1.79	1.14	2.11
Beryllium	mg/kg dry wt	*0.013*	0.60	0.54	0.52	0.73	0.34
Boron	mg/kg dry wt	*1.25*	1.28	2.08	1.52	<1.25	1.35
Cadmium	mg/kg dry wt	*0.005*	0.024	0.15	0.031	0.035	0.045
Chromium	mg/kg dry wt	*0.125*	16.4	30.0	24.9	29.2	20.3
Copper	mg/kg dry wt	*0.075*	6.32	10.3	10.8	5.72	6.78
Lead	mg/kg dry wt	*0.05*	8.65	14.8	6.94	10.9	6.73
Mercury	mg/kg dry wt	*0.025*	0.074	0.12	0.053	0.078	0.041
Nickel	mg/kg dry wt	*0.05*	12.7	14.0	18.1	18.0	10.5
Zinc	mg/kg dry wt	*0.05*	21.7	40.4	28.1	25.9	20.0

Heavy Metals in Soil

Client Sample ID			RH_HA12-0.1-0.3	RH_HA12_0.8-1.0	RH_HA7_0.2-0.4	RH_HA9_0.2-0.4	RH_HA9_0.6-0.8
Date Sampled							
Analyte	Unit	*Reporting Limit*	19-05381-23	19-05381-24	19-05381-26	19-05381-28	19-05381-29
Arsenic	mg/kg dry wt	*0.125*	3.81	1.17	1.26	5.02	1.95
Beryllium	mg/kg dry wt	*0.013*	0.62	0.28	0.34	0.57	0.40
Boron	mg/kg dry wt	*1.25*	1.90	<1.25	<1.25	1.43	1.35
Cadmium	mg/kg dry wt	*0.005*	0.12	0.017	0.015	0.12	0.023

IANZ ACCREDITED LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation, with the exception of tests marked *, which are not accredited.

Heavy Metals in Soil

			Client Sample ID	RH_HA12-0.1-0.3	RH_HA12_0.8-1.0	RH_HA7_0.2-0.4	RH_HA9_0.2-0.4	RH_HA9_0.6-0.8
			Date Sampled					
Chromium	mg/kg dry wt	*0.125*		30.8	16.1	20.7	25.4	18.1
Copper	mg/kg dry wt	*0.075*		9.40	5.68	5.25	8.18	4.36
Lead	mg/kg dry wt	*0.05*		11.0	4.66	6.03	11.6	9.26
Mercury	mg/kg dry wt	*0.025*		0.059	0.033	0.12	0.072	0.058
Nickel	mg/kg dry wt	*0.05*		15.1	7.88	9.80	13.7	11.4
Zinc	mg/kg dry wt	*0.05*		34.0	14.6	12.8	33.7	16.8

Volatile Organic Compounds - Soil

			Client Sample ID	RH_HA1_0.2-0.4	RH_HA4_0.1-0.3	RH_HA4_1.8-2.0	RH_HA10_0.3-0.5	RH_HA11_0.2-0.4
			Date Sampled					
Analyte	Unit	*Reporting Limit*		19-05381-1	19-05381-12	19-05381-13	19-05381-17	19-05381-20
1,2-Dichloropropane	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
2,2-Dichloropropane	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Cis-1,3-Dichloropropene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Trans-1,3-Dichloropropene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,2-Dibromoethane	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Carbon disulfide	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Vinyl acetate	mg/kg dry wt	*0.50*		<0.50	<0.50	<0.50	<0.50	<0.50
4-Methyl-2-pentanone (MIBK)	mg/kg dry wt	*0.20*		<0.20	<0.20	<0.20	<0.20	<0.20
2-Hexanone	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
2-Methoxy-2-methylpropane (MTBE)	mg/kg dry wt	*0.500*		<0.500	<0.500	<0.500	<0.500	<0.500
Benzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Toluene	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Ethylbenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
m,p-Xylene	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Styrene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Isopropylbenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
n-Propylbenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,3,5-Trimethylbenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
sec-Butylbenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,2,4-Trimethylbenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
tert-Butylbenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
p-Isopropyltoluene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
n-Butylbenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Naphthalene	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Chlorobenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Bromobenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
2-Chlorotoluene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
4-Chlorotoluene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,2-Dichlorobenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,3-Dichlorobenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,4-Dichlorobenzene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,4-Dioxane	mg/kg dry wt	*1.00*		<1.00	<1.00	<1.00	<1.00	<1.00
1,2,3-Trichlorobenzene	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
1,2,4-Trichlorobenzene	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Carbon tetrachloride	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054

Volatile Organic Compounds - Soil

			Client Sample ID	RH_HA1_0.2-0.4	RH_HA4_0.1-0.3	RH_HA4_1.8-2.0	RH_HA10_0.3-0.5	RH_HA11_0.2-0.4
			Date Sampled					
Methylene chloride	mg/kg dry wt	*0.20*		<0.20	<0.20	<0.20	<0.20	<0.20
1,1-Dichloroethane	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,2-Dichloroethane	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Acetone	mg/kg dry wt	*5.0*		<5.0	<5.0	<5.0	<5.0	<5.0
Trans-1,2-Dichloroethene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Cis-1,2-Dichloroethene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,1,1-Trichloroethane	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Trichloroethene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Dibromomethane	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Iodomethane	mg/kg dry wt	*0.20*		<0.20	<0.20	<0.20	<0.20	<0.20
1,1-Dichloroethene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
2-Chloroethyl vinyl ether	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,1,2-Trichloroethane	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
1,1-Dichloropropene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,3-Dichloropropane	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Tetrachloroethene	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
1,1,1,2-Tetrachloroethane	mg/kg dry wt	*0.20*		<0.20	<0.20	<0.20	<0.20	<0.20
1,1,2,2-Tetrachloroethane	mg/kg dry wt	*0.20*		<0.20	<0.20	<0.20	<0.20	<0.20
1,2,3-Trichloropropane	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
1,2-Dibromo-3-chloropropane	mg/kg dry wt	*0.20*		<0.20	<0.20	<0.20	<0.20	<0.20
Hexachlorobutadiene	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Chloroform	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	0.09	<0.054
Bromodichloromethane	mg/kg dry wt	*0.05*		<0.064	<0.06	<0.07	<0.063	<0.054
Dibromochloromethane	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Bromoform	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Dichlorodifluoro methane	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Chloromethane	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Vinyl chloride	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Bromomethane	mg/kg dry wt	*0.50*		<0.50	<0.50	<0.50	<0.50	<0.50
Chloroethane	mg/kg dry wt	*0.50*		<0.50	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
1,2-Dichloroethane-d4 (Surrogate)	%	*1*		89.1	91.8	89.0	128.7	89.9
p-Bromofluorobenzene (Surrogate)	%	*1*		100.4	98.7	102.8	105.7	97.6
Toluene-d8 (Surrogate)	%	*1*		99.5	99.2	101.0	102.6	100.7

Volatile Organic Compounds - Soil

			Client Sample ID	RH_HA12-0.1-0.3	RH_HA12_0.8-1.0	RH_HA7_0.2-0.4	RH_HA9_0.2-0.4	RH_HA9_0.6-0.8
			Date Sampled					
Analyte	Unit	*Reporting Limit*		19-05381-23	19-05381-24	19-05381-26	19-05381-28	19-05381-29
1,2-Dichloropropane	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
2,2-Dichloropropane	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Cis-1,3-Dichloropropene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Trans-1,3-Dichloropropene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068

Volatile Organic Compounds - Soil

			Client Sample ID	RH_HA12-0.1-0.3	RH_HA12_0.8-1.0	RH_HA7_0.2-0.4	RH_HA9_0.2-0.4	RH_HA9_0.6-0.8
			Date Sampled					
1,2-Dibromoethane	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Carbon disulfide	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Vinyl acetate	mg/kg dry wt	*0.50*		<0.50	<0.50	<0.50	<0.50	<0.50
4-Methyl-2-pentanone (MIBK)	mg/kg dry wt	*0.20*		<0.20	<0.20	<0.20	<0.20	<0.20
2-Hexanone	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
2-Methoxy-2-methylpropane (MTBE)	mg/kg dry wt	*0.500*		<0.500	<0.500	<0.500	<0.500	<0.500
Benzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Toluene	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Ethylbenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
m,p-Xylene	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Styrene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Isopropylbenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
n-Propylbenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
1,3,5-Trimethylbenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
sec-Butylbenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
1,2,4-Trimethylbenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
tert-Butylbenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
p-Isopropyltoluene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
n-Butylbenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Naphthalene	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Chlorobenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Bromobenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
2-Chlorotoluene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
4-Chlorotoluene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
1,2-Dichlorobenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
1,3-Dichlorobenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
1,4-Dichlorobenzene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
1,4-Dioxane	mg/kg dry wt	*1.00*		<1.00	<1.00	<1.00	<1.00	<1.00
1,2,3-Trichlorobenzene	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
1,2,4-Trichlorobenzene	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Carbon tetrachloride	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Methylene chloride	mg/kg dry wt	*0.20*		<0.20	<0.20	<0.20	<0.20	<0.20
1,1-Dichloroethane	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
1,2-Dichloroethane	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
Acetone	mg/kg dry wt	*5.0*		<5.0	<5.0	<5.0	<5.0	<5.0
Trans-1,2-Dichloroethene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Cis-1,2-Dichloroethene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
1,1,1-Trichloroethane	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Trichloroethene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Dibromomethane	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Iodomethane	mg/kg dry wt	*0.20*		<0.20	<0.20	<0.20	<0.20	<0.20
1,1-Dichloroethene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
2-Chloroethyl vinyl ether	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
1,1,2-Trichloroethane	mg/kg dry wt	*0.10*		<0.10	<0.10	<0.10	<0.10	<0.10
1,1-Dichloropropene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
1,3-Dichloropropane	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
Tetrachloroethene	mg/kg dry wt	*0.05*		<0.058	<0.066	<0.057	<0.064	<0.068
1,1,1,2-Tetrachloroethane	mg/kg dry wt	*0.20*		<0.20	<0.20	<0.20	<0.20	<0.20

Volatile Organic Compounds - Soil

Client Sample ID			RH_HA12-0.1-0.3	RH_HA12_0.8-1.0	RH_HA7_0.2-0.4	RH_HA9_0.2-0.4	RH_HA9_0.6-0.8
Date Sampled							
1,1,2,2-Tetrachloroethane	mg/kg dry wt	*0.20*	<0.20	<0.20	<0.20	<0.20	<0.20
1,2,3-Trichloropropane	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
1,2-Dibromo-3-chloropropane	mg/kg dry wt	*0.20*	<0.20	<0.20	<0.20	<0.20	<0.20
Hexachlorobutadiene	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
Chloroform	mg/kg dry wt	*0.05*	<0.058	<0.066	<0.057	<0.064	<0.068
Bromodichloromethane	mg/kg dry wt	*0.05*	<0.058	<0.066	<0.057	<0.064	<0.068
Dibromochloromethane	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
Bromoform	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
Dichlorodifluoro methane	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
Chloromethane	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
Vinyl chloride	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
Bromomethane	mg/kg dry wt	*0.50*	<0.50	<0.50	<0.50	<0.50	<0.50
Chloroethane	mg/kg dry wt	*0.50*	<0.50	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane	mg/kg dry wt	*0.10*	<0.10	<0.10	<0.10	<0.10	<0.10
1,2-Dichloroethane-d4 (Surrogate)	%	*1*	90.0	95.2	91.2	89.2	93.6
p-Bromofluorobenzene (Surrogate)	%	*1*	96.6	98.4	96.8	100.3	101.2
Toluene-d8 (Surrogate)	%	*1*	99.2	96.1	101.0	100.5	100.5

Semivolatile Organic Compounds - Soil

Client Sample ID			RH_HA1_0.2-0.4	RH_HA4_0.1-0.3	RH_HA4_1.8-2.0	RH_HA10_0.3-0.5	RH_HA11_0.2-0.4
Date Sampled							
Analyte	Unit	*Reporting Limit*	19-05381-1	19-05381-12	19-05381-13	19-05381-17	19-05381-20
Phenol	mg/kg dry wt	*0.3*	<0.3	<0.3	<0.3	<0.3	<0.3
2-Chlorophenol	mg/kg dry wt	*0.3*	<0.3	<0.3	<0.3	<0.3	<0.3
2-Methylphenol	mg/kg dry wt	*0.3*	<0.3	<0.3	<0.3	<0.3	<0.3
2-Nitrophenol	mg/kg dry wt	*1.0*	<1.0	<1.0	<1.0	<1.0	<1.0
2,4-Dimethylphenol	mg/kg dry wt	*0.3*	<0.3	<0.3	<0.3	<0.3	<0.3
2,4-Dichlorophenol	mg/kg dry wt	*0.3*	<0.3	<0.3	<0.3	<0.3	<0.3
2,6-Dichlorophenol	mg/kg dry wt	*0.3*	<0.3	<0.3	<0.3	<0.3	<0.3
4-Chloro-3-methylphenol	mg/kg dry wt	*0.3*	<0.3	<0.3	<0.3	<0.3	<0.3
2,4,5-Trichlorophenol	mg/kg dry wt	*5*	<5	<5	<5	<5	<5
2,4,6-Trichlorophenol	mg/kg dry wt	*5*	<5.0	<5.0	<5.0	<5.0	<5.0
2,3,4,6-Tetrachlorophenol	mg/kg dry wt	*5*	<5	<5	<5	<5	<5
4-Methylphenol	mg/kg dry wt	*0.3*	<0.3	<0.3	<0.3	<0.3	<0.3
4-Nitrophenol	mg/kg dry wt	*5*	<5	<5	<5	<5	<5
Naphthalene	mg/kg dry wt	*0.1*	<0.1	<0.1	<0.1	<0.1	<0.1
2-Methylnaphthalene	mg/kg dry wt	*0.1*	<0.1	<0.1	<0.1	<0.1	<0.1
2-Chloronaphthalene	mg/kg dry wt	*0.3*	<0.3	<0.3	<0.3	<0.3	<0.3
Acenaphthene	mg/kg dry wt	*0.1*	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg dry wt	*0.1*	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg dry wt	*0.1*	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg dry wt	*0.1*	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg dry wt	*0.1*	<0.1	<0.1	<0.1	<0.1	<0.1
2-Phenylphenol	mg/kg dry wt	*0.5*	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	mg/kg dry wt	*0.1*	<0.1	<0.1	<0.1	<0.1	<0.1

Semivolatile Organic Compounds - Soil

			Client Sample ID	RH_HA1_0.2-0.4	RH_HA4_0.1-0.3	RH_HA4_1.8-2.0	RH_HA10_0.3-0.5	RH_HA11_0.2-0.4
			Date Sampled					
Benzo[a]anthracene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Bis(2-ethylhexyl) adipate	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo[b]fluoranthene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[k]fluoranthene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[a]pyrene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo[a,h]anthracene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[g,h,i]perylene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg dry wt	*0.2*		<0.2	<0.2	<0.2	<0.2	<0.2
Benzo[a]pyrene TEQ (LOR)	mg/kg dry wt	*0.1*		0.2	0.2	0.2	0.2	0.2
Benzo[a]pyrene TEQ (Zero)	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
4,4'-DDD	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4,4'-DDE	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4,4'-DDT	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
alpha-BHC	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
beta-BHC	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
gamma-BHC	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
delta-BHC	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Aldrin	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
cis-Chlordane	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
trans-Chlordane	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Dieldrin	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan I	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Endosulfan II	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulphate	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Endrin ketone	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Heptachlor	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Heptachlor epoxide	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Methoxychlor	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-ethylhexyl) phthalate	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Butyl benzyl phthalate	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Di-n-butyl phthalate	mg/kg dry wt	*1*		<1	<1	<1	<1	<1
Di-n-octyl phthalate	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Diethyl phthalate	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Dimethyl phthalate	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
N-Nitrosodiphenylamine	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
N-Nitrosodi-n-propylamine	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
2,4-Dinitrotoluene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
2,6-Dinitrotoluene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Azobenzene	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Isophorone	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Nitrobenzene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4-Bromophenyl phenyl ether	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4-Chlorophenyl phenyl ether	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3

Semivolatile Organic Compounds - Soil

			Client Sample ID	RH_HA1_0.2-0.4	RH_HA4_0.1-0.3	RH_HA4_1.8-2.0	RH_HA10_0.3-0.5	RH_HA11_0.2-0.4
			Date Sampled					
Bis(2-Chloroethyl) ether	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Bis(2-Chloro-1-methylethyl) ether	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Bis(2-Chloroethoxy) methane	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
1,2-Dichlorobenzene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
1,3-Dichlorobenzene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
1,4-Dichlorobenzene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Hexachlorobutadiene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Hexachlorocyclopentadiene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Hexachloroethane	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4-Chloroaniline	mg/kg dry wt	*1.0*		<1.0	<1.0	<1.0	<1.0	<1.0
2-Nitroaniline	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
3-Nitroaniline	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Aniline	mg/kg dry wt	*1.0*		<1.0	<1.0	<1.0	<1.0	<1.0
3,3'-Dichlorobenzidine	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzofuran	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Methyl methanesulfonate	mg/kg dry wt	*1.0*		<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl methanesulfonate	mg/kg dry wt	*1*		<1	<1	<1	<1	<1
Benzyl alcohol	mg/kg dry wt	*1*		<1	<1	<1	<1	<1
Phenol-d5 (Surrogate)	%	*1*		87.4	87.9	84.2	85.6	95.1
2-Fluorophenol (Surrogate)	%	*1*		94.3	97.2	87.8	91.2	99.6
2-Fluorobiphenyl (Surrogate)	%	*1*		102.7	97.5	95.8	103.2	98.1
2,4,6-Tribromophenol (Surrogate)	%	*1*		26.0	43.3	56.1	42.3	50.2
p-Terphenyl-d14 (Surrogate)	%	*1*		88.7	95.9	97.8	95.7	97.0
Nitrobenzene-d5 (Surrogate)	%	*1*		87.8	93.2	92.4	91.6	89.4

Semivolatile Organic Compounds - Soil

			Client Sample ID	RH_HA12-0.1-0.3	RH_HA12_0.8-1.0	RH_HA7_0.2-0.4	RH_HA9_0.2-0.4	RH_HA9_0.6-0.8
			Date Sampled					
Analyte	Unit	*Reporting Limit*		19-05381-23	19-05381-24	19-05381-26	19-05381-28	19-05381-29
Phenol	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
2-Chlorophenol	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
2-Methylphenol	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
2-Nitrophenol	mg/kg dry wt	*1.0*		<1.0	<1.0	<1.0	<1.0	<1.0
2,4-Dimethylphenol	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
2,4-Dichlorophenol	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
2,6-Dichlorophenol	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4-Chloro-3-methylphenol	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
2,4,5-Trichlorophenol	mg/kg dry wt	*5*		<5	<5	<5	<5	<5
2,4,6-Trichlorophenol	mg/kg dry wt	*5*		<5.0	<5.0	<5.0	<5.0	<5.0
2,3,4,6-Tetrachlorophenol	mg/kg dry wt	*5*		<5	<5	<5	<5	<5
4-Methylphenol	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4-Nitrophenol	mg/kg dry wt	*5*		<5	<5	<5	<5	<5

Semivolatile Organic Compounds - Soil

			Client Sample ID	RH_HA12-0.1-0.3	RH_HA12_0.8-1.0	RH_HA7_0.2-0.4	RH_HA9_0.2-0.4	RH_HA9_0.6-0.8
			Date Sampled					
Naphthalene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
2-Methylnaphthalene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
2-Chloronaphthalene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Acenaphthene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
2-Phenylphenol	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[a]anthracene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Bis(2-ethylhexyl) adipate	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo[b]fluoranthene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[k]fluoranthene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[a]pyrene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo[a,h]anthracene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo[g,h,i]perylene	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg dry wt	*0.2*		<0.2	<0.2	<0.2	<0.2	<0.2
Benzo[a]pyrene TEQ (LOR)	mg/kg dry wt	*0.1*		0.2	0.2	0.2	0.2	0.2
Benzo[a]pyrene TEQ (Zero)	mg/kg dry wt	*0.1*		<0.1	<0.1	<0.1	<0.1	<0.1
4,4'-DDD	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4,4'-DDE	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4,4'-DDT	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
alpha-BHC	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
beta-BHC	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
gamma-BHC	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
delta-BHC	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Aldrin	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
cis-Chlordane	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
trans-Chlordane	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Dieldrin	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan I	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Endosulfan II	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulphate	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Endrin ketone	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Heptachlor	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Heptachlor epoxide	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Methoxychlor	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-ethylhexyl) phthalate	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Butyl benzyl phthalate	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Di-n-butyl phthalate	mg/kg dry wt	*1*		<1	<1	<1	<1	<1
Di-n-octyl phthalate	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Diethyl phthalate	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Dimethyl phthalate	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
N-Nitrosodiphenylamine	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3

Semivolatile Organic Compounds - Soil

			Client Sample ID	RH_HA12-0.1-0.3	RH_HA12_0.8-1.0	RH_HA7_0.2-0.4	RH_HA9_0.2-0.4	RH_HA9_0.6-0.8
			Date Sampled					
N-Nitrosodi-n-propylamine	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
2,4-Dinitrotoluene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
2,6-Dinitrotoluene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Azobenzene	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Isophorone	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Nitrobenzene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4-Bromophenyl phenyl ether	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4-Chlorophenyl phenyl ether	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Bis(2-Chloroethyl) ether	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Bis(2-Chloro-1-methylethyl) ether	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Bis(2-Chloroethoxy) methane	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
1,2-Dichlorobenzene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
1,3-Dichlorobenzene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
1,4-Dichlorobenzene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Hexachlorobutadiene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Hexachlorocylopentadiene	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Hexachloroethane	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
4-Chloroaniline	mg/kg dry wt	*1.0*		<1.0	<1.0	<1.0	<1.0	<1.0
2-Nitroaniline	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
3-Nitroaniline	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Aniline	mg/kg dry wt	*1.0*		<1.0	<1.0	<1.0	<1.0	<1.0
3,3'-Dichlorobenzidine	mg/kg dry wt	*0.5*		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzofuran	mg/kg dry wt	*0.3*		<0.3	<0.3	<0.3	<0.3	<0.3
Methyl methanesulfonate	mg/kg dry wt	*1.0*		<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl methanesulfonate	mg/kg dry wt	*1*		<1	<1	<1	<1	<1
Benzyl alcohol	mg/kg dry wt	*1*		<1	<1	<1	<1	<1
Phenol-d5 (Surrogate)	%	*1*		88.7	90.0	89.4	88.9	80.1
2-Fluorophenol (Surrogate)	%	*1*		89.5	103.1	94.7	95.9	89.2
2-Fluorobiphenyl (Surrogate)	%	*1*		95.6	98.0	98.0	97.2	97.9
2,4,6-Tribromophenol (Surrogate)	%	*1*		47.8	51.9	49.3	56.6	55.3
p-Terphenyl-d14 (Surrogate)	%	*1*		96.0	96.3	95.2	97.0	95.1
Nitrobenzene-d5 (Surrogate)	%	*1*		92.3	94.5	92.3	90.8	93.7

Total Petroleum Hydrocarbons - Soil

			Client Sample ID	RH_HA1_0.2-0.4	RH_HA4_0.1-0.3	RH_HA4_1.8-2.0	RH_HA10_0.3-0.5	RH_HA11_0.2-0.4
			Date Sampled					
Analyte	Unit	*Reporting Limit*		19-05381-1	19-05381-12	19-05381-13	19-05381-17	19-05381-20
C7-C9	mg/kg dry wt	*10*		<10	<10	<10	<10	<10
C10-C14	mg/kg dry wt	*15*		<15	<15	<15	<15	<15
C15-C36	mg/kg dry wt	*25*		<25	<25	<25	<25	<25
C7-C36 (Total)	mg/kg dry wt	*50*		<50	<50	<50	<50	<50

Total Petroleum Hydrocarbons - Soil

Client Sample ID			RH_HA12-0.1-0.3	RH_HA12_0.8-1.0	RH_HA7_0.2-0.4	RH_HA9_0.2-0.4	RH_HA9_0.6-0.8
Date Sampled							
Analyte	Unit	*Reporting Limit*	19-05381-23	19-05381-24	19-05381-26	19-05381-28	19-05381-29
C7-C9	mg/kg dry wt	*10*	<10	<10	<10	<10	<10
C10-C14	mg/kg dry wt	*15*	<15	<15	<15	<15	<15
C15-C36	mg/kg dry wt	*25*	<25	<25	<25	62	<25
C7-C36 (Total)	mg/kg dry wt	*50*	<50	<50	<50	62	<50

Moisture Content

Client Sample ID			RH_HA1_0.2-0.4	RH_HA4_0.1-0.3	RH_HA4_1.8-2.0	RH_HA10_0.3-0.5	RH_HA11_0.2-0.4
Date Sampled							
Analyte	Unit	*Reporting Limit*	19-05381-1	19-05381-12	19-05381-13	19-05381-17	19-05381-20
Moisture Content	%	*1*	19	15	29	20	13

Moisture Content

Client Sample ID			RH_HA12-0.1-0.3	RH_HA12_0.8-1.0	RH_HA7_0.2-0.4	RH_HA9_0.2-0.4	RH_HA9_0.6-0.8
Date Sampled							
Analyte	Unit	*Reporting Limit*	19-05381-23	19-05381-24	19-05381-26	19-05381-28	19-05381-29
Moisture Content	%	*1*	12	18	14	13	23

Asbestos in Soil (Qualitative)

Client Sample ID			RH_HA1_0.2-0.4	RH_HA4_0.1-0.3	RH_HA4_1.8-2.0	RH_HA12_0.8-1.0	RH_HA7_0.2-0.4
Date Sampled							
Analyte	Unit	*Reporting Limit*	19-05381-1	19-05381-12	19-05381-13	19-05381-24	19-05381-26
Asbestos in Soil (Qualitative)			Complete	Complete	Complete	Complete	Complete

Total Heavy Metals in Water

Client Sample ID			RH_MW1	RH_MWD
Date Sampled				
Analyte	Unit	*Reporting Limit*	19-05381-30	19-05381-31
Arsenic	g/m^3	*0.0005*	0.0019	0.0018
Beryllium	g/m^3	*0.00001*	0.00006	0.00005
Boron	g/m^3	*0.005*	0.046	0.045
Cadmium	g/m^3	*0.00001*	0.00002	0.00002
Chromium	g/m^3	*0.0002*	0.0030	0.0018
Copper	g/m^3	*0.0002*	0.0051	0.0053
Lead	g/m^3	*0.00005*	0.00161	0.00139
Mercury	g/m^3	*0.0001*	<0.0001	<0.0001
Nickel	g/m^3	*0.0002*	0.0039	0.0034
Zinc	g/m^3	*0.001*	0.011	0.015

Semivolatile Organic Compounds - Water

			Client Sample ID	RH_MW1	RH_MWD
			Date Sampled		
Analyte	Unit	*Reporting Limit*		19-05381-30	19-05381-31
Phenol	g/m^3	*0.002*		<0.0020	<0.0020
2-Chlorophenol	g/m^3	*0.0003*		<0.0003	<0.0003
2-Methylphenol	g/m^3	*0.0003*		<0.0003	<0.0003
2-Nitrophenol	g/m^3	*0.0005*		<0.0005	<0.0005
2,4-Dimethylphenol	g/m^3	*0.0010*		<0.0010	<0.0010
2,4-Dichlorophenol	g/m^3	*0.0003*		<0.0003	<0.0003
2,6-Dichlorophenol	g/m^3	*0.0003*		<0.0003	<0.0003
4-Chloro-3-methylphenol	g/m^3	*0.0003*		<0.0003	<0.0003
2,4,5-Trichlorophenol	g/m^3	*0.0005*		<0.0005	<0.0005
2,4,6-Trichlorophenol	g/m^3	*0.0005*		<0.0005	<0.0005
2,3,4,6-Tetrachlorophenol	g/m^3	*0.0003*		<0.0003	<0.0003
4-Methylphenol	g/m^3	*0.0003*		<0.0003	<0.0003
4-Nitrophenol	g/m^3	*0.0010*		<0.0010	<0.0010
Naphthalene	g/m^3	*0.0003*		<0.0003	<0.0003
2-Methylnaphthalene	g/m^3	*0.0003*		<0.0003	<0.0003
2-Chloronaphthalene	g/m^3	*0.0003*		<0.0003	<0.0003
Acenaphthylene	g/m^3	*0.0003*		<0.0003	<0.0003
Acenaphthene	g/m^3	*0.0003*		<0.0003	<0.0003
Fluorene	g/m^3	*0.0003*		<0.0003	<0.0003
Phenanthrene	g/m^3	*0.0003*		<0.0003	<0.0003
Anthracene	g/m^3	*0.0003*		<0.0003	<0.0003
2-Phenylphenol	g/m^3	*0.005*		<0.005	<0.005
Fluoranthene	g/m^3	*0.0003*		<0.0003	<0.0003
Benzo[a]anthracene	g/m^3	*0.0003*		<0.0003	<0.0003
Chrysene	g/m^3	*0.0003*		<0.0003	<0.0003
Bis(2-ethylhexyl) adipate	g/m^3	*0.005*		<0.005	<0.005
Benzo[b]fluoranthene	g/m^3	*0.0005*		<0.0005	<0.0005
Benzo[k]fluoranthene	g/m^3	*0.0005*		<0.0005	<0.0005
Benzo[a]pyrene	g/m^3	*0.0003*		<0.0003	<0.0003
Indeno(1,2,3-c,d)pyrene	g/m^3	*0.0003*		<0.0003	<0.0003
Dibenzo[a,h]anthracene	g/m^3	*0.0003*		<0.0003	<0.0003
Benzo[g,h,i]perylene	g/m^3	*0.0003*		<0.0003	<0.0003
Pyrene	g/m^3	*0.0003*		<0.0003	<0.0003
Benzo[a]pyrene TEQ (LOR)	g/m^3	*0.0003*		0.0008	0.0008
Benzo[a]pyrene TEQ (Zero)	g/m^3	*0.0003*		<0.0003	<0.0003
4,4'-DDD	g/m^3	*0.0005*		<0.0005	<0.0005
4,4'-DDE	g/m^3	*0.0003*		<0.0003	<0.0003
4,4'-DDT	g/m^3	*0.0010*		<0.0010	<0.0010
alpha-BHC	g/m^3	*0.0003*		<0.0003	<0.0003
beta-BHC	g/m^3	*0.0003*		<0.0003	<0.0003
gamma-BHC	g/m^3	*0.0003*		<0.0003	<0.0003
delta-BHC	g/m^3	*0.0003*		<0.0003	<0.0003
Aldrin	g/m^3	*0.0005*		<0.0005	<0.0005
cis-Chlordane	g/m^3	*0.0003*		<0.0003	<0.0003
trans-Chlordane	g/m^3	*0.0005*		<0.0005	<0.0005
Dieldrin	g/m^3	*0.0005*		<0.0005	<0.0005
Endosulfan I	g/m^3	*0.0010*		<0.0010	<0.0010
Endosulfan II	g/m^3	*0.0010*		<0.0010	<0.0010
Endosulfan sulphate	g/m^3	*0.0005*		<0.0005	<0.0005

Semivolatile Organic Compounds - Water

		Client Sample ID	RH_MW1	RH_MWD
		Date Sampled		
Endrin	g/m³	*0.0010*	<0.0010	<0.0010
Endrin aldehyde	g/m³	*0.0003*	<0.0003	<0.0003
Endrin ketone	g/m³	*0.0003*	<0.0003	<0.0003
Hexachlorobenzene	g/m³	*0.0003*	<0.0003	<0.0003
Heptachlor	g/m³	*0.0003*	<0.0003	<0.0003
Heptachlor epoxide	g/m³	*0.0003*	<0.0003	<0.0003
Methoxychlor	g/m³	*0.0003*	<0.0003	<0.0003
Bis(2-ethylhexyl) phthalate	g/m³	*0.010*	<0.010	<0.010
Butyl benzyl phthalate	g/m³	*0.0010*	<0.0010	<0.0010
Di-n-butyl phthalate	g/m³	*0.010*	<0.010	<0.010
Di-n-octyl phthalate	g/m³	*0.0005*	<0.0005	<0.0005
Diethyl phthalate	g/m³	*0.0020*	<0.0020	<0.0020
Dimethyl phthalate	g/m³	*0.0003*	<0.002	<0.002
N-Nitrosodiphenylamine	g/m³	*0.0003*	<0.0003	<0.0003
N-Nitrosodi-n-propylamine	g/m³	*0.0003*	<0.0003	<0.0003
2,4-Dinitrotoluene	g/m³	*0.0010*	<0.0010	<0.0010
2,6-Dinitrotoluene	g/m³	*0.0010*	<0.0010	<0.0010
Azobenzene	g/m³	*0.0003*	<0.0003	<0.0003
Isophorone	g/m³	*0.0003*	<0.0003	<0.0003
Nitrobenzene	g/m³	*0.0003*	<0.0003	<0.0003
4-Bromophenyl phenyl ether	g/m³	*0.0003*	<0.0003	<0.0003
4-Chlorophenyl phenyl ether	g/m³	*0.0003*	<0.0003	<0.0003
Bis(2-Chloroethyl) ether	g/m³	*0.0003*	<0.0003	<0.0003
Bis(2-Chloro-1-methylethyl) ether	g/m³	*0.0003*	<0.0003	<0.0003
Bis(2-Chloroethoxy) methane	g/m³	*0.0003*	<0.0003	<0.0003
1,2-Dichlorobenzene	g/m³	*0.0003*	<0.0003	<0.0003
1,3-Dichlorobenzene	g/m³	*0.0003*	<0.0003	<0.0003
1,4-Dichlorobenzene	g/m³	*0.0003*	<0.0003	<0.0003
Hexachlorobutadiene	g/m³	*0.0003*	<0.0003	<0.0003
Hexachlorocylopentadiene	g/m³	*0.0003*	<0.0003	<0.0003
Hexachloroethane	g/m³	*0.0003*	<0.0003	<0.0003
4-Chloroaniline	g/m³	*0.0005*	<0.0005	<0.0005
2-Nitroaniline	g/m³	*0.0005*	<0.0005	<0.0005
3-Nitroaniline	g/m³	*0.0003*	<0.0003	<0.0003
3,3'-Dichlorobenzidine	g/m³	*0.0005*	<0.0005	<0.0005
Dibenzofuran	g/m³	*0.0003*	<0.0003	<0.0003
Methyl methanesulfonate	g/m³	*0.0003*	<0.0003	<0.0003
Ethyl methanesulfonate	g/m³	*0.010*	<0.0100	<0.0100
Benzyl alcohol	g/m³	*0.0003*	<0.0003	<0.0003
Phenol-d5 (Surrogate)	%	*1*	82.8	93.0
2-Fluorophenol (Surrogate)	%	*1*	102.5	115.1
2-Fluorobiphenyl (Surrogate)	%	*1*	99.0	95.7
2,4,6-Tribromophenol (Surrogate)	%	*1*	230.1	240.8
p-Terphenyl-d14 (Surrogate)	%	*1*	148.8	139.8
Nitrobenzene-d5 (Surrogate)	%	*1*	123.2	127.1

Volatile Organic Compounds - Water

			Client Sample ID	RH_MW1	RH_MWD
			Date Sampled		
Analyte	Unit	*Reporting Limit*		19-05381-30	19-05381-31
1,2-Dichloropropane	g/m^3	*0.0005*		<0.0005	<0.0005
2,2-Dichloropropane	g/m^3	*0.002*		<0.002	<0.002
Cis-1,3-Dichloropropene	g/m^3	*0.001*		<0.001	<0.001
Trans-1,3-Dichloropropene	g/m^3	*0.001*		<0.001	<0.001
1,2-Dibromoethane	g/m^3	*0.0005*		<0.0005	<0.0005
Carbon disulfide	g/m^3	*0.001*		<0.001	<0.001
Vinyl acetate	g/m^3	*0.008*		<0.008	<0.008
4-Methyl-2-pentanone (MIBK)	g/m^3	*0.001*		<0.001	<0.001
2-Hexanone	g/m^3	*0.008*		<0.008	<0.008
2-Methoxy-2-methylpropane (MTBE)	g/m^3	*0.005*		<0.005	<0.005
Benzene	g/m^3	*0.001*		<0.001	<0.001
Toluene	g/m^3	*0.001*		<0.001	<0.001
Ethylbenzene	g/m^3	*0.001*		<0.001	<0.001
m,p-Xylene	g/m^3	*0.001*		<0.001	<0.001
o-Xylene	g/m^3	*0.001*		<0.001	<0.001
Styrene	g/m^3	*0.001*		<0.001	<0.001
Isopropylbenzene	g/m^3	*0.001*		<0.001	<0.001
n-Propylbenzene	g/m^3	*0.001*		<0.001	<0.001
1,3,5-Trimethylbenzene	g/m^3	*0.001*		<0.001	<0.001
sec-Butylbenzene	g/m^3	*0.001*		<0.001	<0.001
1,2,4-Trimethylbenzene	g/m^3	*0.001*		<0.001	<0.001
tert-Butylbenzene	g/m^3	*0.001*		<0.001	<0.001
p-Isopropyltoluene	g/m^3	*0.001*		<0.001	<0.001
n-Butylbenzene	g/m^3	*0.001*		<0.001	<0.001
Naphthalene	g/m^3	*0.002*		<0.002	<0.002
Chlorobenzene	g/m^3	*0.0005*		<0.0005	<0.0005
Bromobenzene	g/m^3	*0.001*		<0.001	<0.001
2-Chlorotoluene	g/m^3	*0.001*		<0.001	<0.001
4-Chlorotoluene	g/m^3	*0.001*		<0.001	<0.001
1,2-Dichlorobenzene	g/m^3	*0.001*		<0.001	<0.001
1,3-Dichlorobenzene	g/m^3	*0.001*		<0.001	<0.001
1,4-Dichlorobenzene	g/m^3	*0.001*		<0.001	<0.001
1,4-Dioxane	g/m^3	*0.02*		<0.02	<0.02
1,2,3-Trichlorobenzene	g/m^3	*0.002*		<0.002	<0.002
1,2,4-Trichlorobenzene	g/m^3	*0.002*		<0.002	<0.002
Carbon tetrachloride	g/m^3	*0.001*		<0.001	<0.001
Methylene chloride	g/m^3	*0.002*		<0.002	<0.002
1,1-Dichloroethane	g/m^3	*0.0005*		<0.0005	<0.0005
1,2-Dichloroethane	g/m^3	*0.001*		<0.001	<0.001
Acetone	g/m^3	*0.25*		<0.25	<0.25
Trans-1,2-Dichloroethene	g/m^3	*0.001*		<0.001	<0.001
Cis-1,2-Dichloroethene	g/m^3	*0.001*		<0.001	<0.001
1,1,1-Trichloroethane	g/m^3	*0.0005*		<0.0005	<0.0005
Trichloroethene	g/m^3	*0.0005*		<0.0005	<0.0005
Dibromomethane	g/m^3	*0.001*		<0.001	<0.001
Iodomethane	g/m^3	*0.0005*		<0.0005	<0.0005
1,1-Dichloroethene	g/m^3	*0.001*		<0.001	<0.001

Volatile Organic Compounds - Water

	Client Sample ID		RH_MW1	RH_MWD
	Date Sampled			
2-Chloroethyl vinyl ether	g/m³	*0.008*	<0.008	<0.008
1,1,2-Trichloroethane	g/m³	*0.001*	<0.001	<0.001
1,1-Dichloropropene	g/m³	*0.001*	<0.001	<0.001
1,3-Dichloropropane	g/m³	*0.0005*	<0.0005	<0.0005
Tetrachloroethene	g/m³	*0.001*	<0.001	<0.001
1,1,1,2-Tetrachloroethane	g/m³	*0.001*	<0.001	<0.001
1,1,2,2-Tetrachloroethane	g/m³	*0.005*	<0.005	<0.005
1,2,3-Trichloropropane	g/m³	*0.001*	<0.001	<0.001
1,2-Dibromo-3-chloropropane	g/m³	*0.008*	<0.008	<0.008
Hexachlorobutadiene	g/m³	*0.002*	<0.002	<0.002
Chloroform	g/m³	*0.001*	<0.001	<0.001
Bromodichloromethane	g/m³	*0.0005*	<0.0005	<0.0005
Dibromochloromethane	g/m³	*0.001*	<0.001	<0.001
Bromoform	g/m³	*0.001*	<0.001	<0.001
Dichlorodifluoro methane	g/m³	*0.001*	<0.001	<0.001
Chloromethane	g/m³	*0.001*	<0.001	<0.001
Vinyl chloride	g/m³	*0.001*	<0.001	<0.001
Bromomethane	g/m³	*0.008*	<0.008	<0.008
Chloroethane	g/m³	*0.008*	<0.008	<0.008
Trichlorofluoromethane	g/m³	*0.001*	<0.001	<0.001
1,2-Dichloroethane-d4 (Surrogate)	%	*1*	96.6	94.2
p-Bromofluorobenzene (Surrogate)	%	*1*	100.1	101.8
Toluene-d8 (Surrogate)	%	*1*	99.2	100.2

Total Petroleum Hydrocarbons - Water

	Client Sample ID		RH_MW1	RH_MWD	RH_MWB1	RH_MWB2
	Date Sampled					
Analyte	Unit	*Reporting Limit*	19-05381-30	19-05381-31	19-05381-32	19-05381-33
C7-C9	g/m³	*0.2*	<0.2	<0.2	<0.2	<0.2
C10-C14	g/m³	*0.2*	<0.2	<0.2	<0.2	<0.2
C15-C36	g/m³	*0.3*	<0.3	<0.3	<0.3	<0.3
C7-C36 (Total)	g/m³	*0.5*	<0.5	<0.5	<0.5	<0.5

Method Summary

Elements in Soil	Acid digestion followed by ICP-MS analysis. (US EPA method 200.8). Results are based on a dried sample passed through a 2 mm sieve.
VOC in Soil	Methanol extraction using US-EPA 5030A, analysis by US-EPA Method 5021A (modified) using GCMS with headspace sample introduction.
SVOC in Soil	Solvent extraction, followed by GC-MS analysis.(In-house based on US EPA 8270).
TPH in Soil	Solvent extraction, silica cleanup, followed by GC-FID analysis. (C7-C36)
Moisture	Moisture content is determined gravimetrically by drying at 103 °C.
Recoverable Trace Elements	Samples were analysed as received by the laboratory using ICP-MS following an acid digestion. US EPA method 200.8.

Method Summary

SVOC in Water	Dichloromethane extraction followed by GC-MS analysis. (In-house method based on US-EPA 8270).
VOC in Water	Analysis by US-EPA Method 5021A (modified) using GCMS analysis with headspace sample introduction.
TPH in Water	Solvent extraction, silica cleanup, followed by GC-FID analysis (C7-C36). MFE Petroleum Industry Guidelines.

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Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	1979897 SPv1
Contact:	N Macorison	**Date Received:**	11-May-2018
	C/- AECOM New Zealand Limited	**Date Reported:**	22-May-2018
	PO Box 4241	**Quote No:**	81048
	Shortland Street	**Order No:**	60563280/3.7.5
	Auckland 1140	**Client Reference:**	60563280/3.7.5
		Submitted By:	Max Nightingale

Sample Type: Soil

Sample Name:		SAH010_0.2 09-May-2018 8:10 am	SAH010_1.6 09-May-2018 9:00 am	SAH011_0.5 09-May-2018 11:45 am	SAH011_1.0 [12:00-12:15] 09-May-2018	SAH012_0.5 09-May-2018 1:00 pm
Lab Number:		1979897.1	1979897.4	1979897.6	1979897.7	1979897.10
Individual Tests						
Dry Matter	g/100g as rcvd	72	-	76	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	2	3	2	3	< 2
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	0.24
Total Recoverable Chromium	mg/kg dry wt	16	26	23	22	41
Total Recoverable Copper	mg/kg dry wt	7	12	11	9	14
Total Recoverable Lead	mg/kg dry wt	8.3	9.6	6.8	6.8	20
Total Recoverable Nickel	mg/kg dry wt	8	12	10	9	34
Total Recoverable Zinc	mg/kg dry wt	16	35	27	22	53
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	-	-	814.8	-	827.0
Dry Weight	g	-	-	605.2	-	538.2
Ashed Weight	g	-	-	592.2	-	512.4
Moisture	%	-	-	26	-	35
Dry Sample Fraction >10mm	g ashed wt	-	-	< 0.1	-	75.0
Sample Fraction <10mm to >2mm	g ashed wt	-	-	348.3	-	227.9
Sample Fraction <2mm	g ashed wt	-	-	242.2	-	207.5
<2mm Subsample Weight	g ashed wt	-	-	55.2	-	53.4
Asbestos Presence / Absence		-	-	Asbestos NOT detected.	-	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g ashed wt	-	-	< 0.00001	-	< 0.00001
Asbestos in ACM as % of Total Sample*	% w/w	-	-	< 0.001	-	< 0.001
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	-	-	< 0.00001	-	< 0.00001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	-	-	< 0.001	-	< 0.001
Weight of Asbestos as Asbestos Fines (Friable)*	g ashed wt	-	-	< 0.00001	-	< 0.00001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	-	-	< 0.001	-	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	-	-	< 0.001	-	< 0.001

Sample Type: Soil						
Sample Name:		SAH010_0.2 09-May-2018 8:10 am	SAH010_1.6 09-May-2018 9:00 am	SAH011_0.5 09-May-2018 11:45 am	SAH011_1.0 [12:00-12:15] 09-May-2018	SAH012_0.5 09-May-2018 1:00 pm
Lab Number:		1979897.1	1979897.4	1979897.6	1979897.7	1979897.10
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.014	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.014	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.014	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.014	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.014	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.014	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.014	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.014	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.014	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.014	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.014	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.014	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.014	-	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.09	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.014	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.014	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.014	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.014	-	-	-	-
Endrin	mg/kg dry wt	< 0.014	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.014	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.014	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.014	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.014	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.014	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.014	-	-	-	-
Haloethers in SVOC Soil Samples by GC-MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	-	-	< 0.5	-	-
Bis(2-chloroethyl)ether	mg/kg dry wt	-	-	< 0.5	-	-
Bis(2-chloroisopropyl)ether	mg/kg dry wt	-	-	< 0.5	-	-
4-Bromophenyl phenyl ether	mg/kg dry wt	-	-	< 0.4	-	-
4-Chlorophenyl phenyl ether	mg/kg dry wt	-	-	< 0.5	-	-
Nitrogen containing compounds in SVOC Soil Samples by GC-MS						
2,4-Dinitrotoluene	mg/kg dry wt	-	-	< 1.0	-	-
2,6-Dinitrotoluene	mg/kg dry wt	-	-	< 1.0	-	-
Nitrobenzene	mg/kg dry wt	-	-	< 0.5	-	-
N-Nitrosodi-n-propylamine	mg/kg dry wt	-	-	< 0.8	-	-
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	-	-	< 0.8	-	-
Organochlorine Pesticides in SVOC Soil Samples by GC-MS						
Aldrin	mg/kg dry wt	-	-	< 0.5	-	-
alpha-BHC	mg/kg dry wt	-	-	< 0.5	-	-
beta-BHC	mg/kg dry wt	-	-	< 0.5	-	-
delta-BHC	mg/kg dry wt	-	-	< 0.5	-	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.5	-	-
4,4'-DDD	mg/kg dry wt	-	-	< 0.5	-	-
4,4'-DDE	mg/kg dry wt	-	-	< 0.5	-	-
4,4'-DDT	mg/kg dry wt	-	-	< 1.0	-	-
Dieldrin	mg/kg dry wt	-	-	< 0.5	-	-
Endosulfan I	mg/kg dry wt	-	-	< 1.0	-	-
Endosulfan II	mg/kg dry wt	-	-	< 2	-	-
Endosulfan sulphate	mg/kg dry wt	-	-	< 1.0	-	-
Endrin	mg/kg dry wt	-	-	< 0.8	-	-

Sample Type: Soil						
Sample Name:		SAH010_0.2 09-May-2018 8:10 am	SAH010_1.6 09-May-2018 9:00 am	SAH011_0.5 09-May-2018 11:45 am	SAH011_1.0 [12:00-12:15] 09-May-2018	SAH012_0.5 09-May-2018 1:00 pm
Lab Number:		1979897.1	1979897.4	1979897.6	1979897.7	1979897.10
Organochlorine Pesticides in SVOC Soil Samples by GC-MS						
Endrin ketone	mg/kg dry wt	-	-	< 1.0	-	-
Heptachlor	mg/kg dry wt	-	-	< 0.5	-	-
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.5	-	-
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.5	-	-
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS						
Acenaphthene	mg/kg dry wt	-	-	< 0.5	-	-
Acenaphthylene	mg/kg dry wt	-	-	< 0.5	-	-
Anthracene	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[a]anthracene	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[k]fluoranthene	mg/kg dry wt	-	-	< 0.5	-	-
1&2-Chloronaphthalene	mg/kg dry wt	-	-	< 0.5	-	-
Chrysene	mg/kg dry wt	-	-	< 0.5	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	< 0.5	-	-
Fluoranthene	mg/kg dry wt	-	-	< 0.5	-	-
Fluorene	mg/kg dry wt	-	-	< 0.5	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	< 0.5	-	-
2-Methylnaphthalene	mg/kg dry wt	-	-	< 0.5	-	-
Naphthalene	mg/kg dry wt	-	-	< 0.5	-	-
Phenanthrene	mg/kg dry wt	-	-	< 0.5	-	-
Pyrene	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	-	< 1.3	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	-	< 1.3	-	-
Phenols in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	-	-	< 5	-	-
2-Chlorophenol	mg/kg dry wt	-	-	< 1.0	-	-
2,4-Dichlorophenol	mg/kg dry wt	-	-	< 1.0	-	-
2,4-Dimethylphenol	mg/kg dry wt	-	-	< 3	-	-
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	-	-	< 3	-	-
2-Methylphenol (o-Cresol)	mg/kg dry wt	-	-	< 1.0	-	-
2-Nitrophenol	mg/kg dry wt	-	-	< 5	-	-
Pentachlorophenol (PCP)	mg/kg dry wt	-	-	< 30	-	-
Phenol	mg/kg dry wt	-	-	< 1.0	-	-
2,4,5-Trichlorophenol	mg/kg dry wt	-	-	< 1.0	-	-
2,4,6-Trichlorophenol	mg/kg dry wt	-	-	< 1.0	-	-
Plasticisers in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	-	-	< 5	-	-
Butylbenzylphthalate	mg/kg dry wt	-	-	< 1.0	-	-
Di(2-ethylhexyl)adipate	mg/kg dry wt	-	-	< 1.0	-	-
Diethylphthalate	mg/kg dry wt	-	-	< 1.0	-	-
Dimethylphthalate	mg/kg dry wt	-	-	< 1.0	-	-
Di-n-butylphthalate	mg/kg dry wt	-	-	< 1.0	-	-
Di-n-octylphthalate	mg/kg dry wt	-	-	< 1.0	-	-
Other Halogenated compounds in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	-	-	< 0.8	-	-
1,3-Dichlorobenzene	mg/kg dry wt	-	-	< 0.8	-	-
1,4-Dichlorobenzene	mg/kg dry wt	-	-	< 0.8	-	-
Hexachlorobutadiene	mg/kg dry wt	-	-	< 0.8	-	-
Hexachloroethane	mg/kg dry wt	-	-	< 0.8	-	-

Sample Type: Soil						
Sample Name:		SAH010_0.2 09-May-2018 8:10 am	SAH010_1.6 09-May-2018 9:00 am	SAH011_0.5 09-May-2018 11:45 am	SAH011_1.0 [12:00-12:15] 09-May-2018	SAH012_0.5 09-May-2018 1:00 pm
Lab Number:		1979897.1	1979897.4	1979897.6	1979897.7	1979897.10
Other Halogenated compounds in SVOC Soil Samples by GC-MS						
1,2,4-Trichlorobenzene	mg/kg dry wt	-	-	< 0.5	-	-
Other compounds in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	-	-	< 10	-	-
Carbazole	mg/kg dry wt	-	-	< 0.5	-	-
Dibenzofuran	mg/kg dry wt	-	-	< 0.5	-	-
Isophorone	mg/kg dry wt	-	-	< 0.5	-	-

Sample Name:		SAH012_1.0 09-May-2018 1:20 pm				
Lab Number:		1979897.11				
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	40	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	18	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	12.8	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	22	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	40	-	-	-	-

Analyst's Comments

Appendix No.1 - Chain of Custody

Summary of Methods

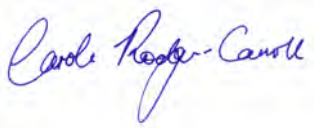
The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Dry Matter (Env)	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, 6
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 4, 6-7, 10-11
New Zealand Guidelines Semi Quantitative Asbestos in Soil*		-	6, 10
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082). Tested on as recieved sample	0.010 - 0.06 mg/kg dry wt	1
Semivolatile Organic Compounds Screening in Soil by GC-MS	Sonication extraction, GC-MS FS analysis. Tested on as received sample	0.002 - 30 mg/kg dry wt	6
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	6, 10
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	6, 10
Ashed Weight	Sample ashed at 400°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	6, 10
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	1 %	6, 10
Sample Fraction >10mm	Sample ashed at 400°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	6, 10
Sample Fraction <10mm and >2mm	Sample ashed at 400°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	6, 10

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Sample Fraction <2mm	Sample ashed at 400°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	6, 10
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	6, 10
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	6, 10
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	6, 10
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	6, 10
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	6, 10
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	6, 10
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	6, 10
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	6, 10
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	6, 10

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.



Carole Rodgers-Carroll BA, NZCS
Client Services Manager - Environmental

Job No: 197 9897 Date Recv: 11-May-18 05:56

Received by: Sachet Sharma

3119798973

Hill Laboratories
A WORLD LEADER IN ANALYTICAL SERVICES

ANALYSIS

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Client

Name AECOM New Zealand Limited

Address PO Box 4241, Shortland Street

AUCKLAND 1140

Phone 09 967 9200 *Fax* 09 960 9201

Client Reference 60563280/375

Quote No *Order Number*

Primary Contact Naum Morrison

Submitted By Max Nightingale

Charge To AECOM New Zealand Limited

Results To ☐ Mail Client ☐ Mail Submitter

☐ Fax Results naum.morrison@aecom.com

☑ Email Results max.nightingale@aecom.com

ADDITIONAL INFORMATION

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:* 10/5/18
Name: Max Nightingale
Signature: M.N.

☑ *Please tick if you require COC to be faxed back*

Received at Hill Laboratories *Date & Time:*
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 5.9

☐ Sample Analysis details checked
Signature:

Priority ☐ Low ☑ Normal ☐ High

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required*
1	SAH010_0.2	9/5/18	ES	Metals, OCP
2	SAH010_0.5			HOLD COLD
3	SAH010_1.0			HOLD COLD
4	SAH010_1.6			Metals
5				
6	SAH011_0.2			~~Metals, SVOC, Asbestos (WA)~~ HOLD COLD
7	SAH011_0.5			Metals, SVOC, Asbestos (WA)
8	SAH011_1.0			Metals
9	SAH011_2.0			HOLD COLD
10				

Continued on next page

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required
11	SAHO1Z_0.1			HOLD (COLD)
12	SAHO1Z_0.5			Metals, Asbestos (NEPM)
13	SAHO1Z_1.0			Metals
14	SAHO2_2.0			HOLD (COLD)
15				
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19				
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TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

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T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	1979897 SPv2
Contact:	N Macorison C/- AECOM New Zealand Limited PO Box 4241 Shortland Street Auckland 1140	**Date Received:**	11-May-2018
		Date Reported:	02-May-2019 **(Amended)**
		Quote No:	81048
		Order No:	60563280/3.7.5
		Client Reference:	60563280/3.7.5
		Submitted By:	Max Nightingale

Sample Type: Soil

Sample Name:	DH104_0.2 09-May-2018 8:10 am	DH104_1.6 09-May-2018 9:00 am	DH103_0.5 09-May-2018 11:45 am	DH103_1.0 [12:00-12:15] 09-May-2018	DH107_0.5 09-May-2018 1:00 pm
Lab Number:	1979897.1	1979897.4	1979897.6	1979897.7	1979897.10
Individual Tests					
Dry Matter g/100g as rcvd	72	-	76	-	-
Heavy Metals, Screen Level					
Total Recoverable Arsenic mg/kg dry wt	2	3	2	3	< 2
Total Recoverable Cadmium mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	0.24
Total Recoverable Chromium mg/kg dry wt	16	26	23	22	41
Total Recoverable Copper mg/kg dry wt	7	12	11	9	14
Total Recoverable Lead mg/kg dry wt	8.3	9.6	6.8	6.8	20
Total Recoverable Nickel mg/kg dry wt	8	12	10	9	34
Total Recoverable Zinc mg/kg dry wt	16	35	27	22	53
New Zealand Guidelines Semi Quantitative Asbestos in Soil					
As Received Weight g	-	-	814.8	-	827.0
Dry Weight g	-	-	605.2	-	538.2
Ashed Weight g	-	-	592.2	-	512.4
Moisture %	-	-	26	-	35
Dry Sample Fraction >10mm g ashed wt	-	-	< 0.1	-	75.0
Sample Fraction <10mm to >2mm g ashed wt	-	-	348.3	-	227.9
Sample Fraction <2mm g ashed wt	-	-	242.2	-	207.5
<2mm Subsample Weight g ashed wt	-	-	55.2	-	53.4
Asbestos Presence / Absence	-	-	Asbestos NOT detected.	-	Asbestos NOT detected.
Description of Asbestos Form	-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable) g ashed wt	-	-	< 0.00001	-	< 0.00001
Asbestos in ACM as % of Total Sample* % w/w	-	-	< 0.001	-	< 0.001
Weight of Asbestos as Fibrous Asbestos (Friable) g ashed wt	-	-	< 0.00001	-	< 0.00001
Asbestos as Fibrous Asbestos as % of Total Sample* % w/w	-	-	< 0.001	-	< 0.001
Weight of Asbestos as Asbestos Fines (Friable)* g ashed wt	-	-	< 0.00001	-	< 0.00001
Asbestos as Asbestos Fines as % of Total Sample* % w/w	-	-	< 0.001	-	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample* % w/w	-	-	< 0.001	-	< 0.001

Sample Type: Soil						
Sample Name:		DH104_0.2 09-May-2018 8:10 am	DH104_1.6 09-May-2018 9:00 am	DH103_0.5 09-May-2018 11:45 am	DH103_1.0 [12:00-12:15] 09-May-2018	DH107_0.5 09-May-2018 1:00 pm
Lab Number:		1979897.1	1979897.4	1979897.6	1979897.7	1979897.10
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.014	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.014	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.014	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.014	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.014	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.014	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.014	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.014	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.014	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.014	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.014	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.014	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.014	-	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.09	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.014	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.014	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.014	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.014	-	-	-	-
Endrin	mg/kg dry wt	< 0.014	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.014	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.014	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.014	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.014	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.014	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.014	-	-	-	-
Haloethers in SVOC Soil Samples by GC-MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	-	-	< 0.5	-	-
Bis(2-chloroethyl)ether	mg/kg dry wt	-	-	< 0.5	-	-
Bis(2-chloroisopropyl)ether	mg/kg dry wt	-	-	< 0.5	-	-
4-Bromophenyl phenyl ether	mg/kg dry wt	-	-	< 0.4	-	-
4-Chlorophenyl phenyl ether	mg/kg dry wt	-	-	< 0.5	-	-
Nitrogen containing compounds in SVOC Soil Samples by GC-MS						
2,4-Dinitrotoluene	mg/kg dry wt	-	-	< 1.0	-	-
2,6-Dinitrotoluene	mg/kg dry wt	-	-	< 1.0	-	-
Nitrobenzene	mg/kg dry wt	-	-	< 0.5	-	-
N-Nitrosodi-n-propylamine	mg/kg dry wt	-	-	< 0.8	-	-
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	-	-	< 0.8	-	-
Organochlorine Pesticides in SVOC Soil Samples by GC-MS						
Aldrin	mg/kg dry wt	-	-	< 0.5	-	-
alpha-BHC	mg/kg dry wt	-	-	< 0.5	-	-
beta-BHC	mg/kg dry wt	-	-	< 0.5	-	-
delta-BHC	mg/kg dry wt	-	-	< 0.5	-	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.5	-	-
4,4'-DDD	mg/kg dry wt	-	-	< 0.5	-	-
4,4'-DDE	mg/kg dry wt	-	-	< 0.5	-	-
4,4'-DDT	mg/kg dry wt	-	-	< 1.0	-	-
Dieldrin	mg/kg dry wt	-	-	< 0.5	-	-
Endosulfan I	mg/kg dry wt	-	-	< 1.0	-	-
Endosulfan II	mg/kg dry wt	-	-	< 2	-	-
Endosulfan sulphate	mg/kg dry wt	-	-	< 1.0	-	-
Endrin	mg/kg dry wt	-	-	< 0.8	-	-

Sample Type: Soil						
Sample Name:		DH104_0.2 09-May-2018 8:10 am	DH104_1.6 09-May-2018 9:00 am	DH103_0.5 09-May-2018 11:45 am	DH103_1.0 [12:00-12:15] 09-May-2018	DH107_0.5 09-May-2018 1:00 pm
Lab Number:		1979897.1	1979897.4	1979897.6	1979897.7	1979897.10
Organochlorine Pesticides in SVOC Soil Samples by GC-MS						
Endrin ketone	mg/kg dry wt	-	-	< 1.0	-	-
Heptachlor	mg/kg dry wt	-	-	< 0.5	-	-
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.5	-	-
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.5	-	-
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS						
Acenaphthene	mg/kg dry wt	-	-	< 0.5	-	-
Acenaphthylene	mg/kg dry wt	-	-	< 0.5	-	-
Anthracene	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[a]anthracene	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[k]fluoranthene	mg/kg dry wt	-	-	< 0.5	-	-
1&2-Chloronaphthalene	mg/kg dry wt	-	-	< 0.5	-	-
Chrysene	mg/kg dry wt	-	-	< 0.5	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	< 0.5	-	-
Fluoranthene	mg/kg dry wt	-	-	< 0.5	-	-
Fluorene	mg/kg dry wt	-	-	< 0.5	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	< 0.5	-	-
2-Methylnaphthalene	mg/kg dry wt	-	-	< 0.5	-	-
Naphthalene	mg/kg dry wt	-	-	< 0.5	-	-
Phenanthrene	mg/kg dry wt	-	-	< 0.5	-	-
Pyrene	mg/kg dry wt	-	-	< 0.5	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	-	< 1.3	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	-	< 1.3	-	-
Phenols in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	-	-	< 5	-	-
2-Chlorophenol	mg/kg dry wt	-	-	< 1.0	-	-
2,4-Dichlorophenol	mg/kg dry wt	-	-	< 1.0	-	-
2,4-Dimethylphenol	mg/kg dry wt	-	-	< 3	-	-
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	-	-	< 3	-	-
2-Methylphenol (o-Cresol)	mg/kg dry wt	-	-	< 1.0	-	-
2-Nitrophenol	mg/kg dry wt	-	-	< 5	-	-
Pentachlorophenol (PCP)	mg/kg dry wt	-	-	< 30	-	-
Phenol	mg/kg dry wt	-	-	< 1.0	-	-
2,4,5-Trichlorophenol	mg/kg dry wt	-	-	< 1.0	-	-
2,4,6-Trichlorophenol	mg/kg dry wt	-	-	< 1.0	-	-
Plasticisers in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	-	-	< 5	-	-
Butylbenzylphthalate	mg/kg dry wt	-	-	< 1.0	-	-
Di(2-ethylhexyl)adipate	mg/kg dry wt	-	-	< 1.0	-	-
Diethylphthalate	mg/kg dry wt	-	-	< 1.0	-	-
Dimethylphthalate	mg/kg dry wt	-	-	< 1.0	-	-
Di-n-butylphthalate	mg/kg dry wt	-	-	< 1.0	-	-
Di-n-octylphthalate	mg/kg dry wt	-	-	< 1.0	-	-
Other Halogenated compounds in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	-	-	< 0.8	-	-
1,3-Dichlorobenzene	mg/kg dry wt	-	-	< 0.8	-	-
1,4-Dichlorobenzene	mg/kg dry wt	-	-	< 0.8	-	-
Hexachlorobutadiene	mg/kg dry wt	-	-	< 0.8	-	-
Hexachloroethane	mg/kg dry wt	-	-	< 0.8	-	-

Sample Type: Soil						
Sample Name:		DH104_0.2 09-May-2018 8:10 am	DH104_1.6 09-May-2018 9:00 am	DH103_0.5 09-May-2018 11:45 am	DH103_1.0 [12:00-12:15] 09-May-2018	DH107_0.5 09-May-2018 1:00 pm
Lab Number:		1979897.1	1979897.4	1979897.6	1979897.7	1979897.10
Other Halogenated compounds in SVOC Soil Samples by GC-MS						
1,2,4-Trichlorobenzene	mg/kg dry wt	-	-	< 0.5	-	-
Other compounds in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	-	-	< 10	-	-
Carbazole	mg/kg dry wt	-	-	< 0.5	-	-
Dibenzofuran	mg/kg dry wt	-	-	< 0.5	-	-
Isophorone	mg/kg dry wt	-	-	< 0.5	-	-

Sample Name:		DH107_1.0 09-May-2018 1:20 pm				
Lab Number:		1979897.11				
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	40	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	18	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	12.8	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	22	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	40	-	-	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces an earlier report issued on 22 May 2018 at 3:17 pm
Reason for amendment: Sample IDs amended as requested.

Appendix No.1 - Chain of Custody

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 clean 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.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Dry Matter (Env)	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, 6
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 4, 6-7, 10-11
New Zealand Guidelines Semi Quantitative Asbestos in Soil*		-	6, 10
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082). Tested on as recieved sample	0.010 - 0.06 mg/kg dry wt	1
Semivolatile Organic Compounds Screening in Soil by GC-MS	Sonication extraction, GC-MS FS analysis. Tested on as received sample	0.002 - 30 mg/kg dry wt	6
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	6, 10
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	6, 10
Ashed Weight	Sample ashed at 400°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	6, 10
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	1 %	6, 10

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Sample Fraction >10mm	Sample ashed at 400°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	6, 10
Sample Fraction <10mm and >2mm	Sample ashed at 400°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	6, 10
Sample Fraction <2mm	Sample ashed at 400°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	6, 10
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	6, 10
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	6, 10
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	6, 10
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	6, 10
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	6, 10
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	6, 10
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	6, 10
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	6, 10
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	6, 10

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Kim Harrison MSc
Client Services Manager - Environmental

Job No: 197 9897 Date Recv: 11-May-18 05:56

Received by: Sachet Sharma

3119798973

Hill Laboratories

A WORLD LEADER IN ANALYTICAL SERVICES

ANALYSIS

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Client

Name	AECOM New Zealand Limited
Address	PO Box 4241, Shortland Street
	AUCKLAND 1140
Phone	09 967 9200 — Fax 09 960 9201
Client Reference	60563280/3 7 5
Quote No	Order Number
Primary Contact	Naum Morrison
Submitted By	Max Nightingale
Charge To	AECOM New Zealand Limited

Results To ☐ Mail Client ☐ Mail Submitter

☐ Fax Results naum.morrison@aecom.com

☑ Email Results max.nightingale@aecom.com

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 10/5/18 Name: Max Nightingale Signature: M.N.

☑ Please tick if you require COC to be faxed back

Received at Hill Laboratories Date & Time: Name: Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen Temp: 5.9

☐ Sample Analysis details checked Signature:

ADDITIONAL INFORMATION

Priority ☐ Low ☑ Normal ☐ High

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E** Effluent	**G** Geothermal	**Pot1** Potable Water (LAS/EU)	**Pot2** Potable Water (NZDWS)
	GW Ground Water	**L** Leachate	☐ Audit Monitoring	**Pot3** Potable Water (other)
	SW Surface Water	**S** Saline	☐ Check Monitoring	**Pool** Swimming/Spa Pool
	TW Trade Waste			
Solids	**ES** Soil	**SE** Sediment	**SL** Sludge	**PL** Plant
Other	**O** O Oil	**M** Miscellaneous	**FS** FS Fish/shellfish/biota	**BM** BM Biological Material

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required
1	SAH010_0.2	9/5/18	ES	Metals, OCP
2	SAH010_0.5			HOLD COLD
3	SAH010_1.0			HOLD COLD
4	SAH010_1.6			Metals
5				
6	SAH011_0.2			~~Metals, SVOC, Asbestos (WA)~~ HOLD COLD
7	SAH011_0.5			Metals, SVOC, Asbestos (WA)
8	SAH011_1.0			Metals
9	SAH011_2.0			HOLD COLD
10				

Continued on next page

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required
11	SAHO1Z_0.1			HOLD (COLD)
12	SAHO1Z_0.5			Metals, Asbestos (NEPM)
13	SAHO1Z_1.0			Metals
14	SAHO2_2.0			HOLD (COLD)
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Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	1981512	SPv1
Contact:	N Macorison	**Date Received:**	14-May-2018	
	C/- AECOM New Zealand Limited	**Date Reported:**	22-May-2018	
	PO Box 4241	**Quote No:**	81048	
	Shortland Street	**Order No:**	60563280/3.7.5	
	Auckland 1140	**Client Reference:**	60563280/3.75	
		Submitted By:	Max Nightingale	

Sample Type: Soil

Sample Name:		SAH013_0.3 11-May-2018 7:55 am	SAH014_0.5 11-May-2018 9:50 am	SAH015_0.1 11-May-2018 10:45 am	SAH015_0.5 11-May-2018 10:45 am	SAH016_0.5 11-May-2018 11:45 am
Lab Number:		1981512.1	1981512.6	1981512.8	1981512.9	1981512.13
Individual Tests						
Dry Matter	g/100g as rcvd	77	80	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	4	3	4	4
Total Recoverable Cadmium	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	-	32	30	36	36
Total Recoverable Copper	mg/kg dry wt	-	19	19	10	12
Total Recoverable Lead	mg/kg dry wt	-	12.9	103	12.8	10.4
Total Recoverable Nickel	mg/kg dry wt	-	31	33	19	17
Total Recoverable Zinc	mg/kg dry wt	-	47	61	32	32
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.15	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	28	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	11	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	15.6	-	-	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	16	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	42	-	-	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.013	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.013	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.013	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.013	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.013	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.013	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.013	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.013	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.013	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.013	-	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.08	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.013	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.013	-	-	-	-

Sample Type: Soil						
Sample Name:		SAH013_0.3 11-May-2018 7:55 am	SAH014_0.5 11-May-2018 9:50 am	SAH015_0.1 11-May-2018 10:45 am	SAH015_0.5 11-May-2018 10:45 am	SAH016_0.5 11-May-2018 11:45 am
Lab Number:		1981512.1	1981512.6	1981512.8	1981512.9	1981512.13
Organochlorine Pesticides Screening in Soil						
Endosulfan II	mg/kg dry wt	< 0.013	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.013	-	-	-	-
Endrin	mg/kg dry wt	< 0.013	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.013	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.013	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.013	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.013	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.013	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.013	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	-	0.042	-	-	-
2-Methylnaphthalene	mg/kg dry wt	-	0.031	-	-	-
Perylene	mg/kg dry wt	-	1.45	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	7.8	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	7.7	-	-	-
Acenaphthylene	mg/kg dry wt	-	0.137	-	-	-
Acenaphthene	mg/kg dry wt	-	0.37	-	-	-
Anthracene	mg/kg dry wt	-	1.97	-	-	-
Benzo[a]anthracene	mg/kg dry wt	-	5.8	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	5.0	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	6.9	-	-	-
Benzo[e]pyrene	mg/kg dry wt	-	3.3	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	3.4	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	-	2.6	-	-	-
Chrysene	mg/kg dry wt	-	4.4	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	0.67	-	-	-
Fluoranthene	mg/kg dry wt	-	11.7	-	-	-
Fluorene	mg/kg dry wt	-	0.26	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	4.0	-	-	-
Naphthalene	mg/kg dry wt	-	< 0.07	-	-	-
Phenanthrene	mg/kg dry wt	-	5.7	-	-	-
Pyrene	mg/kg dry wt	-	8.5	-	-	-

Sample Name:		SAH016_1.1 11-May-2018 11:55 am				
Lab Number:		1981512.14				
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	8	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	3	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	5.3	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	6	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	5	-	-	-	-

Analyst's Comments

Appendix No.1 - Chain of Custody

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 clean 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.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	6, 8-9, 13-14
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082). Tested on as recieved sample	0.010 - 0.06 mg/kg dry wt	1
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	0.002 - 0.05 mg/kg dry wt	6
Dry Matter (Env)	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, 6
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benz(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 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + 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.	0.002 mg/kg dry wt	6
Benzo[a]pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k) fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	6

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Kim Harrison MSc
Client Services Manager - Environmental

Hill Laboratories
A WORLD LEADER IN ANALYTICAL SERVICES

ANALYSIS REQUEST

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Tel +64 7 858 2000
Fax +64 7 858 2001
Email mail@hill-labs.co.nz
Web www.hill-labs.co.nz

Client

Name AECOM New Zealand Limited

Address PO Box 4241, Shortland Street

AUCKLAND 1140

Phone 09 967 9200 *Fax* 09 960 9201

Client Reference 60563280/3.7.5

Quote No *Order Number*

Primary Contact Naomi Macorison

Submitted By Max Nightingale

Charge To AECOM New Zealand Limited

Results To ☐ Mail Client ☐ Mail Submitter

☐ Fax Results Naomi.Macorison@aecom.com

☑ Email Results Max.Nightingale@aecom.com

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time: 14/05/2018

Name: Max Nightingale

☑ *Please tick if you require COC to be faxed back*

Signature:

Received at Hill Laboratories

Date & Time:

Name:

Signature:

Condition *Temp:*

☐ *Room Temp* ☐ *Chilled* ☐ *Frozen*

☐ Sample Analysis details checked

Signature:

ADDITIONAL INFORMATION

Please email CoC on arrival at Lab reception

Priority

☐ **Low** ☑ **Normal** ☐ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required*
1	SAH013_0.3	11/05/2018	ES	Metals (Incl Mecrury), OCP
2	SAH013_0.9	11/05/2018	ES	Hold Cold
3	SAH013_1.3-1.5	11/05/2018	ES	Hold Cold
4	SAH013_1.8-2.0	11/05/2018	ES	Hold Cold
5				
6	SAH014_0.1	11/05/2018	ES	Hold Cold
7	SAH014_0.5	11/05/2018	ES	Metals , PAH
8	SAH014_1.5	11/05/2018	ES	Hold Cold
9	SAH014_1.8-2.0	11/05/2018	ES	Hold Cold
10				

Continued on next page

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required
11	SAH015_0.1	11/05/2018	ES	Metals
12	SAH015_0.5	11/05/2018	ES	Metals
13	SAH015_0.9	11/05/2018	ES	Hold Cold
14	SAH015_1.8-2.0	11/05/2018	ES	Hold Cold
15				
16	SAH016_0.1	11/05/2018	ES	Hold Cold
17	SAH016_0.5	11/05/2018	ES	Metals
18	SAH016_1.1	11/05/2018	ES	Metals
19	SAH016_2.3	11/05/2018	ES	Hold Cold
20	SAH016_3.0-3.4	11/05/2018	ES	Hold Cold
21				
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40				

Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	1981512 SPv2	
Contact:	N Macorison	**Date Received:**	14-May-2018	
	C/- AECOM New Zealand Limited	**Date Reported:**	02-May-2019	**(Amended)**
	PO Box 4241	**Quote No:**	81048	
	Shortland Street	**Order No:**	60563280/3.7.5	
	Auckland 1140	**Client Reference:**	60563280/3.75	
		Submitted By:	Max Nightingale	

Sample Type: Soil

Sample Name:		AME_EHA102_0.3 11-May-2018 7:55 am	AME_EHA106_0.5 11-May-2018 9:50 am	AME_EHA107_0.1 11-May-2018 10:45 am	AME_EHA107_0.5 11-May-2018 10:45 am	AME_EHA108_0.5 11-May-2018 11:45 am
Lab Number:		1981512.1	1981512.6	1981512.8	1981512.9	1981512.13
Individual Tests						
Dry Matter	g/100g as rcvd	77	80	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	4	3	4	4
Total Recoverable Cadmium	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	-	32	30	36	36
Total Recoverable Copper	mg/kg dry wt	-	19	19	10	12
Total Recoverable Lead	mg/kg dry wt	-	12.9	103	12.8	10.4
Total Recoverable Nickel	mg/kg dry wt	-	31	33	19	17
Total Recoverable Zinc	mg/kg dry wt	-	47	61	32	32
Heavy Metals with Mercury, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.15	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	28	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	11	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	15.6	-	-	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	16	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	42	-	-	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.013	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.013	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.013	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.013	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.013	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.013	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.013	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.013	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.013	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.013	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.013	-	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.08	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.013	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.013	-	-	-	-

Sample Type: Soil						
Sample Name:		AME_EHA102_0.3 11-May-2018 7:55 am	AME_EHA106_0.5 11-May-2018 9:50 am	AME_EHA107_0.1 11-May-2018 10:45 am	AME_EHA107_0.5 11-May-2018 10:45 am	AME_EHA108_0.5 11-May-2018 11:45 am
Lab Number:		1981512.1	1981512.6	1981512.8	1981512.9	1981512.13
Organochlorine Pesticides Screening in Soil						
Endosulfan II	mg/kg dry wt	< 0.013	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.013	-	-	-	-
Endrin	mg/kg dry wt	< 0.013	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.013	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.013	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.013	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.013	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.013	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.013	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	-	0.042	-	-	-
2-Methylnaphthalene	mg/kg dry wt	-	0.031	-	-	-
Perylene	mg/kg dry wt	-	1.45	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	7.8	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	7.7	-	-	-
Acenaphthylene	mg/kg dry wt	-	0.137	-	-	-
Acenaphthene	mg/kg dry wt	-	0.37	-	-	-
Anthracene	mg/kg dry wt	-	1.97	-	-	-
Benzo[a]anthracene	mg/kg dry wt	-	5.8	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	5.0	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	6.9	-	-	-
Benzo[e]pyrene	mg/kg dry wt	-	3.3	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	3.4	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	-	2.6	-	-	-
Chrysene	mg/kg dry wt	-	4.4	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	0.67	-	-	-
Fluoranthene	mg/kg dry wt	-	11.7	-	-	-
Fluorene	mg/kg dry wt	-	0.26	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	4.0	-	-	-
Naphthalene	mg/kg dry wt	-	< 0.07	-	-	-
Phenanthrene	mg/kg dry wt	-	5.7	-	-	-
Pyrene	mg/kg dry wt	-	8.5	-	-	-

Sample Name:		AME_EHA108_1.1 11-May-2018 11:55 am				
Lab Number:		1981512.14				
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	8	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	3	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	5.3	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	6	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	5	-	-	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces an earlier report issued on 22 May 2018 at 9:49 am
Reason for amendment: Sample IDs amended as requested.

Appendix No.1 - Chain of Custody

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 clean 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.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	6, 8-9, 13-14
Heavy Metals with Mercury, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082). Tested on as recieved sample	0.010 - 0.06 mg/kg dry wt	1
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	0.002 - 0.05 mg/kg dry wt	6
Dry Matter (Env)	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, 6
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benz(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 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + 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.	0.002 mg/kg dry wt	6
Benzo[a]pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k) fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	6

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Kim Harrison MSc
Client Services Manager - Environmental

Hill Laboratories
A WORLD LEADER IN ANALYTICAL SERVICES

ANALYSIS REQUEST

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Tel +64 7 858 2000
Fax +64 7 858 2001
Email mail@hill-labs.co.nz
Web www.hill-labs.co.nz

Client

Name AECOM New Zealand Limited

Address PO Box 4241, Shortland Street

AUCKLAND 1140

Phone 09 967 9200 *Fax* 09 960 9201

Client Reference 60563280/3.7.5

Quote No *Order Number*

Primary Contact Naomi Macorison

Submitted By Max Nightingale

Charge To AECOM New Zealand Limited

Results To ☐ Mail Client ☐ Mail Submitter

☐ Fax Results Naomi.Macorison@aecom.com

☑ Email Results Max.Nightingale@aecom.com

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time: 14/05/2018

Name: Max Nightingale

☑ *Please tick if you require COC to be faxed back*

Signature:

Received at Hill Laboratories

Date & Time:

Name:

Signature:

Condition *Temp:*

☐ *Room Temp* ☐ *Chilled* ☐ *Frozen*

☐ Sample Analysis details checked

Signature:

ADDITIONAL INFORMATION

Please email CoC on arrival at Lab reception

Priority

☐ **Low** ☑ **Normal** ☐ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required*
1	SAH013_0.3	11/05/2018	ES	Metals (Incl Mecrury), OCP
2	SAH013_0.9	11/05/2018	ES	Hold Cold
3	SAH013_1.3-1.5	11/05/2018	ES	Hold Cold
4	SAH013_1.8-2.0	11/05/2018	ES	Hold Cold
5				
6	SAH014_0.1	11/05/2018	ES	Hold Cold
7	SAH014_0.5	11/05/2018	ES	Metals , PAH
8	SAH014_1.5	11/05/2018	ES	Hold Cold
9	SAH014_1.8-2.0	11/05/2018	ES	Hold Cold
10				

Continued on next page

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required
11	SAH015_0.1	11/05/2018	ES	Metals
12	SAH015_0.5	11/05/2018	ES	Metals
13	SAH015_0.9	11/05/2018	ES	Hold Cold
14	SAH015_1.8-2.0	11/05/2018	ES	Hold Cold
15				
16	SAH016_0.1	11/05/2018	ES	Hold Cold
17	SAH016_0.5	11/05/2018	ES	Metals
18	SAH016_1.1	11/05/2018	ES	Metals
19	SAH016_2.3	11/05/2018	ES	Hold Cold
20	SAH016_3.0-3.4	11/05/2018	ES	Hold Cold
21				
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Hill Laboratories
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Private Bag 3205
Hamilton 3240 New Zealand

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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	1984837	SPv1
Contact:	N Macorison	**Date Received:**	18-May-2018	
	C/- AECOM New Zealand Limited	**Date Reported:**	24-May-2018	
	PO Box 4241	**Quote No:**	81048	
	Shortland Street	**Order No:**	60563280/3.7.5	
	Auckland 1140	**Client Reference:**	60563280/3.7.5	
		Submitted By:	Kate Feickert	

Sample Type: Soil

Sample Name:		SAH017_0.2 14-May-2018 2:30 pm				
Lab Number:		1984837.1				
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	25	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	13	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	11.9	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	22	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	34	-	-	-	-

Analyst's Comments

Appendix No.1 - Chain of Custody

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 clean 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.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Carole Rodgers-Carroll BA, NZCS
Client Services Manager - Environmental

Hill Laboratories
A WORLD LEADER IN ANALYTICAL SERVICES

ANALYSIS REQUEST

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Job No: **198 4837**
Date Recv: 18-May-18 11:38
Received by: Nathaniel Sue
3119848374

Client

Name AECOM New Zealand Limited
Address PO Box 4241, Shortland Street
AUCKLAND 1140
Phone 09 967 9200 *Fax* 09 960 9201
Client Reference 60563280/3.7.5
Quote No *Order Number*

Primary Contact Naomi Macorison
Submitted By Kate Feickert
Charge To AECOM New Zealand Limited

Results To ☑ Mail Client ☑ Mail Submitter
☐ Fax Results
☑ Email Results Max.Nightingale@aecom.com

Office use only Job N

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:* *Name:* *Signature:*
☑ *Please tick if you require COC to be faxed back*

Received at Hill Laboratories *Date & Time:* *Name:* *Signature:*

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 4.0°C
☐ Sample Anelysis details checked
Signature:

ADDITIONAL INFORMATION

Priority
☐ **Low** ☑ **Normal** ☐ **High**
☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required
1	SAH017_0.2	5/14/2018	Soil	Metals
2	SAH017_0.6	5/14/2018	Soil	Hold Cold
3	SAH017_1.1	5/14/2018	Soil	Hold Cold
4	SAH017_3.0-3.4	5/14/2018	Soil	Hold Cold
5				
6				
7				
8				
9				
10				

Continued on next page

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Private Bag 3205
Hamilton 3240 New Zealand

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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	1984837	SPv2
Contact:	N Macorison	**Date Received:**	18-May-2018	
	C/- AECOM New Zealand Limited	**Date Reported:**	02-May-2019	**(Amended)**
	PO Box 4241	**Quote No:**	81048	
	Shortland Street	**Order No:**	60563280/3.7.5	
	Auckland 1140	**Client Reference:**	60563280/3.7.5	
		Submitted By:	Kate Feickert	

Sample Type: Soil

Sample Name:		DH108_0.2 14-May-2018 2:30 pm				
Lab Number:		1984837.1				
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	25	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	13	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	11.9	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	22	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	34	-	-	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces an earlier report issued on 24 May 2018 at 12:34 pm
Reason for amendment: Sample IDs amended as requested.

Appendix No.1 - Chain of Custody

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 clean 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.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Kim Harrison MSc
Client Services Manager - Environmental

Hill Laboratories
A WORLD LEADER IN ANALYTICAL SERVICES

ANALYSIS REQUEST

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Job No: **198 4837**
Date Recv: 18-May-18 11:38
Received by: Nathaniel Sue
3119848374

Client

Name AECOM New Zealand Limited
Address PO Box 4241, Shortland Street
AUCKLAND 1140
Phone 09 967 9200 *Fax* 09 960 9201
Client Reference 60563280/3.7.5
Quote No *Order Number*

Primary Contact Naomi Macorison
Submitted By Kate Feickert
Charge To AECOM New Zealand Limited

Results To ☑ Mail Client ☑ Mail Submitter
☐ Fax Results
☑ Email Results Max.Nightingale@aecom.com

Office use only Job N

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:* *Name:* *Signature:*
☑ *Please tick if you require COC to be faxed back*

Received at Hill Laboratories *Date & Time:* *Name:* *Signature:*

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 4.0°C
☐ Sample Anelysis details checked
Signature:

ADDITIONAL INFORMATION

Priority
☐ **Low** ☑ **Normal** ☐ **High**
☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required
1	SAH017_0.2	5/14/2018	Soil	Metals
2	SAH017_0.6	5/14/2018	Soil	Hold Cold
3	SAH017_1.1	5/14/2018	Soil	Hold Cold
4	SAH017_3.0-3.4	5/14/2018	Soil	Hold Cold
5				
6				
7				
8				
9				
10				

Continued on next page

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R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

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T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	1985842	SPv1
Contact:	N Macorison	**Date Received:**	21-May-2018	
	C/- AECOM New Zealand Limited	**Date Reported:**	28-May-2018	
	PO Box 4241	**Quote No:**	81048	
	Shortland Street	**Order No:**	60563280/3.7.5	
	Auckland 1140	**Client Reference:**	AMETI	
		Submitted By:	Max Nightingale	

Sample Type: Soil

Sample Name:		SAH030_0.5 18-May-2018	SAH030_2.0 18-May-2018	SAH031_0.5 18-May-2018	SAH031_1.3 18-May-2018	
Lab Number:		1985842.2	1985842.5	1985842.7	1985842.9	
Individual Tests						
Dry Matter	g/100g as rcvd	87	82	-	74	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	-	5	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	< 0.10	-	-
Total Recoverable Chromium	mg/kg dry wt	21	-	32	-	-
Total Recoverable Copper	mg/kg dry wt	25	-	12	-	-
Total Recoverable Lead	mg/kg dry wt	16.4	-	16.0	-	-
Total Recoverable Nickel	mg/kg dry wt	26	-	22	-	-
Total Recoverable Zinc	mg/kg dry wt	89	-	41	-	-
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	-	-	-
Toluene	mg/kg dry wt	< 0.05	< 0.05	-	-	-
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	-	-	-
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	-	-	-
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	-	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	< 8	-	-	-
C10 - C14	mg/kg dry wt	< 20	< 20	-	-	-
C15 - C36	mg/kg dry wt	< 40	< 40	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	-	-	-
BTEX in VOC Soils by Headspace GC-MS						
Benzene	mg/kg dry wt	-	-	-	< 0.3	-
Ethylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
Toluene	mg/kg dry wt	-	-	-	< 0.3	-
m&p-Xylene	mg/kg dry wt	-	-	-	< 0.5	-
o-Xylene	mg/kg dry wt	-	-	-	< 0.3	-
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
Bromomethane (Methyl Bromide)	mg/kg dry wt	-	-	-	< 0.3	-
Carbon tetrachloride	mg/kg dry wt	-	-	-	< 0.3	-
Chloroethane	mg/kg dry wt	-	-	-	< 0.3	-
Chloromethane	mg/kg dry wt	-	-	-	< 0.3	-
1,2-Dibromo-3-chloropropane	mg/kg dry wt	-	-	-	< 0.5	-
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	-	-	-	< 0.3	-
Dibromomethane	mg/kg dry wt	-	-	-	< 0.3	-
1,3-Dichloropropane	mg/kg dry wt	-	-	-	< 0.3	-
Dichlorodifluoromethane	mg/kg dry wt	-	-	-	< 0.5	-

Sample Type: Soil							
Sample Name:		SAH030_0.5 18-May-2018	SAH030_2.0 18-May-2018	SAH031_0.5 18-May-2018	SAH031_1.3 18-May-2018	
Lab Number:		1985842.2	1985842.5	1985842.7	1985842.9	
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
1,1-Dichloroethane	mg/kg dry wt	-	-	-	< 0.3	-
1,2-Dichloroethane	mg/kg dry wt	-	-	-	< 0.3	-
1,1-Dichloroethene	mg/kg dry wt	-	-	-	< 0.3	-
cis-1,2-Dichloroethene	mg/kg dry wt	-	-	-	< 0.3	-
trans-1,2-Dichloroethene	mg/kg dry wt	-	-	-	< 0.3	-
Dichloromethane (methylene chloride)	mg/kg dry wt	-	-	-	< 3	-
1,2-Dichloropropane	mg/kg dry wt	-	-	-	< 0.3	-
1,1-Dichloropropene	mg/kg dry wt	-	-	-	< 0.3	-
cis-1,3-Dichloropropene	mg/kg dry wt	-	-	-	< 0.3	-
trans-1,3-Dichloropropene	mg/kg dry wt	-	-	-	< 0.3	-
Hexachlorobutadiene	mg/kg dry wt	-	-	-	< 0.3	-
1,1,1,2-Tetrachloroethane	mg/kg dry wt	-	-	-	< 0.3	-
1,1,2,2-Tetrachloroethane	mg/kg dry wt	-	-	-	< 0.3	-
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	-	-	-	< 0.3	-
1,1,1-Trichloroethane	mg/kg dry wt	-	-	-	< 0.3	-
1,1,2-Trichloroethane	mg/kg dry wt	-	-	-	< 0.3	-
Trichloroethene (trichloroethylene)	mg/kg dry wt	-	-	-	< 0.3	-
Trichlorofluoromethane	mg/kg dry wt	-	-	-	< 0.3	-
1,2,3-Trichloropropane	mg/kg dry wt	-	-	-	< 0.5	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	-	-	-	< 0.3	-
Vinyl chloride	mg/kg dry wt	-	-	-	< 0.3	-
Haloaromatics in VOC Soils by Headspace GC-MS						
Bromobenzene	mg/kg dry wt	-	-	-	< 0.3	-
1,3-Dichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
4-Chlorotoluene	mg/kg dry wt	-	-	-	< 0.3	-
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	-	-	-	< 0.3	-
1,2-Dichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
1,4-Dichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
2-Chlorotoluene	mg/kg dry wt	-	-	-	< 0.3	-
1,2,3-Trichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
1,2,4-Trichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
1,3,5-Trichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS						
n-Butylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
tert-Butylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
Isopropylbenzene (Cumene)	mg/kg dry wt	-	-	-	< 0.3	-
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	-	-	-	< 0.3	-
n-Propylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
sec-Butylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
Styrene	mg/kg dry wt	-	-	-	< 0.3	-
1,2,4-Trimethylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
1,3,5-Trimethylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
Ketones in VOC Soils by Headspace GC-MS						
2-Butanone (MEK)	mg/kg dry wt	-	-	-	< 50	-
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	-	-	-	< 9	-
Acetone	mg/kg dry wt	-	-	-	< 50	-
Methyl tert-butylether (MTBE)	mg/kg dry wt	-	-	-	< 0.3	-
Trihalomethanes in VOC Soils by Headspace GC-MS						
Bromodichloromethane	mg/kg dry wt	-	-	-	< 0.3	-
Bromoform (tribromomethane)	mg/kg dry wt	-	-	-	< 0.5	-
Chloroform (Trichloromethane)	mg/kg as rcvd	-	-	-	< 0.3	-

Sample Type: Soil						
Sample Name:		SAH030_0.5 18-May-2018	SAH030_2.0 18-May-2018	SAH031_0.5 18-May-2018	SAH031_1.3 18-May-2018	
Lab Number:		1985842.2	1985842.5	1985842.7	1985842.9	
Trihalomethanes in VOC Soils by Headspace GC-MS						
Dibromochloromethane	mg/kg dry wt	-	-	-	< 0.3	-
Other VOC in Soils by Headspace GC-MS						
Carbon disulphide	mg/kg dry wt	-	-	-	0.08	-
Naphthalene	mg/kg dry wt	-	-	-	< 0.3	-

Analyst's Comments

Appendix No.1 - Chain of Custody

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 clean 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.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 7
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample [KBIs:5782,26687,3629]	0.05 - 0.10 mg/kg dry wt	2, 5
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample [KBIs:5786,2805,10734]	8 - 60 mg/kg dry wt	2, 5
Volatile Organic Compounds Screening in Soil by Headspace GC-MS	Sonication extraction, Headspace, GC-MS SIM analysis. Tested on as received sample [KBIs:31662,37857,37921]	-	9
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2, 5, 9

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Hill Laboratories
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ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street, Hamilton 3204
Private Bag 3205
Hamilton 3240, New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **198 5842**

Date Recv: 21-May-18 12:36

Received by: Jason Meadows

3119858425

Quote No

Primary Contact

Submitted By

Client Name

Address

Postcode

Phone *Mobile*

Email

Charge To

Client Reference

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*

☐ *Email Other*

☐ *Other*

ADDITIONAL INFORMATION

CHAIN OF CUSTODY

Sent to Hill Laboratories
Date & Time:
Name:
☐ *Tick if you require COC to be emailed back*
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition
☐ *Room Temp* ☐ *Chilled* ☐ *Frozen*
Temp: 11.3

☐ *Sample and Analysis details checked*
Signature:

Priority ☐ Low ☑ Normal ☐ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Continued on next page

Hill Laboratories
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R J Hill Laboratories Limited
28 Duke Street Frankton 3204
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Hamilton 3240 New Zealand

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Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	1985842	SPv3
Contact:	N Macorison	**Date Received:**	21-May-2018	
	C/- AECOM New Zealand Limited	**Date Reported:**	02-May-2019	**(Amended)**
	PO Box 4241	**Quote No:**	81048	
	Shortland Street	**Order No:**	60563280/3.7.5	
	Auckland 1140	**Client Reference:**	AMETI	
		Submitted By:	Max Nightingale	

Sample Type: Soil

Sample Name:		DH109_0.5 18-May-2018	DH109_2.0 18-May-2018	AME_EHA118_0.5 18-May-2018	AME_EHA118_1.3 18-May-2018	
Lab Number:		1985842.2	1985842.5	1985842.7	1985842.9	
Individual Tests						
Dry Matter	g/100g as rcvd	87	82	-	74	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	-	5	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	< 0.10	-	-
Total Recoverable Chromium	mg/kg dry wt	21	-	32	-	-
Total Recoverable Copper	mg/kg dry wt	25	-	12	-	-
Total Recoverable Lead	mg/kg dry wt	16.4	-	16.0	-	-
Total Recoverable Nickel	mg/kg dry wt	26	-	22	-	-
Total Recoverable Zinc	mg/kg dry wt	89	-	41	-	-
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.05	< 0.05	-	-	-
Toluene	mg/kg dry wt	< 0.05	< 0.05	-	-	-
Ethylbenzene	mg/kg dry wt	< 0.05	< 0.05	-	-	-
m&p-Xylene	mg/kg dry wt	< 0.10	< 0.10	-	-	-
o-Xylene	mg/kg dry wt	< 0.05	< 0.05	-	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	< 8	-	-	-
C10 - C14	mg/kg dry wt	< 20	< 20	-	-	-
C15 - C36	mg/kg dry wt	< 40	< 40	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	-	-	-
BTEX in VOC Soils by Headspace GC-MS						
Benzene	mg/kg dry wt	-	-	-	< 0.3	-
Ethylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
Toluene	mg/kg dry wt	-	-	-	< 0.3	-
m&p-Xylene	mg/kg dry wt	-	-	-	< 0.5	-
o-Xylene	mg/kg dry wt	-	-	-	< 0.3	-
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
Bromomethane (Methyl Bromide)	mg/kg dry wt	-	-	-	< 0.3	-
Carbon tetrachloride	mg/kg dry wt	-	-	-	< 0.3	-
Chloroethane	mg/kg dry wt	-	-	-	< 0.3	-
Chloromethane	mg/kg dry wt	-	-	-	< 0.3	-
1,2-Dibromo-3-chloropropane	mg/kg dry wt	-	-	-	< 0.5	-
1,2-Dibromoethane (ethylene dibromide, EDB)	mg/kg dry wt	-	-	-	< 0.3	-
Dibromomethane	mg/kg dry wt	-	-	-	< 0.3	-
1,3-Dichloropropane	mg/kg dry wt	-	-	-	< 0.3	-
Dichlorodifluoromethane	mg/kg dry wt	-	-	-	< 0.5	-
1,1-Dichloroethane	mg/kg dry wt	-	-	-	< 0.3	-

Sample Type: Soil						
Sample Name:		DH109_0.5 18-May-2018	DH109_2.0 18-May-2018	AME_EHA118_0.5 18-May-2018	AME_EHA118_1.3 18-May-2018	
Lab Number:		1985842.2	1985842.5	1985842.7	1985842.9	
Halogenated Aliphatics in VOC Soils by Headspace GC-MS						
1,2-Dichloroethane	mg/kg dry wt	-	-	-	< 0.3	-
1,1-Dichloroethene	mg/kg dry wt	-	-	-	< 0.3	-
cis-1,2-Dichloroethene	mg/kg dry wt	-	-	-	< 0.3	-
trans-1,2-Dichloroethene	mg/kg dry wt	-	-	-	< 0.3	-
Dichloromethane (methylene chloride)	mg/kg dry wt	-	-	-	< 3	-
1,2-Dichloropropane	mg/kg dry wt	-	-	-	< 0.3	-
1,1-Dichloropropene	mg/kg dry wt	-	-	-	< 0.3	-
cis-1,3-Dichloropropene	mg/kg dry wt	-	-	-	< 0.3	-
trans-1,3-Dichloropropene	mg/kg dry wt	-	-	-	< 0.3	-
Hexachlorobutadiene	mg/kg dry wt	-	-	-	< 0.3	-
1,1,1,2-Tetrachloroethane	mg/kg dry wt	-	-	-	< 0.3	-
1,1,2,2-Tetrachloroethane	mg/kg dry wt	-	-	-	< 0.3	-
Tetrachloroethene (tetrachloroethylene)	mg/kg dry wt	-	-	-	< 0.3	-
1,1,1-Trichloroethane	mg/kg dry wt	-	-	-	< 0.3	-
1,1,2-Trichloroethane	mg/kg dry wt	-	-	-	< 0.3	-
Trichloroethene (trichloroethylene)	mg/kg dry wt	-	-	-	< 0.3	-
Trichlorofluoromethane	mg/kg dry wt	-	-	-	< 0.3	-
1,2,3-Trichloropropane	mg/kg dry wt	-	-	-	< 0.5	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	mg/kg dry wt	-	-	-	< 0.3	-
Vinyl chloride	mg/kg dry wt	-	-	-	< 0.3	-
Haloaromatics in VOC Soils by Headspace GC-MS						
Bromobenzene	mg/kg dry wt	-	-	-	< 0.3	-
1,3-Dichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
4-Chlorotoluene	mg/kg dry wt	-	-	-	< 0.3	-
Chlorobenzene (monochlorobenzene)	mg/kg dry wt	-	-	-	< 0.3	-
1,2-Dichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
1,4-Dichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
2-Chlorotoluene	mg/kg dry wt	-	-	-	< 0.3	-
1,2,3-Trichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
1,2,4-Trichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
1,3,5-Trichlorobenzene	mg/kg dry wt	-	-	-	< 0.3	-
Monoaromatic Hydrocarbons in VOC Soils by Headspace GC-MS						
n-Butylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
tert-Butylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
Isopropylbenzene (Cumene)	mg/kg dry wt	-	-	-	< 0.3	-
4-Isopropyltoluene (p-Cymene)	mg/kg dry wt	-	-	-	< 0.3	-
n-Propylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
sec-Butylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
Styrene	mg/kg dry wt	-	-	-	< 0.3	-
1,2,4-Trimethylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
1,3,5-Trimethylbenzene	mg/kg dry wt	-	-	-	< 0.3	-
Ketones in VOC Soils by Headspace GC-MS						
2-Butanone (MEK)	mg/kg dry wt	-	-	-	< 50	-
4-Methylpentan-2-one (MIBK)	mg/kg dry wt	-	-	-	< 9	-
Acetone	mg/kg dry wt	-	-	-	< 50	-
Methyl tert-butylether (MTBE)	mg/kg dry wt	-	-	-	< 0.3	-
Trihalomethanes in VOC Soils by Headspace GC-MS						
Bromodichloromethane	mg/kg dry wt	-	-	-	< 0.3	-
Bromoform (tribromomethane)	mg/kg dry wt	-	-	-	< 0.5	-
Chloroform (Trichloromethane)	mg/kg as rcvd	-	-	-	< 0.3	-
Dibromochloromethane	mg/kg dry wt	-	-	-	< 0.3	-

Sample Type: Soil						
Sample Name:		DH109_0.5 18-May-2018	DH109_2.0 18-May-2018	AME_EHA118_0.5 18-May-2018	AME_EHA118_1.3 18-May-2018	
Lab Number:		1985842.2	1985842.5	1985842.7	1985842.9	
Other VOC in Soils by Headspace GC-MS						
Carbon disulphide	mg/kg dry wt	-	-	-	0.08	-
Naphthalene	mg/kg dry wt	-	-	-	< 0.3	-

Analyst's Comments

Amended Report: This certificate of analysis replaces an earlier report issued on 02 May 2019 at 3:47 pm
Reason for amendment: Sample IDs amended as per request.

Appendix No.1 - Chain of Custody

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 clean 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.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 7
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample [KBIs:5782,26687,3629]	0.05 - 0.10 mg/kg dry wt	2, 5
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample [KBIs:5786,2805,10734]	8 - 60 mg/kg dry wt	2, 5
Volatile Organic Compounds Screening in Soil by Headspace GC-MS	Sonication extraction, Headspace, GC-MS SIM analysis. Tested on as received sample [KBIs:31662,37857,37921]	-	9
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2, 5, 9

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Kim Harrison MSc
Client Services Manager - Environmental

Hill Laboratories
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ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street, Hamilton 3204
Private Bag 3205
Hamilton 3240, New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **198 5842**

Date Recv: 21-May-18 12:36

Received by: Jason Meadows

3119858425

Quote No

Primary Contact

Submitted By

Client Name

Address

Postcode

Phone *Mobile*

Email

Charge To

Client Reference

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ *Email Primary Contact* ☐ *Email Submitter* ☐ *Email Client*

☐ *Email Other*

☐ *Other*

ADDITIONAL INFORMATION

CHAIN OF CUSTODY

Sent to Hill Laboratories
Date & Time:
Name:
☐ *Tick if you require COC to be emailed back*
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition
☐ *Room Temp* ☐ *Chilled* ☐ *Frozen*
Temp: 11.3

☐ *Sample and Analysis details checked*
Signature:

Priority ☐ Low ☑ Normal ☐ High
☐ **Urgent** (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Continued on next page

Hill Laboratories
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R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

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T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	1991296	SPv1
Contact:	N Macorison	**Date Received:**	30-May-2018	
	C/- AECOM New Zealand Limited	**Date Reported:**	12-Jun-2018	
	PO Box 4241	**Quote No:**	81048	
	Shortland Street	**Order No:**	12638	
	Auckland 1140	**Client Reference:**	60563280	
		Submitted By:	Max Nightingale	

Sample Type: Soil

Sample Name:		SAH035_0.2 29-May-2018 12:00 pm				
Lab Number:		1991296.1				
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	35	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	24	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	14.0	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	32	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	55	-	-	-	-
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	331.2	-	-	-	-
Dry Weight	g	225.1	-	-	-	-
Ashed Weight	g	216.1	-	-	-	-
Moisture	%	32	-	-	-	-
Dry Sample Fraction >10mm	g ashed wt	< 0.1	-	-	-	-
Sample Fraction <10mm to >2mm	g ashed wt	147.7	-	-	-	-
Sample Fraction <2mm	g ashed wt	67.6	-	-	-	-
<2mm Subsample Weight	g ashed wt	57.9	-	-	-	-
Asbestos Presence / Absence		Asbestos NOT detected.	-	-	-	-
Description of Asbestos Form		-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g ashed wt	< 0.00001	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	-	-	-	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	< 0.00001	-	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	-	-	-	-
Weight of Asbestos as Asbestos Fines (Friable)*	g ashed wt	< 0.00001	-	-	-	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	-	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	-	-	-	-

Analyst's Comments

Appendix No.1 - Chain of Custody

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 clean 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.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1
New Zealand Guidelines Semi Quantitative Asbestos in Soil*		-	1
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1
Ashed Weight	Sample ashed at 400°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	1 %	1
Sample Fraction >10mm	Sample ashed at 400°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1
Sample Fraction <10mm and >2mm	Sample ashed at 400°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1
Sample Fraction <2mm	Sample ashed at 400°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Hill Laboratories
A WORLD LEADER IN ANALYTICAL SERVICES

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

ANALYSIS Job No: **199 1296** Date Recv: 30-May-18 06:40

Received by: Nathaniel Sue

3119912964

Client

Name	AECOM New Zealand Limited
Address	PO Box 4241, Shortland Street
	AUCKLAND 1140
Phone	09 967 9200 *Fax* 09 960 9201
Client Reference	60563280
Quote No	12638 *Order Number* 12638

Primary Contact	Naomi Macorison
Submitted By	Max Nightingale
Charge To	AECOM New Zealand Limited

Results To ☐ Mail Client ☐ Mail Submitter

☐ Fax Results Naomi.Macorison@aecom.com

☑ Email Results Max.Nightingale@aecom.com

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 29/05/2018
Name: Max Nightingale
☑ *Please tick if you require COC to be faxed back*
Signature: M. Nightingale

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 2.5

☐ Sample Analysis details checked
Signature:

ADDITIONAL INFORMATION

Please email CoC on arrival at Lab reception. PO Number 12638

Priority

☐ **Low** ☑ **Normal** ☐ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Seline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required*
1	SAH035_0.2	29/05/2018	ES	Metals + Asbestos (WA)
2	SAH035_0.5	29/05/2018	ES	Hold Cold
3	SAH035_1.4	29/05/2018	ES	Hold Cold
4	SAH035_2.2	29/05/2018	ES	Hold Cold
5				
6				
7				
8				
9				
10				

Continued on next page

Hill Laboratories
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R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	1991296	SPv2
Contact:	N Macorison C/- AECOM New Zealand Limited PO Box 4241 Shortland Street Auckland 1140	**Date Received:**	30-May-2018	
		Date Reported:	02-May-2019	**(Amended)**
		Quote No:	81048	
		Order No:	12638	
		Client Reference:	60563280	
		Submitted By:	Max Nightingale	

Sample Type: Soil

Sample Name:		DH102_0.2 29-May-2018 12:00 pm				
Lab Number:		1991296.1				
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	35	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	24	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	14.0	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	32	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	55	-	-	-	-
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	331.2	-	-	-	-
Dry Weight	g	225.1	-	-	-	-
Ashed Weight	g	216.1	-	-	-	-
Moisture	%	32	-	-	-	-
Dry Sample Fraction >10mm	g ashed wt	< 0.1	-	-	-	-
Sample Fraction <10mm to >2mm	g ashed wt	147.7	-	-	-	-
Sample Fraction <2mm	g ashed wt	67.6	-	-	-	-
<2mm Subsample Weight	g ashed wt	57.9	-	-	-	-
Asbestos Presence / Absence		Asbestos NOT detected.	-	-	-	-
Description of Asbestos Form		-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g ashed wt	< 0.00001	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	-	-	-	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	< 0.00001	-	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	-	-	-	-
Weight of Asbestos as Asbestos Fines (Friable)*	g ashed wt	< 0.00001	-	-	-	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	-	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	-	-	-	-

Analyst's Comments

Amended Report: This certificate of analysis replaces an earlier report issued on 12 Jun 2018 at 2:43 pm
Reason for amendment: Sample IDs amended as requested.

Appendix No.1 - Chain of Custody

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 clean 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.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1
New Zealand Guidelines Semi Quantitative Asbestos in Soil*		-	1
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1
Ashed Weight	Sample ashed at 400°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	1 %	1
Sample Fraction >10mm	Sample ashed at 400°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1
Sample Fraction <10mm and >2mm	Sample ashed at 400°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1
Sample Fraction <2mm	Sample ashed at 400°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Kim Harrison MSc
Client Services Manager - Environmental

Hill Laboratories
A WORLD LEADER IN ANALYTICAL SERVICES

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

ANALYSIS Job No: **199 1296** Date Recv: 30-May-18 06:40

Received by: Nathaniel Sue

3119912964

Client

Name	AECOM New Zealand Limited
Address	PO Box 4241, Shortland Street
	AUCKLAND 1140
Phone	09 967 9200 *Fax* 09 960 9201
Client Reference	60563280
Quote No	12638 *Order Number* 12638

Primary Contact	Naomi Macorison
Submitted By	Max Nightingale
Charge To	AECOM New Zealand Limited

Results To ☐ Mail Client ☐ Mail Submitter

☐ Fax Results Naomi.Macorison@aecom.com

☑ Email Results Max.Nightingale@aecom.com

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 29/05/2018
Name: Max Nightingale
☑ *Please tick if you require COC to be faxed back*
Signature: M. Nightingale

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 2.5

☐ Sample Analysis details checked
Signature:

ADDITIONAL INFORMATION

Please email CoC on arrival at Lab reception. PO Number 12638

Priority

☐ **Low** ☑ **Normal** ☐ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Seline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required*
1	SAH035_0.2	29/05/2018	ES	Metals + Asbestos (WA)
2	SAH035_0.5	29/05/2018	ES	Hold Cold
3	SAH035_1.4	29/05/2018	ES	Hold Cold
4	SAH035_2.2	29/05/2018	ES	Hold Cold
5				
6				
7				
8				
9				
10				

Continued on next page

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R J Hill Laboratories Limited
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Private Bag 3205
Hamilton 3240 New Zealand

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T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

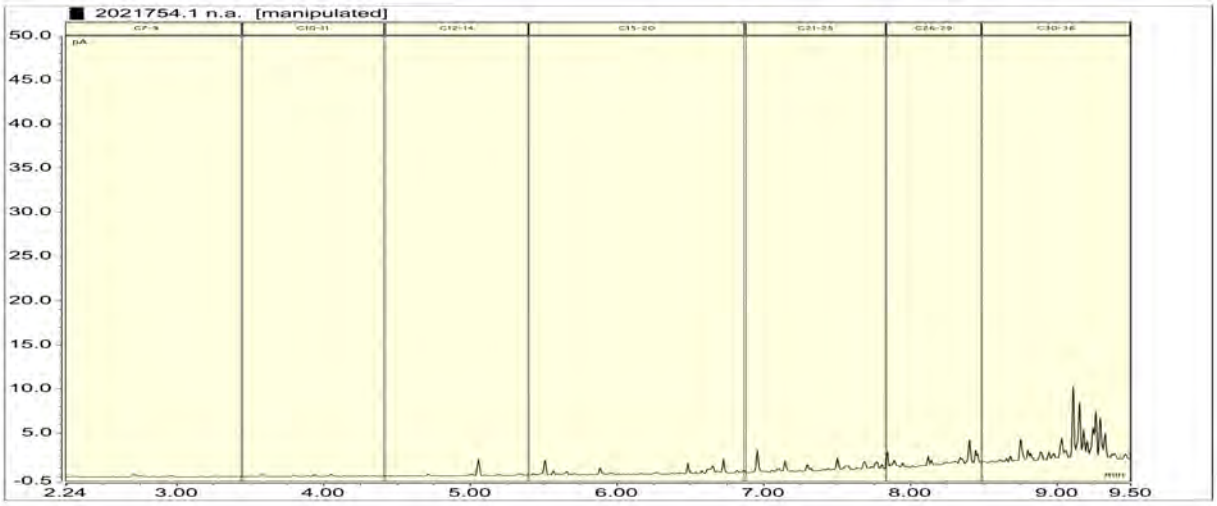
Client:	AECOM New Zealand Limited	**Lab No:**	2021754	SPv1
Contact:	N Macorison	**Date Received:**	27-Jul-2018	
	C/- AECOM New Zealand Limited	**Date Reported:**	03-Aug-2018	
	PO Box 4241	**Quote No:**	81048	
	Shortland Street	**Order No:**	60563280	
	Auckland 1140	**Client Reference:**	AMETI	
		Submitted By:	Max Nightingale	

Sample Type: Sediment

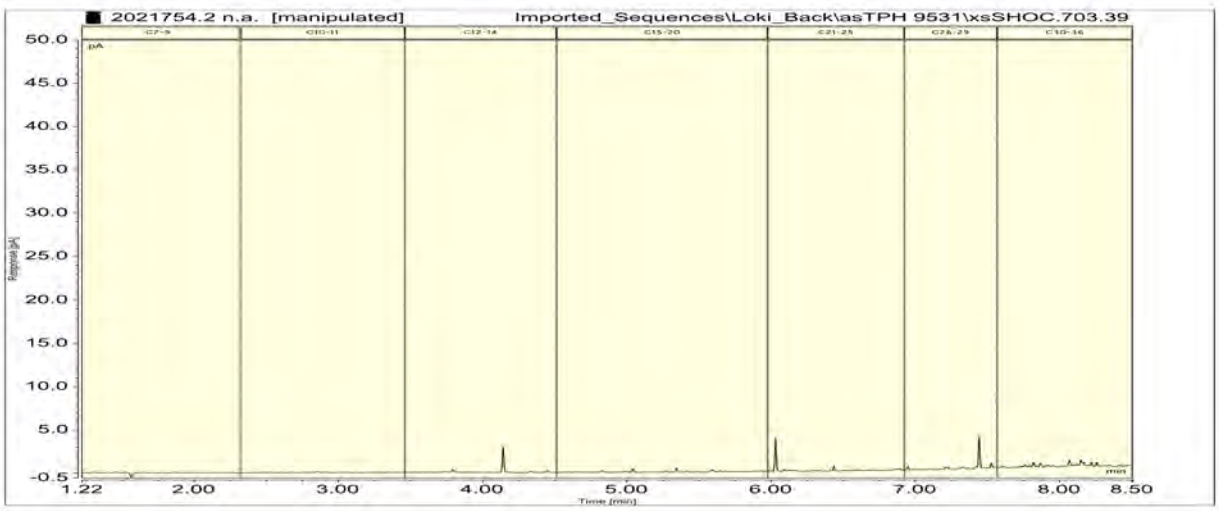
Sample Name:		AMETI_SED01 26-Jul-2018	AMETI_SED02 26-Jul-2018			
Lab Number:		2021754.1	2021754.2			
Individual Tests						
Dry Matter	g/100g as rcvd	46	44	-	-	-
Heavy metal, trace level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	8.1	9.7	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.093	0.067	-	-	-
Total Recoverable Chromium	mg/kg dry wt	27	27	-	-	-
Total Recoverable Copper	mg/kg dry wt	47	32	-	-	-
Total Recoverable Lead	mg/kg dry wt	57	34	-	-	-
Total Recoverable Nickel	mg/kg dry wt	21	12.6	-	-	-
Total Recoverable Zinc	mg/kg dry wt	220	220	-	-	-
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	509.1	417.4	-	-	-
Dry Weight	g	403.0	310.4	-	-	-
Ashed Weight	g	198.3	177.2	-	-	-
Moisture	%	21	26	-	-	-
Dry Sample Fraction >10mm	g ashed wt	< 0.1	< 0.1	-	-	-
Sample Fraction <10mm to >2mm	g ashed wt	115.8	112.5	-	-	-
Sample Fraction <2mm	g ashed wt	81.5	63.4	-	-	-
<2mm Subsample Weight	g ashed wt	51.3	63.4	-	-	-
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	-	-	-
Description of Asbestos Form		-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g ashed wt	< 0.00001	< 0.00001	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	< 0.00001	< 0.00001	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-	-
Weight of Asbestos as Asbestos Fines (Friable)*	g ashed wt	< 0.00001	< 0.00001	-	-	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Perylene	mg/kg dry wt	0.05	0.02	-	-	-

Sample Type: Sediment						
Sample Name:		AMETI_SED01 26-Jul-2018	AMETI_SED02 26-Jul-2018			
Lab Number:		2021754.1	2021754.2			
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	0.09	< 0.06	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	0.09	< 0.06	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Acenaphthene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Anthracene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Benzo[a]anthracene	mg/kg dry wt	0.04	0.03	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.05	0.02	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.08	0.03	-	-	-
Benzo[e]pyrene	mg/kg dry wt	0.05	< 0.03	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.08	0.04	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	0.03	< 0.03	-	-	-
Chrysene	mg/kg dry wt	0.04	0.02	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Fluoranthene	mg/kg dry wt	0.08	0.04	-	-	-
Fluorene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.05	0.02	-	-	-
Naphthalene	mg/kg dry wt	< 0.11	< 0.11	-	-	-
Phenanthrene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Pyrene	mg/kg dry wt	0.09	0.04	-	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 13	< 13	-	-	-
C10 - C14	mg/kg dry wt	< 30	< 30	-	-	-
C15 - C36	mg/kg dry wt	580	144	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	580	144	-	-	-

2021754.1
AMETI_SED01 26-Jul-2018
Client Chromatogram for TPH by FID



2021754.2
AMETI_SED02 26-Jul-2018
Client Chromatogram for TPH by FID



Analyst's Comments

Appendix No.1 - Chain of Custody

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 clean 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.

Sample Type: Sediment

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-2
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-2
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-2
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benz(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 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + 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.	0.002 mg/kg dry wt	1-2
Benzo[a]pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k) fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	1-2
TPH Oil Industry Profile + PAHscreen	Sonication in DCM extraction, SPE cleanup, GC-FID & GC-MS analysis. Tested on as received sample. US EPA 8015B/MfE Petroleum Industry Guidelines [KBIs:5786,2805,10734;2695]	0.002 - 60 mg/kg dry wt	1-2
Heavy metal, trace level As,Cd,Cr,Cu,Ni,Pb,Zn	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, trace level.	0.010 - 0.4 mg/kg dry wt	1-2
New Zealand Guidelines Semi Quantitative Asbestos in Soil*		-	1-2
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1-2
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1-2

Sample Type: Sediment			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Ashed Weight	Sample ashed at 400°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1-2
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	1 %	1-2
Sample Fraction >10mm	Sample ashed at 400°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1-2
Sample Fraction <10mm and >2mm	Sample ashed at 400°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1-2
Sample Fraction <2mm	Sample ashed at 400°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1-2
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1-2
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1-2
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1-2
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1-2
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1-2
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1-2

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

Hill Laboratories
A WORLD LEADER IN ANALYTICAL SERVICES

ANALYSIS REQUEST

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Job No: 202 1754 Date Recv: 27-Jul-18 05:39

Received by: Sachet Sharma

Client

Name	AECOM New Zealand Limited
Address	PO Box 4241, Shortland Street
	AUCKLAND 1140
Phone	09 967 9200 Fax 09 960 9201
Client Reference	AMETI
Quote No	Order Number 60563280

Primary Contact Naomi.macorison@aecom.com

Submitted By MAX Nightingale

Charge To AECOM New Zealand Limited

Results To ☐ Mail Client ☑ Mail Submitter

☐ Fax Results

☑ Email Results Kate.fuicker@aecom.com

Office use only Job No: 3120217544

CHAIN OF CUSTODY

Sent to Hill Laboratories
Date & Time:
Name:
Signature:
☑ Please tick if you require COC to be faxed back

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition
☐ Room Temp ☑ Chilled ☐ Frozen
Temp: 1.6

☐ Sample Analysis details checked
Signature:

ADDITIONAL INFORMATION

Priority

☐ Low ☑ Normal ☐ High

☐ Urgent (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	E	Effluent	G	Geothermal	Pot1	Potable Water (LAS/EU)	Pot2	Potable Water (NZDWS)
	GW	Ground Water	L	Leachete	☐	Audit Monitoring	Pot3	Potable Water (other)
	SW	Surface Water	S	Saline	☐	Check Monitoring	Pool	Swimming/Spa Pool
	TW	Trade Waste						
Solids	ES	Soil	SE	Sediment	SL	Sludge	PL	Plant
Other	O	O Oil	M	Miscellaneous	FS	FS Fish/shellfish/biota	BM	BM Biological Material

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required
1	AMETI_SED01	26.07.18	~~SE~~ SE	TPH, PAH, metals, ACM
2	AMETI_SED02	26.07.18	SE	" "
3				
4				
5				
6				
7				
8				
9				
10				

Continued on next page

Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	2035377 SPv1
Contact:	N Macorison	**Date Received:**	22-Aug-2018
	C/- AECOM New Zealand Limited	**Date Reported:**	29-Aug-2018
	PO Box 4241	**Quote No:**	81048
	Shortland Street	**Order No:**	60563280/3.3.1
	Auckland 1140	**Client Reference:**	60563280/3.3.1
		Submitted By:	Suresh Nuthalapati

Sample Type: Soil

Sample Name:		AME_EHA101_0.1-0.2 20-Aug-2018	AME_EHA101_0.8-0.9 20-Aug-2018	AME_EHA103_0.1-0.2 20-Aug-2018	AME_EHA103_0.9-1.0 20-Aug-2018	AME_EHA104_0.1-0.2 20-Aug-2018
Lab Number:		2035377.1	2035377.2	2035377.4	2035377.5	2035377.7
Individual Tests						
Dry Matter	g/100g as rcvd	-	75	-	67	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	-	3	2	2
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	-	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	30	-	32	7	27
Total Recoverable Copper	mg/kg dry wt	14	-	7	6	9
Total Recoverable Lead	mg/kg dry wt	9.2	-	10.0	13.8	13.8
Total Recoverable Nickel	mg/kg dry wt	29	-	15	10	14
Total Recoverable Zinc	mg/kg dry wt	45	-	38	16	36
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	-	< 0.06	-	-	-
Toluene	mg/kg dry wt	-	< 0.06	-	-	-
Ethylbenzene	mg/kg dry wt	-	< 0.06	-	-	-
m&p-Xylene	mg/kg dry wt	-	< 0.11	-	-	-
o-Xylene	mg/kg dry wt	-	< 0.06	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	-	-	-	< 0.015	-
2-Methylnaphthalene	mg/kg dry wt	-	-	-	< 0.015	-
Perylene	mg/kg dry wt	-	-	-	< 0.015	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	-	-	< 0.04	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	-	-	< 0.04	-
Acenaphthylene	mg/kg dry wt	-	-	-	< 0.015	-
Acenaphthene	mg/kg dry wt	-	-	-	< 0.015	-
Anthracene	mg/kg dry wt	-	-	-	< 0.015	-
Benzo[a]anthracene	mg/kg dry wt	-	-	-	< 0.015	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	-	< 0.015	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	-	-	< 0.015	-
Benzo[e]pyrene	mg/kg dry wt	-	-	-	< 0.015	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	-	< 0.015	-
Benzo[k]fluoranthene	mg/kg dry wt	-	-	-	< 0.015	-
Chrysene	mg/kg dry wt	-	-	-	< 0.015	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	-	< 0.015	-
Fluoranthene	mg/kg dry wt	-	-	-	< 0.015	-
Fluorene	mg/kg dry wt	-	-	-	< 0.015	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	-	< 0.015	-

Sample Type: Soil						
Sample Name:		AME_EHA101_0.1-0.2 20-Aug-2018	AME_EHA101_0.8-0.9 20-Aug-2018	AME_EHA103_0.1-0.2 20-Aug-2018	AME_EHA103_0.9-1.0 20-Aug-2018	AME_EHA104_0.1-0.2 20-Aug-2018
Lab Number:		2035377.1	2035377.2	2035377.4	2035377.5	2035377.7
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Naphthalene	mg/kg dry wt	-	-	-	< 0.08	-
Phenanthrene	mg/kg dry wt	-	-	-	< 0.015	-
Pyrene	mg/kg dry wt	-	-	-	< 0.015	-
Total of Reported PAHs in Soil*	mg/kg	-	-	-	< 0.4	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	-	< 8	-	-	-
C10 - C14	mg/kg dry wt	-	< 20	-	-	-
C15 - C36	mg/kg dry wt	-	< 40	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	-	< 70	-	-	-

Sample Name:		AME_EHA104_0.8-0.9 20-Aug-2018	AME_EHA111_0.2-0.3 20-Aug-2018	AME_EHA111_0.5-0.6 20-Aug-2018	AME_EHA111_0.9-1.0 20-Aug-2018	
Lab Number:		2035377.9	2035377.11	2035377.12	2035377.13	
Individual Tests						
Dry Matter	g/100g as rcvd	61	-	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	5	3	3	-
Total Recoverable Cadmium	mg/kg dry wt	-	< 0.10	< 0.10	< 0.10	-
Total Recoverable Chromium	mg/kg dry wt	-	25	31	38	-
Total Recoverable Copper	mg/kg dry wt	-	12	13	6	-
Total Recoverable Lead	mg/kg dry wt	-	33	10.6	11.0	-
Total Recoverable Nickel	mg/kg dry wt	-	20	18	7	-
Total Recoverable Zinc	mg/kg dry wt	-	44	30	10	-
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.08	-	-	-	-
Toluene	mg/kg dry wt	< 0.08	-	-	-	-
Ethylbenzene	mg/kg dry wt	< 0.08	-	-	-	-
m&p-Xylene	mg/kg dry wt	< 0.16	-	-	-	-
o-Xylene	mg/kg dry wt	< 0.08	-	-	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 10	-	-	-	-
C10 - C14	mg/kg dry wt	< 20	-	-	-	-
C15 - C36	mg/kg dry wt	< 40	-	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	-	-	-	-

Analyst's Comments

Appendix No.1 - Chain of Custody

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 clean 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.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 4-5, 7, 11-13
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample [KBIs:5782,26687,3629]	0.05 - 0.10 mg/kg dry wt	2, 9
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	-	5

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample [KBIs:5786,2805,10734]	8 - 60 mg/kg dry wt	2, 9
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2, 5, 9
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benz(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 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + 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.	0.002 mg/kg dry wt	5
Benzo[a]pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k) fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	5
Total of Reported PAHs in Soil*	Sonication extraction, SPE cleanup, GC-MS SIM analysis.	0.3 mg/kg	5

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

Hill Laboratories
BETTER TESTING BETTER RESULTS

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

ANALYSIS Job No: 203 5377 Date Recv: 22-Aug-18 05:20

Received by: Nathaniel Sue

3120353770

Client

Name AECOM New Zealand Limited

Address 8 Mahuhu Crescent

Phone *Fax*

Client Reference

Quote No *Order Number* 605628280/33.1

Primary Contact NAOMI MACORISON

Submitted By SURESH NUTHALAPATI

Charge To Aecom Auckland

Results To ☑ Mail Client ☑ Mail Submitter

☐ Fax Results

☑ Email Results Naomi.macorison@aecom.com

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 21/8/18 09:15am
Name: SURESH.N
☑ *Please tick if you require COC to be faxed back*
Signature:

Received at Hill Laboratories
Date & Time:
Nema:
Signature:

Condition ☐ *Room Temp* ☐ *Chilled* ☐ *Frozen* *Temp:* 9.1

☐ Sample Analysis details checked
Signature:

ADDITIONAL INFORMATION

HOLD COLD ALL SAMPLES

Priority

☐ **Low** ☑ **Normal** ☐ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Seline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required/COWL/Initial/Final flow/Total Time*
1	AME_HA101_0.1-0.2	20/8/18	ES	
2	AME_HA101_0.8-0.9	20/8/18	ES	
3	AME_HA101_1.4-1.5	20/8/18	ES	
4	AME_HA103_0.1-0.2	20/8/18	ES	
5	AME_HA103_0.9-1.0	20/8/18	ES	
6	AME_HA103_1.7-1.8	20/8/18	ES	
7	AME_HA104_0.1-0.2	20/8/18	ES	
8	AME_HA104_0.4-0.5	20/8/18	ES	
9	AME_HA104_0.8-0.9	20/8/18	ES	
10	AME_HA104_1.8-2.0	20/8/18	ES	

TO BE CONFIRMED

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required/COWL/Initial/Final flow/Total Time
11	AME_HA111_0.2-0.3	20/8/18	ES	TO BE CONFIRMED
12	AME_HA111_0.5-0.6	20/8/18	ES	
13	AME_HA111_0.9-1.0	20/8/18	ES	
14	AME_HA111_1.75-1.85	20/8/18	ES	
15	AME_HA110_0.2-0.3	20/8/18	ES	
16	AME_HA110_0.5-0.6	20/8/18	ES	
17	AME_HA110_1.3-1.4	20/8/18	ES	
18	AME_HA110_1.7-1.8	20/8/18	ES	
19	AME_HA110_1.9-2.0	20/8/18	ES	
20	AME_HA121_0.2-0.3	20/8/18	ES	
21	AME_HA121_0.8-0.9	20/8/18	ES	
22	AME_HA121_1.4-1.5	20/8/18	ES	
23	AME_HA121_1.9-2.0	20/8/18	ES	

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Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	2035379 SPv1
Contact:	N Macorison	**Date Received:**	22-Aug-2018
	C/- AECOM New Zealand Limited	**Date Reported:**	29-Aug-2018
	PO Box 4241	**Quote No:**	81048
	Shortland Street	**Order No:**	60563280/3.3.1
	Auckland 1140	**Client Reference:**	
		Submitted By:	Suresh Nuthalapati

Sample Type: Soil

Sample Name:		AME - HA122 - 0.15-0.25	AME - HA112 - 0.15-0.3	AME - HA112 - 0.9-1.0	AME - HA114 - 0.1-0.2	AME - HA114 - 0.7-0.8
Lab Number:		2035379.1	2035379.4	2035379.5	2035379.8	2035379.9
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	77	-	77
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	3	< 2	4	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.23	-
Total Recoverable Chromium	mg/kg dry wt	30	24	27	37	-
Total Recoverable Copper	mg/kg dry wt	11	5	10	35	-
Total Recoverable Lead	mg/kg dry wt	39	7.8	4.8	27	-
Total Recoverable Nickel	mg/kg dry wt	25	8	21	55	-
Total Recoverable Zinc	mg/kg dry wt	42	25	25	96	-
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	-	-	-	-	< 0.06
Toluene	mg/kg dry wt	-	-	-	-	< 0.06
Ethylbenzene	mg/kg dry wt	-	-	-	-	< 0.06
m&p-Xylene	mg/kg dry wt	-	-	-	-	< 0.11
o-Xylene	mg/kg dry wt	-	-	-	-	< 0.06
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	-	-	< 0.013	-	-
2-Methylnaphthalene	mg/kg dry wt	-	-	< 0.013	-	-
Perylene	mg/kg dry wt	-	-	< 0.013	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	-	< 0.04	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	-	< 0.04	-	-
Acenaphthylene	mg/kg dry wt	-	-	< 0.013	-	-
Acenaphthene	mg/kg dry wt	-	-	< 0.013	-	-
Anthracene	mg/kg dry wt	-	-	< 0.013	-	-
Benzo[a]anthracene	mg/kg dry wt	-	-	< 0.013	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	< 0.013	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	< 0.013	-	-
Benzo[e]pyrene	mg/kg dry wt	-	-	< 0.013	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	< 0.013	-	-
Benzo[k]fluoranthene	mg/kg dry wt	-	-	< 0.013	-	-
Chrysene	mg/kg dry wt	-	-	< 0.013	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	< 0.013	-	-
Fluoranthene	mg/kg dry wt	-	-	< 0.013	-	-
Fluorene	mg/kg dry wt	-	-	< 0.013	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	< 0.013	-	-

Sample Type: Soil						
Sample Name:		AME - HA122 - 0.15-0.25	AME - HA112 - 0.15-0.3	AME - HA112 - 0.9-1.0	AME - HA114 - 0.1-0.2	AME - HA114 - 0.7-0.8
Lab Number:		2035379.1	2035379.4	2035379.5	2035379.8	2035379.9
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Naphthalene	mg/kg dry wt	-	-	< 0.07	-	-
Phenanthrene	mg/kg dry wt	-	-	< 0.013	-	-
Pyrene	mg/kg dry wt	-	-	< 0.013	-	-
Total of Reported PAHs in Soil*	mg/kg	-	-	< 0.4	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	-	-	-	-	< 8
C10 - C14	mg/kg dry wt	-	-	-	-	< 20
C15 - C36	mg/kg dry wt	-	-	-	-	< 40
Total hydrocarbons (C7 - C36)	mg/kg dry wt	-	-	-	-	< 70

Sample Name:		AME - HA114 - 1.4-1.5	AME - HA113 - 0.1-0.2	AME - HA113 - 0.9-1.0	AME - HA105 - 0.2-0.3	AME - HA105 - 0.8-0.9
Lab Number:		2035379.10	2035379.11	2035379.12	2035379.15	2035379.16
Individual Tests						
Dry Matter	g/100g as rcvd	62	-	72	-	70
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	4	-	< 2	< 2
Total Recoverable Cadmium	mg/kg dry wt	-	0.59	-	0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	-	40	-	23	23
Total Recoverable Copper	mg/kg dry wt	-	43	-	13	13
Total Recoverable Lead	mg/kg dry wt	-	71	-	17.2	9.5
Total Recoverable Nickel	mg/kg dry wt	-	61	-	16	12
Total Recoverable Zinc	mg/kg dry wt	-	157	-	36	30
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	< 0.08	-	< 0.06	-	-
Toluene	mg/kg dry wt	< 0.08	-	< 0.06	-	-
Ethylbenzene	mg/kg dry wt	< 0.08	-	< 0.06	-	-
m&p-Xylene	mg/kg dry wt	< 0.16	-	< 0.12	-	-
o-Xylene	mg/kg dry wt	< 0.08	-	< 0.06	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	-	-	-	-	< 0.015
2-Methylnaphthalene	mg/kg dry wt	-	-	-	-	< 0.015
Perylene	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	-	-	-	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	-	-	-	< 0.04
Acenaphthylene	mg/kg dry wt	-	-	-	-	< 0.015
Acenaphthene	mg/kg dry wt	-	-	-	-	< 0.015
Anthracene	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[a]anthracene	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[e]pyrene	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	-	-	< 0.015
Benzo[k]fluoranthene	mg/kg dry wt	-	-	-	-	< 0.015
Chrysene	mg/kg dry wt	-	-	-	-	< 0.015
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	-	-	< 0.015
Fluoranthene	mg/kg dry wt	-	-	-	-	< 0.015
Fluorene	mg/kg dry wt	-	-	-	-	< 0.015
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	-	-	< 0.015
Naphthalene	mg/kg dry wt	-	-	-	-	< 0.08
Phenanthrene	mg/kg dry wt	-	-	-	-	< 0.015
Pyrene	mg/kg dry wt	-	-	-	-	< 0.015
Total of Reported PAHs in Soil*	mg/kg	-	-	-	-	< 0.4

Sample Type: Soil						
Sample Name:		AME - HA114 - 1.4-1.5	AME - HA113 - 0.1-0.2	AME - HA113 - 0.9-1.0	AME - HA105 - 0.2-0.3	AME - HA105 - 0.8-0.9
Lab Number:		2035379.10	2035379.11	2035379.12	2035379.15	2035379.16
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 10	-	< 9	-	-
C10 - C14	mg/kg dry wt	< 20	-	< 20	-	-
C15 - C36	mg/kg dry wt	< 40	-	< 40	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	-	< 70	-	-

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 clean 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.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 4-5, 8, 11, 15-16
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample [KBIs:5782,26687,3629]	0.05 - 0.10 mg/kg dry wt	9-10, 12
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	-	5, 16
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample [KBIs:5786,2805,10734]	8 - 60 mg/kg dry wt	9-10, 12
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	5, 9-10, 12, 16
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benz(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 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + 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.	0.002 mg/kg dry wt	5, 16
Benzo[a]pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k) fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	5, 16
Total of Reported PAHs in Soil*	Sonication extraction, SPE cleanup, GC-MS SIM analysis.	0.3 mg/kg	5, 16

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	2036105	SPv1
Contact:	N Macorison	**Date Received:**	23-Aug-2018	
	C/- AECOM New Zealand Limited	**Date Reported:**	29-Aug-2018	
	PO Box 4241	**Quote No:**	81048	
	Shortland Street	**Order No:**	60563280/3.3.1	
	Auckland 1140	**Client Reference:**	60563280/3.3.1	
		Submitted By:	Suresh Nuthalapati	

Sample Type: Soil

Sample Name:		AME_HA115_0.1-0.2 22-Aug-2018	AME_HA115_0.6-0.7 22-Aug-2018	AME_HA117_0.3-0.4 22-Aug-2018	AME_HA117_1.7-1.8 22-Aug-2018	AME_HA116_0.25-0.35 22-Aug-2018
Lab Number:		2036105.1	2036105.2	2036105.3	2036105.4	2036105.6
Individual Tests						
Dry Matter	g/100g as rcvd	-	73	-	71	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	-	3	4	< 2
Total Recoverable Cadmium	mg/kg dry wt	0.20	-	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	37	-	47	51	13
Total Recoverable Copper	mg/kg dry wt	21	-	15	23	7
Total Recoverable Lead	mg/kg dry wt	37	-	11.1	16.9	11.3
Total Recoverable Nickel	mg/kg dry wt	27	-	25	37	10
Total Recoverable Zinc	mg/kg dry wt	80	-	38	32	19
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	-	< 0.06	-	-	-
Toluene	mg/kg dry wt	-	< 0.06	-	-	-
Ethylbenzene	mg/kg dry wt	-	< 0.06	-	-	-
m&p-Xylene	mg/kg dry wt	-	< 0.12	-	-	-
o-Xylene	mg/kg dry wt	-	< 0.06	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	-	-	-	< 0.014	-
2-Methylnaphthalene	mg/kg dry wt	-	-	-	< 0.014	-
Perylene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	-	-	< 0.04	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	-	-	< 0.04	-
Acenaphthylene	mg/kg dry wt	-	-	-	< 0.014	-
Acenaphthene	mg/kg dry wt	-	-	-	< 0.014	-
Anthracene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[a]anthracene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[e]pyrene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	-	-	< 0.014	-
Benzo[k]fluoranthene	mg/kg dry wt	-	-	-	< 0.014	-
Chrysene	mg/kg dry wt	-	-	-	< 0.014	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	-	-	< 0.014	-
Fluoranthene	mg/kg dry wt	-	-	-	< 0.014	-
Fluorene	mg/kg dry wt	-	-	-	< 0.014	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	-	-	< 0.014	-

Sample Type: Soil						
Sample Name:		AME_HA115_0.1-0.2 22-Aug-2018	AME_HA115_0.6-0.7 22-Aug-2018	AME_HA117_0.3-0.4 22-Aug-2018	AME_HA117_1.7-1.8 22-Aug-2018	AME_HA116_0.25-0.35 22-Aug-2018
Lab Number:		2036105.1	2036105.2	2036105.3	2036105.4	2036105.6
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Naphthalene	mg/kg dry wt	-	-	-	< 0.07	-
Phenanthrene	mg/kg dry wt	-	-	-	< 0.014	-
Pyrene	mg/kg dry wt	-	-	-	< 0.014	-
Total of Reported PAHs in Soil*	mg/kg	-	-	-	< 0.4	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	-	< 9	-	-	-
C10 - C14	mg/kg dry wt	-	< 20	-	-	-
C15 - C36	mg/kg dry wt	-	< 40	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	-	< 70	-	-	-

Sample Name:		AME_HA116_0.8-0.9 22-Aug-2018	AME_HA119_0.15-0.25 22-Aug-2018	AME_HA119_1.2-1.3 22-Aug-2018	AME_HA120_0.4-0.5 22-Aug-2018	AME_HA123_0.2-0.3 22-Aug-2018
Lab Number:		2036105.7	2036105.10	2036105.11	2036105.13	2036105.16
Individual Tests						
Dry Matter	g/100g as rcvd	58	-	-	71	81
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	3	2	2	< 2
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.12	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	3	32	31	41	13
Total Recoverable Copper	mg/kg dry wt	9	11	12	9	8
Total Recoverable Lead	mg/kg dry wt	42	14.0	22	12.3	9.6
Total Recoverable Nickel	mg/kg dry wt	4	19	16	16	15
Total Recoverable Zinc	mg/kg dry wt	12	26	40	27	19
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.017	-	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.017	-	-	-	-
Perylene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.05	-	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.05	-	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.017	-	-	-	-
Acenaphthene	mg/kg dry wt	< 0.017	-	-	-	-
Anthracene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.017	-	-	-	-
Chrysene	mg/kg dry wt	< 0.017	-	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.017	-	-	-	-
Fluoranthene	mg/kg dry wt	< 0.017	-	-	-	-
Fluorene	mg/kg dry wt	< 0.017	-	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.017	-	-	-	-
Naphthalene	mg/kg dry wt	< 0.09	-	-	-	-
Phenanthrene	mg/kg dry wt	< 0.017	-	-	-	-
Pyrene	mg/kg dry wt	< 0.017	-	-	-	-
Total of Reported PAHs in Soil*	mg/kg	< 0.4	-	-	-	-
Pentachlorophenol Screening in Soil by LCMSMS						
Pentachlorophenol (PCP)	mg/kg dry wt	-	-	-	< 0.05	< 0.05
2,3,4,6-Tetrachlorophenol (TCP)	mg/kg dry wt	-	-	-	< 0.05	< 0.05

Sample Type: Soil						
Sample Name:		AME_HA116_0.8-0.9 22-Aug-2018	AME_HA119_0.15-0.25 22-Aug-2018	AME_HA119_1.2-1.3 22-Aug-2018	AME_HA120_0.4-0.5 22-Aug-2018	AME_HA123_0.2-0.3 22-Aug-2018
Lab Number:		2036105.7	2036105.10	2036105.11	2036105.13	2036105.16
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 10	-	-	-	-
C10 - C14	mg/kg dry wt	< 20	-	-	-	-
C15 - C36	mg/kg dry wt	< 40	-	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	-	-	-	-

Sample Name:		AME_HA123_0.85-0.95 22-Aug-2018	AME_HA123_1.2-1.3 22-Aug-2018			
Lab Number:		2036105.17	2036105.18			
Individual Tests						
Dry Matter	g/100g as rcvd	74	71	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	< 2	< 2	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	-	-	-
Total Recoverable Chromium	mg/kg dry wt	13	11	-	-	-
Total Recoverable Copper	mg/kg dry wt	3	3	-	-	-
Total Recoverable Lead	mg/kg dry wt	5.7	4.4	-	-	-
Total Recoverable Nickel	mg/kg dry wt	7	6	-	-	-
Total Recoverable Zinc	mg/kg dry wt	18	16	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Perylene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	< 0.04	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.04	< 0.04	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Acenaphthene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Anthracene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Chrysene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Fluoranthene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Fluorene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Naphthalene	mg/kg dry wt	< 0.07	< 0.07	-	-	-
Phenanthrene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Pyrene	mg/kg dry wt	< 0.014	< 0.014	-	-	-
Total of Reported PAHs in Soil*	mg/kg	< 0.4	< 0.4	-	-	-

Analyst's Comments

Appendix No.1 - Chain of Custody

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 clean 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.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
TPH Oil Industry Profile + PAHscreen	Sonication in DCM extraction, SPE cleanup, GC-FID & GC-MS analysis. Tested on as received sample. US EPA 8015B/MfE Petroleum Industry Guidelines [KBIs:5786,2805,10734;2695]	-	7
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3-4, 6-7, 10-11, 13, 16-18
BTEX in Soil by Headspace GC-MS	Solvent extraction, Headspace GC-MS analysis US EPA 8260B. Tested on as received sample [KBIs:5782,26687,3629]	0.05 - 0.10 mg/kg dry wt	2
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	-	4, 17-18
Pentachlorophenol Screening in Soil by LCMSMS	Solvent extraction with sonication, dilution, analysis by LCMSMS with online SPE. Tested on dried sample	0.010 mg/kg dry wt	13, 16
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample [KBIs:5786,2805,10734]	8 - 60 mg/kg dry wt	2
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	2, 4, 7, 13, 16-18
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benz(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 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + 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.	0.002 mg/kg dry wt	4, 7, 17-18
Benzo[a]pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k) fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	4, 7, 17-18
Total of Reported PAHs in Soil*	Sonication extraction, SPE cleanup, GC-MS SIM analysis.	0.3 mg/kg	4, 7, 17-18

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

Hill Laboratories
BETTER TESTING BETTER RESULTS

ANALYSIS

Job No: **203 6105**

Date Recv: 23-Aug-18 05:27

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Received by: Nathaniel Sue

3120361056

Client

Name AECOM New Zealand Limited

Address 8 Mahuhu Crescent

Phone *Fax*

Client Reference

Quote No *Order Number* 60563280/3.3.1

Primary Contact Naomi Macorison

Submitted By Suresh Nuthalapati

Charge To Aecom Auckland

Results To ☑ Mail Client ☑ Mail Submitter

☐ Fax Results

☑ Email Results Naomi.Macorison@aecom.com

ADDITIONAL INFORMATION

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:* 23/08/2018

Name: Suresh Nuthalapati

☑ *Please tick if you require COC to be faxed back* *Signature:* S.N

Received at Hill Laboratories *Date & Time:*

Name:

Signature:

Condition *Temp:*

☐ *Room Temp* ☐ *Chilled* ☐ *Frozen*

☐ Sample Analysis details checked

Signature:

Priority

☐ **Low** ☑ **Normal** ☐ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2** Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3** Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool** Swimming/Spa Pool
	TW	Trade Waste					
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL** Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM** BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required/COWL/Initial/Final flow/Total Time*
1	AME_HA115_0.1-0.2	22/08/2018	ES	Metals
2	AME_HA115_0.6-0.7	22/08/2018	ES	TPH&BTEX
3	AME_HA117_0.3-0.4	22/08/2018	ES	Metals
3	AME_HA117_1.7-1.8	22/08/2018	ES	Metals & PAH
4	AME_HA117_2.5-2.6	22/08/2018	ES	Hold cold
5	AME_HA116_0.25-0.35	22/08/2018	ES	Metals
6	AME_HA116_0.8-0.9	22/08/2018	ES	Metals, TPH & PAH
7	AME_HA116_1.6-1.7	22/08/2018	ES	Hold cold
8	AME_HA116_1.9-2.0	22/08/2018	ES	Hold cold
9	AME_HA119_0.15-0.25	22/08/2018	ES	Metals
10	AME_HA119_1.2-1.3	22/08/2018	ES	Metals

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required/COWL/Initial/Final flow/Total Time
11	AME_HA119_2.5-2.6	22/08/2018	ES	Hold cold
12	AME_HA120_0.4-0.5	22/08/2018	ES	Metals & PCP
13	AME_HA120_1.1-1.2	22/08/2018	ES	Hold cold
14	AME_HA120_1.9-2.0	22/08/2018	ES	Hold cold
15	AME_HA123_0.2-0.3	22/08/2018	ES	Metals & PCP
16	AME_HA123_0.85-0.95	22/08/2018	ES	Metals & PAH
17	AME_HA123_1.2-1.3	22/08/2018	ES	Metals & PAH
18	AME_HA123_1.5-1.6	22/08/2018	ES	Hold cold
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

About AECOM

AECOM is built to deliver a better world. We design, build, finance and operate infrastructure assets for governments, businesses and organizations in more than 150 countries. As a fully integrated firm, we connect knowledge and experience across our global network of experts to help clients solve their most complex challenges. From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, our work is transformative, differentiated and vital. A Fortune 500 firm, AECOM had revenue of approximately $18.2 billion during fiscal year 2017. See how we deliver what others can only imagine at aecom.com and @AECOM.

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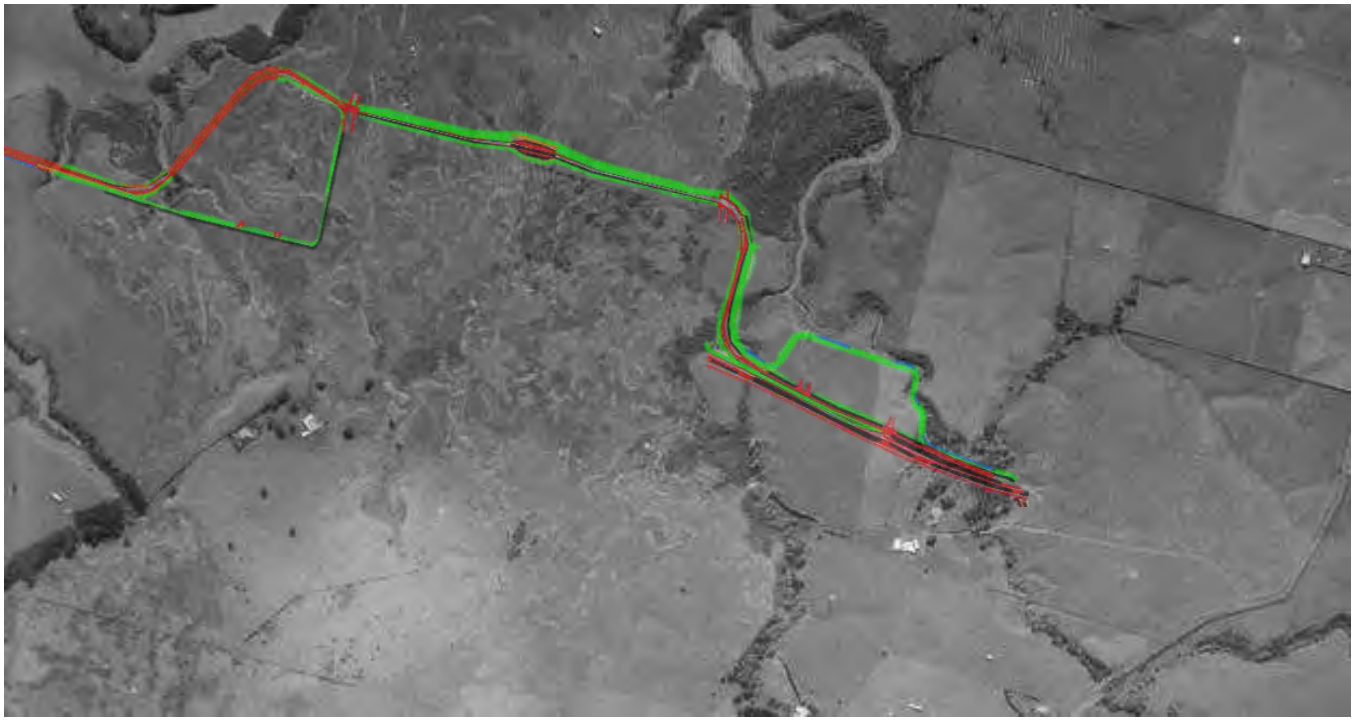
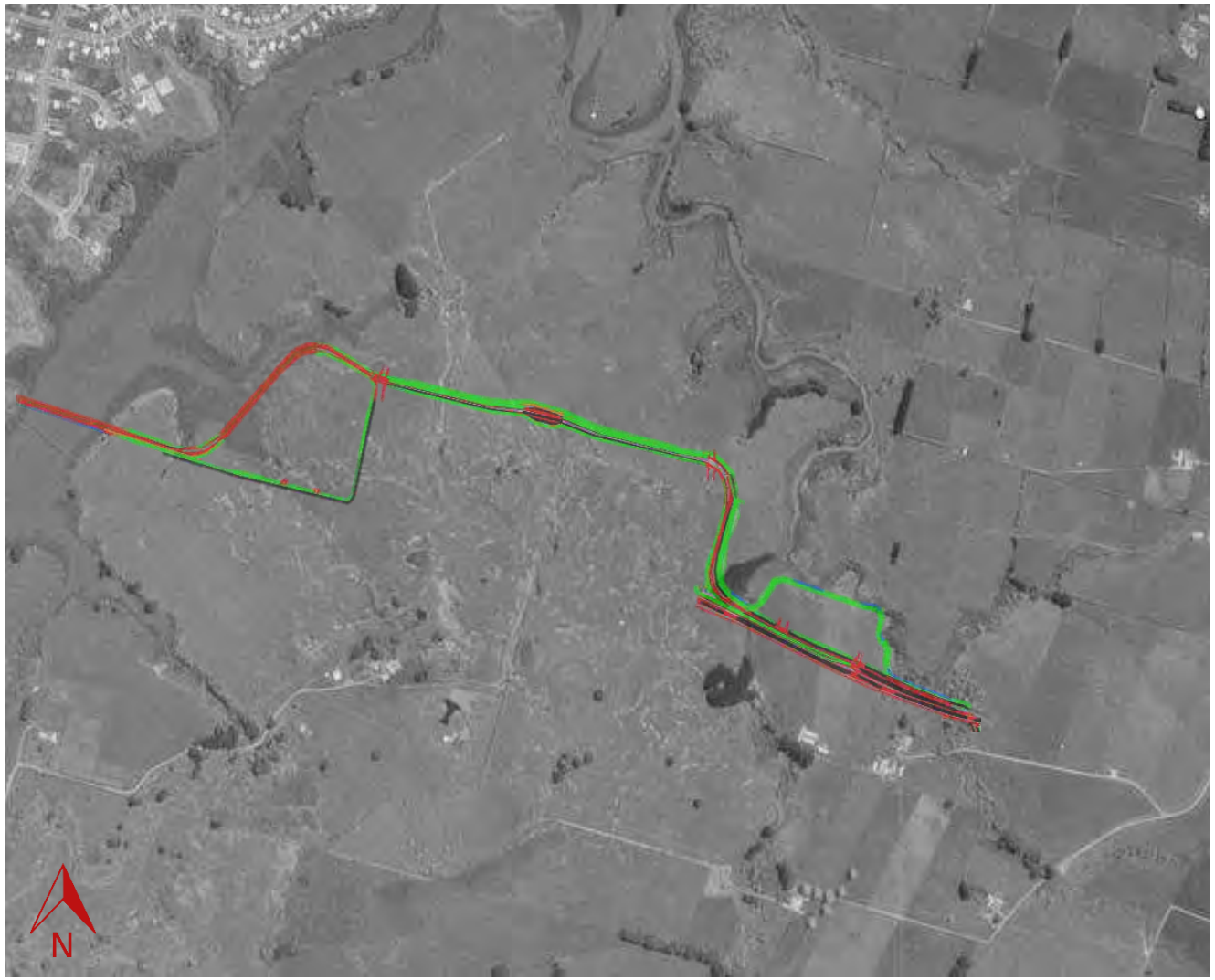
Auckland 1010
PO Box 4241
Auckland 1140
New Zealand
T +64 9 967 9200
F +64 9 967 9201

aecom.com

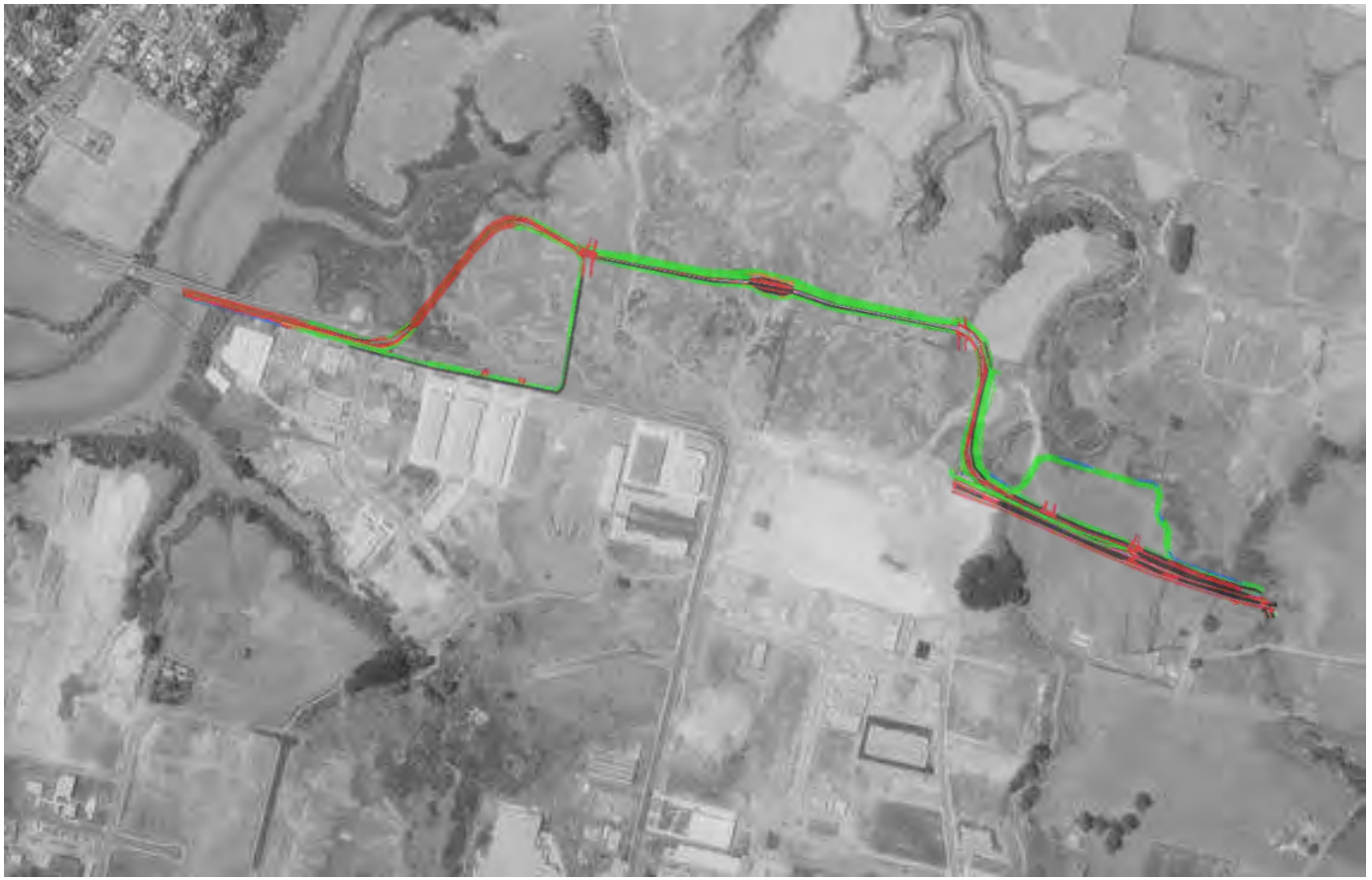
Appendix B: Historical Aerials

Historical Aerials - Eastern Busway – EB3C Package

Reference	Photographs
Date: 1940 Source: Retrolens Historical Image Resource https://www.retrolens.nz Area: EB3C Approximate location of EB3C overlayed onto image	

Reference	Photographs
Date: 1968 Source: Retrolens Historical Image Resource https://www.retrolens.nz Area: EB3C Approximate location of EB3C overlayed onto image	

Reference	Photographs
Date: 1975 Source: Retrolens Historical Image Resource https://www.retrolens.nz Area: EB3C Approximate location of EB3C overlayed onto image	

Reference	Photographs
Date: 1988 Source: Retrolens Historical Image Resource https://www.retrolens.nz Area: EB3C Approximate location of EB3C overlayed onto image	

Reference	Photographs
Date: 1996 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Area: EB3C Approximate location of EB3C overlayed onto image	

Reference	Photographs
Date: 2001 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Area: EB3C Approximate location of EB3C overlayed onto image	

Reference	Photographs
Date: 2003-2004 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Area: EB3C Approximate location of EB3C overlayed onto image	

Reference	Photographs
Date: 2015-2016 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Area: EB3C Approximate location of EB3C overlayed onto image	

Reference	Photographs
Date: 2020 Source: Google Earth Pro online services Area: EB3C Approximate location of EB3C overlayed onto image	

Reference	Photographs
Date: 1995 Source: Retrolens Historical Image Resource https://www.retrolens.nz Area: 280 and 286 Ti Rakau Drive, Pakuranga.	

Reference	Photographs
Date: 1996 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Area: 280 and 286 Ti Rakau Drive, Pakuranga.	

Reference	Photographs
Date: 1996 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Area: 242 Ti Rakau Drive	

Reference	Photographs
Date: 2001 Source: Google Earth Pro online services Area: 242 Ti Rakau Drive	

Historical Aerials - Eastern Busway – EB4L Package

Reference	Photographs
Date: 1940 Source: Retrolens Historical Image Resource https://www.retrolens.nz Area: EB4L Approximate Location of EB4L-	

Reference	Photographs
Date: 1968 Source: Retrolens Historical Image Resource https://www.retrolens.nz Area: EB4L Approximate Location of EB4L-	

Reference	Photographs
Date: 1988 Source: Retrolens Historical Image Resource https://www.retrolens.nz Area: EB4L Approximate Location of EB4L-	

Reference	Photographs
Date: 1994 Source: Retrolens Historical Image Resource https://www.retrolens.nz Area: EB4L Approximate Location of EB4L-	

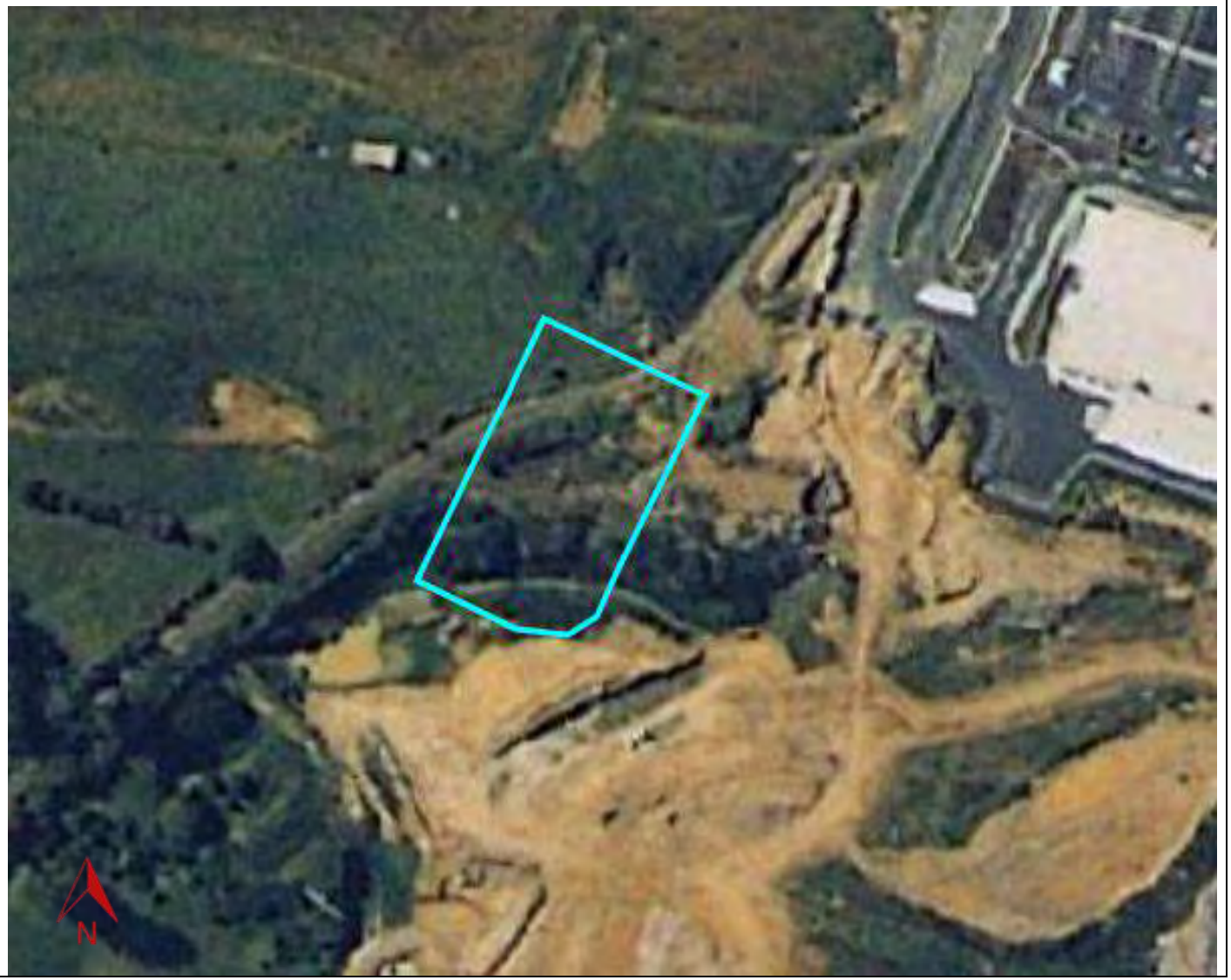
Reference	Photographs
Date: 1996 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Area: EB4L Approximate Location of EB4L-	

Reference	Photographs
Date: 2001 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Area: EB4L Approximate Location of EB4L-	

Reference	Photographs
Date: 2003-2004 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Area: EB4 Approximate Location of EB4L-	

Reference	Photographs
Date: 2015-2016 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Area: EB4L Approximate Location of EB4L-	

Reference	Photographs
Date: 2023 Source: Google Earth Pro online services Area: EB4L Approximate Location of EB4L-	

Reference	Photographs
Date: 1996 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Site: 550 Te Irirangi Drive (Z service station)	

Reference	Photographs
Date: 2001 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Site: 550 Te Irirangi Drive (Z service station)	

Reference	Photographs
Date: 2006 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Site: 550 Te Irirangi Drive (Z service station)	

Reference	Photographs
Date: 2017 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Site: 550 Te Irirangi Drive (Z service station)	

Reference	Photographs
Date: 1996 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Sites: 21/451 Ti Rakau Drive (Pit Stop Botany Downs) and 24/451 Ti Rakau Drive (VTNZ Botany).	

Reference	Photographs
Date: 2001 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Sites: 21/451 Ti Rakau Drive (Pit Stop Botany Downs) and 24/451 Ti Rakau Drive (VTNZ Botany).	

Reference	Photographs
Date: 2006 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Sites: 21/451 Ti Rakau Drive (Pit Stop Botany Downs) and 24/451 Ti Rakau Drive (VTNZ Botany).	

Reference	Photographs
Date: 2017 Source: Auckland Council Geomaps https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html Sites: 21/451 Ti Rakau Drive (Pit Stop Botany Downs) and 24/451 Ti Rakau Drive (VTNZ Botany).	

Appendix C: Auckland Council Contamination Enquiries

14 June 2021

Aecom NZ Limited
PO Box 4241
AUCKLAND 1140

Attention: Kerryn Mclellan

Dear Kerryn

Site Contamination Enquiry – *EB3 & EB4 Ti Rakau Drive*

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:

- 22 Trugood Drive, East Tamaki
- 279 Ti Rakau Drive, East Tamaki
- 23 Trugood Drive, East Tamaki
- 168R Gossamer Drive, Pakuranga Heights

More information on these sites can be found within Attachment A under the 'Property Notes From SAP' tab.

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 (200m radius of the selected site)

The Council database was searched for records of the following activities within approximately 200 metres of the site:

- 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

A map of relevant records can be found appended to this letter (Attachment B)

Relevant details of any pollution incidents and consents are appended to this letter (Attachment A). Please refer to the column titled 'Property Address' on the spreadsheet to aid in identifying corresponding data on the map.

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.

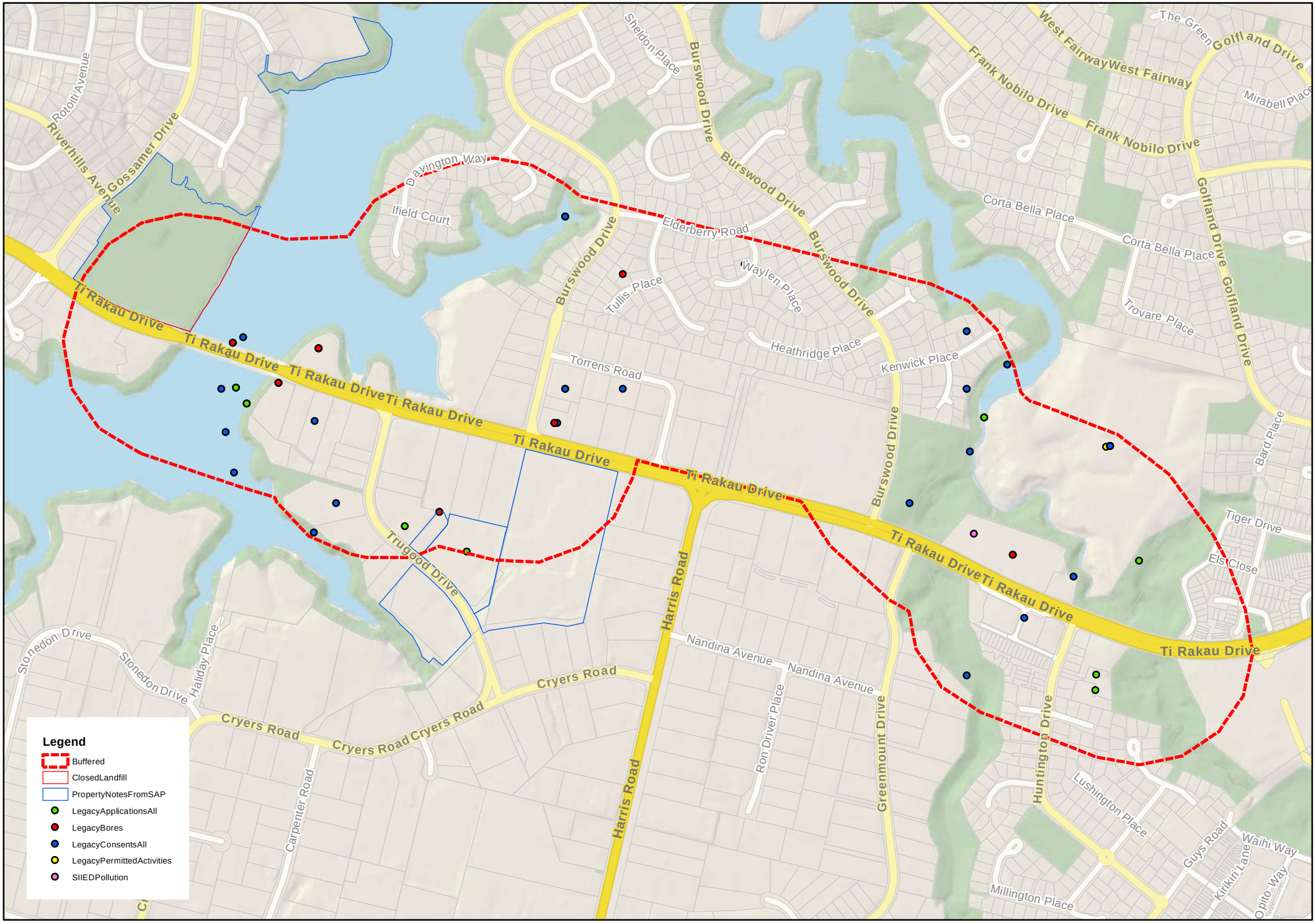
If you wish to clarify anything in this letter that relates to this site, please contact contaminatedsites@aucklandcouncil.govt.nz. Any follow up requests for information on other sites must go through the online order process.

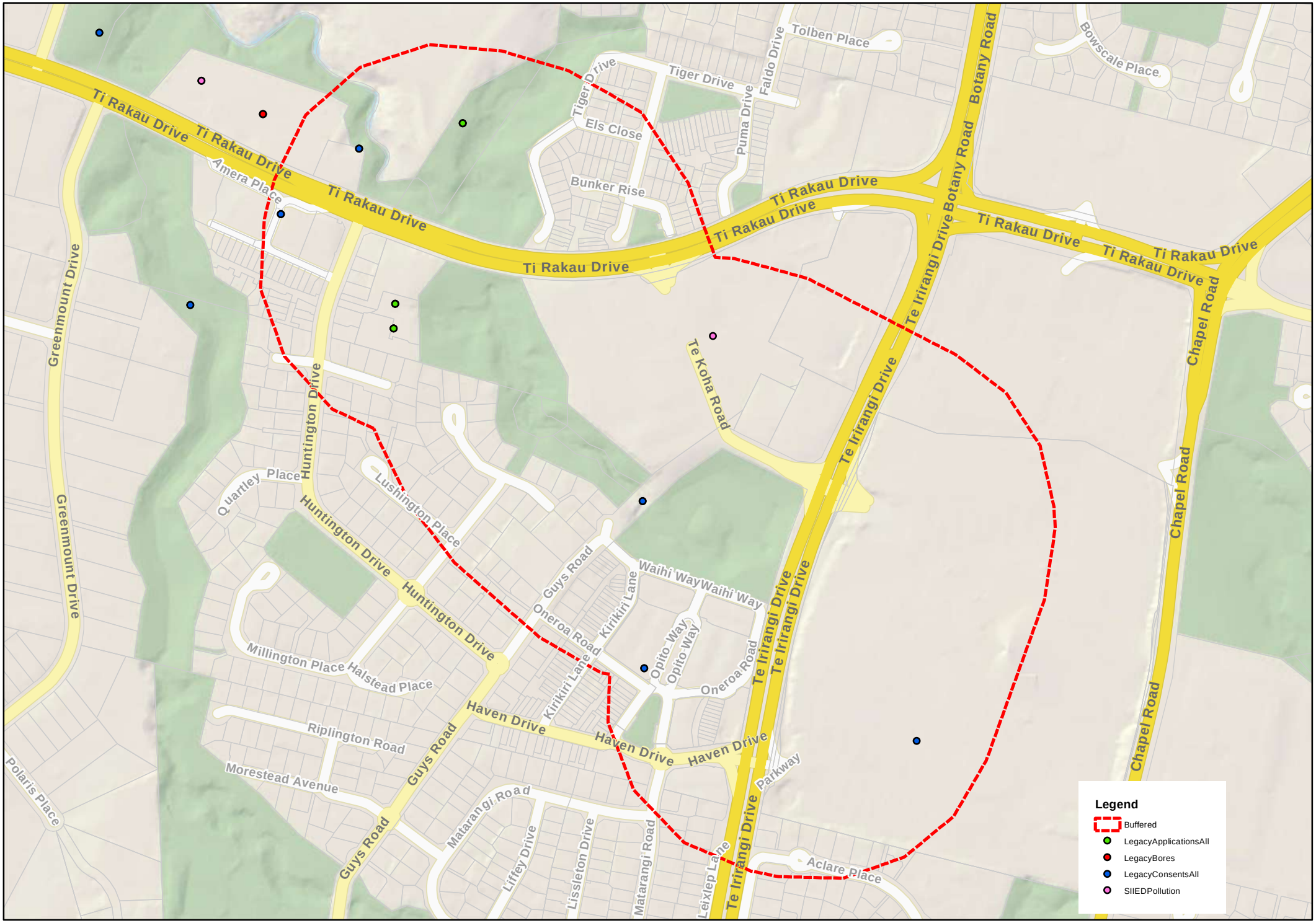
Should you wish to request any of the files referenced above and/or listed in the attached spreadsheet for viewing, please contact the Auckland Council Call Centre on 301 0101 and note you are requesting former Auckland Regional Council records (the records department requires three working days' notice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


Legend
Buffered
ClosedLandfill
PropertyNotesFromSAP
LegacyApplicationsAll
LegacyBores
LegacyConsentsAll
LegacyPermittedActivities
SIIEDPollution
Ti Rakau Drive
Burswood Drive
Harris Road
Cryers Road
Nandina Avenue
Elderberry Road
Torrens Road
Heathridge Place
Kenwick Place
Trugood Drive
Gossamer Drive
Riverhills Avenue
Rotoiti Avenue
Sheldon Place
Davington Way
Ifield Court
Tullis Place
Waylen Place
Trovare Place
Corta Bella Place
Frank Nobilo Drive
West Fairway
The Green
Golfland Drive
Mirabell Place
Bard Place
Tiger Drive
Elsi Close
Greenmount Drive
Ron Driver Place
Huntington Drive
Lushington Place
Millington Place
Guys Road
Waihi Way
Kirikiri Lane
Opito Way
Stonedon Drive
Halliday Place
Carpenter Road


Ti Rakau Drive
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Ti Rakau Drive
Ti Rakau Drive
Ti Rakau Drive
Amera Place
Tiger Drive
Tiger Drive
Els Close
Bunker Rise
Puma Drive
Faldo Drive
Tolben Place
Bowscale Place
Botany Road
Te Irirangi Drive
Te Irirangi Drive
Te Irirangi Drive
Te Irirangi Drive
Te Irirangi Drive
Te Irirangi Drive
Chapel Road
Chapel Road
Chapel Road
Te Koha Road
Greenmount Drive
Greenmount Drive
Huntington Drive
Huntington Drive
Huntington Drive
Quartley Place
Lushington Place
Guys Road
Guys Road
Guys Road
Waihi Way
Waihi Way
Kirikiri Lane
Kirikiri Lane
Oneroa Road
Oneroa Road
Opito Way
Opito Way
Millington Place
Halstead Place
Haven Drive
Haven Drive
Haven Drive
Riplington Road
Morestead Avenue
Polaris Place
Matarangi Road
Matarangi Road
Liffey Drive
Lissleton Drive
Leixlep Lane
Parkway
Aclare Place
Legend
Buffered
LegacyApplicationsAll
LegacyBores
LegacyConsentsAll
SIIEDPollution

From: Fran Osten <fran.osten@aucklandcouncil.govt.nz> on behalf of Contaminated Sites <ContaminatedSites@aucklandcouncil.govt.nz>
Sent: Friday, 2 December 2022 2:29 pm
To: Jones, Harry
Subject: RE: Contam Enquiry - AECOM

Hi Harry

Unfortunately I haven't been able to locate the report associated with the bore log at 242 Ti Rakau Drive.

Ngā mihi | Kind regards

Fran Osten | Specialist – Contaminated Land
Contamination, Air & Noise | Specialist Unit | Resource Consents
Ph 09 301 0101| Mobile 021 963 590
Te Kaunihera o Tāmaki Makaurau | Auckland Council
Level 6, Te Wharau o Tāmaki Auckland House, 135 Albert Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Jones, Harry <Harry.Jones@aecom.com>
Sent: Wednesday, 30 November 2022 2:47 pm
To: Contaminated Sites <ContaminatedSites@aucklandcouncil.govt.nz>
Subject: RE: Contam Enquiry - AECOM

Thanks Fran, much appreciated.

The borelogs from 242 Ti Rakau Drive, it notes there was samples collected, is there a report associated with the logs or perhaps lab results?

Kind Regards
Harry Jones
Environmental Scientist
D +64 21 348 799
harry.jones@aecom.com
AECOM
AECOM House
8 Mahuhu Crescent
Auckland, New Zealand
T +64 9 967 9200
aecom.com

Delivering a better world

From: Fran Osten <fran.osten@aucklandcouncil.govt.nz> On Behalf Of Contaminated Sites
Sent: Wednesday, 30 November 2022 12:49 pm
To: Jones, Harry <Harry.Jones@aecom.com>
Subject: RE: Contam Enquiry - AECOM

Kia ora Harry

Please see attached information related to a UST removal associated with the bore installation at 380 East Tamaki Drive.

I have also attached the bore log for 242 East Tamaki Drive, this was completed prior to development of the site in 1996.

Let me know if you have any further questions.

Ngā mihi | Kind regards

Fran Osten | Specialist – Contaminated Land
Contamination, Air & Noise | Specialist Unit | Resource Consents
Ph 09 301 0101| Mobile 021 963 590
Te Kaunihera o Tāmaki Makaurau | Auckland Council
Level 6, Te Wharau o Tāmaki Auckland House, 135 Albert Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Jones, Harry <Harry.Jones@aecom.com>
Sent: Monday, 28 November 2022 3:57 pm
To: Contaminated Sites <ContaminatedSites@aucklandcouncil.govt.nz>
Subject: Contam Enquiry - AECOM

Hi there,

The enquiry attached stated legacy bores were installed at 242 and 380 Ti Rakau Drive. Are there any monitoring reports associated with these sites?

Kind Regards
Harry Jones
Environmental Scientist
D +64 21 348 799
harry.jones@aecom.com
AECOM
AECOM House
8 Mahuhu Crescent
Auckland, New Zealand
T +64 9 967 9200
aecom.com

Delivering a better world

From: Fran Osten <fran.osten@aucklandcouncil.govt.nz> on behalf of Contaminated Sites <ContaminatedSites@aucklandcouncil.govt.nz>
Sent: Thursday, 19 January 2023 8:04 am
To: Jones, Harry
Subject: RE: Contaminated Land Enquiry - Botany

Morena Harry

There are no environmental investigation reports on file for 550 Te Irirangi Drive.

Ngā mihi | Kind regards

Fran Osten | Specialist – Contaminated Land
Contamination, Air & Noise | Specialist Unit | Resource Consents
Ph 09 301 0101| Mobile 021 963 590
Te Kaunihera o Tāmaki Makaurau | Auckland Council
Level 6, Te Wharau o Tāmaki Auckland House, 135 Albert Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Jones, Harry <Harry.Jones@aecom.com>
Sent: Wednesday, 18 January 2023 12:04 pm
To: Contaminated Sites <ContaminatedSites@aucklandcouncil.govt.nz>
Subject: Contaminated Land Enquiry - Botany

Hi there,

We completed a Contaminated Land Enquiry was completed in 2021 for the general Botany area (see attached). I have noted a Service Station Site at 550 Te Irirangi Drive (Z Botany Downs). Do the council have copies of any Environmental or compliance monitoring reports associated with the site?

Kind Regards
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Appendix D: Soil and Groundwater Sampling

Table D1: Eastern Busway -
Soil Analytical Results Table

	Sample Details and Analytical Results					Guidelines											
Sample Reference	**EHA124_0.5**	**EHA124_2.1**	**EHA125_0.0-0.15**	**EHA125_0.3**	**EHA125_0.9**	**NES CS[1] (Human Health)**	**Auckland Background Concentrations[3]**	**Auckland Permitted Activity Soil Acceptance Criteria[5,6]**	**Oil Industry Guidelines: Tier 1 Soil Acceptance Criteria[7]**						**NZBRANZ Guidelines[10]**		**CCME Guidelines[11]**
Laboratory Sample Reference	**3023442.2**	**3023442.4**	**3023452.3**	**3023442.6**	**3023442.7**												
Date Sampled	**29-Jun-22**	**29-Jun-22**	**29-Jun-22**	**29-Jun-22**	**29-Jun-22**												
Sample Location	**EHA124**		**EHA125**			**Soil Contaminant Standard[2]**			**All Pathways Soil Acceptance Criteria - Commercial / Industrial[8]**			**Soil Acceptance Criteria for the Protection of Groundwater Quality[8]**					
	Adjacent to the Howick and Eastern Bus Depot								**Contamination Depth Surface (<1m) / 1-4m**			**Contamination Depth Surface (<1m) / 1-4m**			**All Land Uses**	**Commercial / Industrial Uses**	**Soil quality guideline for the protecton of environmental health**
Sample Depth (m below ground level)	**0.5**	**2.1**	**0.0-0.15**	**0.3**	**0.9**	**Commercial / Industrial Outdoor Worker (Unpaved)**	**Volcanic Range[4]**		**SANDY SILT**	**CLAY**	**SILTY CLAY**	**SANDY SILT**	**CLAY**	**SILTY CLAY**			
Sample Soil Type	**Clayey SILT**	**CLAY**	**Clayey SILT**	**Clayey SILT**	**Silty CLAY**												
Guideline Soil Type[9]	**SANDY SILT**	**CLAY**	**SANDY SILT**	**SANDY SILT**	**SILTY CLAY**												
Unit	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**												
Heavy Metals																	
Arsenic	7	< 2	-	< 2	< 2	70	0.4 - 12	**100**	-	-	-	-	-	-	-	-	17
Cadmium	< 0.10	< 0.10	-	< 0.10	< 0.10	1,300	< 0.1 - 0.65	**7.5**	-	-	-	-	-	-	-	-	10
Chromium	45	17	-	16	14	6300*	3 - 125	**400**	-	-	-	-	-	-	-	-	64
Copper	17	10	-	3	4	> 10,000	20 - 90	**325**	-	-	-	-	-	-	-	-	63
Lead	21	12.3	-	8.2	6.4	3,300	< 1.5 - 65	**250**	-	-	-	-	-	-	-	-	300
Nickel	37	21	-	6	6	-	4 - 320	**105**	-	-	-	-	-	-	-	-	45
Zinc	30	39	-	18	15	-	54 - 1160	**400**	-	-	-	-	-	-	-	-	250
Total Petroleum Hydrocarbons (TPH)																	
C_7 - C_9	-	< 20	-	< 20	-	-	-	-	*(500) [m] / (500) [m]*	*(15,000) [v] / NA*	*(2,700) [v] / (7,300) [v]*	*(5,200) / N/A*	*(590) / NA*	*(710) / NA*	-	-	-
C_{10} - C_{14}	-	< 20	-	< 20	-	-	-	-	*(510) [x] / (670) [x]*	*(570) [x] / (2900) [x]*	*(560) [x] / (2,700) [x]*	*(9,200) / N/A*	*(1,400) / NA*	*(1,500) / NA*	-	-	-
C_{15} - C_{36}	-	< 40	-	< 40	-	-	-	-	*NA / NA*	*NA / NA*	*NA / NA*	*N/A / N/A*	*NA / NA*	*NA / NA*	-	-	-
Total Hydrocarbons (C_7 - C_{36})	-	< 80	-	< 80	-	-	-	-	-	-	-			-	-	-	-
Asbestos Presence / Absence	**-**	**-**	Asbestos NOT detected.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**			**-**	**-**	**-**	-
Description of Asbestos Form	-	-	-	-	-	-	-	-	-	-	-			-	-	-	-
Asbestos in ACM as % of Total Sample (%w/w)	-	-	< 0.001	-	-	-	-	-	-	-	-			-	-	0.05	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample (%w/w)	-	-	< 0.001	-	-	-	-	-	-	-	-			-	0.001	-	-

Notes
Highlighted Orange - exceeds BRANZ guidelines
Highlighted Blue - exceeds CCME guidelines
Underlined - exceeds Auckland Background Criteria.
Bold - exceeds AC Permitted Activity Criteria.
Red - exceeds the NES CS.
Grey - Below laboratory limit of reporting
Italics - exceeds the Oil Industry Guidelines

1. Ministry for the Environment, 2011. *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health - Soil Contaminant Standard* (NES CS).
2. Values taken from Appendix Tables B2 and B3 of the NES CS.
3. Auckland Regional Council, 2001. *Technical Publication Background Concentrations of inorganic elements in soils from the Auckland Region* (Auckland Background Crtieria).
4. Values taken from Table 3 of Auckland Background Criteria.
5. Auckland Council Unitary Plan Operative in Part, 2016 (updated 12 June 2020). *Permitted Activity Soil Acceptance Criteria* (AC Permitted Activity Criteria).
6. Values taken from Table E30.6.1.4.1.
7. Ministry for the Environment, 1999. *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand* (Oil Industry Guidelines).
8. Values taken from Table 4.11, 4.14 and 4.20 of the Oil Industry Guidelines.
9. Conservative soil category chosen for comparison with Oil Industry Guidelines Tier 1 acceptance criteria to best represent soils observed on site.
10. Building Research Association of New Zealand, November 2017. *New Zealand Guidelines for Assessing and Managing Asbestos in Soil* (BRANZ Guidelines). Values taken from Table 5 of the BRANZ Guidelines.
11. Canadian Council for Ministers of the Environment (CCME), 2002 and updates. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health.

* - Value for Chromium VI
NA - indicates contaminant is not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site.
Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.
The following notes indicate the limiting pathway for each criterion:
v - volatilisation, m - maintenance/excavation worker exposure, x – PAH surrogate.

Table D1: Eastern Busway - Soil Analytical Results Table

								Guidelines									
Sample Reference	**EHA126_0.0-0.15**	**EHA126_0.3**	**EHA126_1.5**	**EHA127_0.0-0.15**	**EHA127_0.3**	**EHA127_1.1**	**EHA127_1.5**	**NES CS[1] (Human Health)**	**Auckland Background Concentrations[3]**	**Auckland Permitted Activity Soil Acceptance Criteria[5,6]**	**Oil Industry Guidelines: Tier 1 Soil Acceptance Criteria[7]**				**NZBRANZ Guidelines[10]**		**CCME Guidelines[11]**
Laboratory Sample Reference	**3023442.9**	**3023442.10**	**3023442.12**	**3023452.7**	**3023442.14**	**3023442.15**	**3023442.16**										
Date Sampled	**29-Jun-22**	**29-Jun-22**	**29-Jun-22**	**29-Jun-22**	**29-Jun-22**	**29-Jun-22**	**29-Jun-22**										
Sample Location	**EHA126**			**EHA127**				**Soil Contaminant Standard[2]**			**All Pathways Soil Acceptance Criteria - Commercial / Industrial[8]**		**Soil Acceptance Criteria for the Protection of Groundwater Quality[8]**				
	Adjacent to the Howick and Eastern Bus Depot																
Sample Depth (m below ground level)	**0.0-0.15**	**0.3**	**1.5**	**0.0-0.15**	**0.3**	**1.1**	**1.5**	**Commercial / Industrial Outdoor Worker (Unpaved)**	**Volcanic Range[4]**		**Contamination Depth Surface (<1m) / 1-4m**		**Contamination Depth Surface (<1m) / 1-4m**		**All Land Uses**	**Commercial / Industrial Uses**	**Soil quality guideline for the protecton of environmental health**
Sample Soil Type	**Clayey SILT**	**Clayey SILT**	**Silty CLAY**	**Clayey SILT**	**Clayey SILT**	**Silty CLAY**	**Silty CLAY**										
Guideline Soil Type[9]	**SANDY SILT**	**SANDY SILT**	**SILTY CLAY**	**SANDY SILT**	**SANDY SILT**	**SILTY CLAY**	**SILTY CLAY**				**SANDY SILT**	**SILTY CLAY**	**SANDY SILT**	**SILTY CLAY**			
Unit^	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**										
Heavy Metals																	
Arsenic	< 2	2	< 2	-	2	-	< 2	70	0.4 - 12	**100**	-	-	-	-	-	-	17
Cadmium	< 0.10	< 0.10	< 0.10	-	< 0.10	-	< 0.10	1,300	< 0.1 - 0.65	**7.5**	-	-	-	-	-	-	10
Chromium	15	11	10	-	15	-	12	6300*	3 - 125	**400**	-	-	-	-	-	-	64
Copper	41	7	3	-	10	-	4	> 10,000	20 - 90	**325**	-	-	-	-	-	-	63
Lead	9.2	12.8	5.2	-	12.3	-	5.3	3,300	< 1.5 - 65	**250**	-	-	-	-	-	-	300
Nickel	14	10	4	-	17	-	5	-	4 - 320	**105**	-	-	-	-	-	-	45
Zinc	23	29	11	-	26	-	15	-	54 - 1160	**400**	-	-	-	-	-	-	250
Total Petroleum Hydrocarbons (TPH)																	
C_7 - C_9	-	-	-	-	-	< 20	-	-	-	-	*(500) [m] / (500) [m]*	*2,700) [v] / (7,300) [s]*	*(5,200) / N/A*	*(710) / NA*	-	-	-
C_{10} - C_{14}	-	-	-	-	-	< 20	-	-	-	-	*(510) [x] / (670) [x]*	*(560) [x] / (2,700) [x]*	*(9,200) / N/A*	*(1,500) / NA*	-	-	-
C_{15} - C_{36}	-	-	-	-	-	< 40	-	-	-	-	*NA / NA*	*NA / NA*	*N/A / N/A*	*NA / NA*	-	-	-
Total Hydrocarbons (C_7 - C_{36})	-	-	-	-	-	< 70	-	-	-	-	-	-		-	-	-	-
Asbestos Presence / Absence	**-**	**-**	**-**	Asbestos NOT detected.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**-**	**-**	**-**	-
Description of Asbestos Form	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-
Asbestos in ACM as % of Total Sample (%w/w)	-	-	-	< 0.001	-	-	-	-	-	-	-	-		-	-	0.05	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample (%w/w)	-	-	-	< 0.001	-	-	-	-	-	-	-	-		-	0.001	-	-

Notes
Hightlighted Orange - exceeds BRANZ guidelines
Highlighted Blue - exceeds CCME guidelines
Underlined - exceeds Auckland Background Criteria.
Bold - exceeds AC Permitted Activity Criteria.
Red - exceeds the NES CS.
Grey - Below laboratory limit of reporting
Italics - exceeds the Oil Industry Guidelines

1. Ministry for the Environment, 2011. *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health - Soil Contaminant Standard* (NES CS).
2. Values taken from Appendix Tables B2 and B3 of the NES CS.
3. Auckland Regional Council, 2001. *Technical Publication Background Concentrations of inorganic elements in soils from the Auckland Region* (Auckland Background Crtieria).
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6. Values taken from Table E30.6.1.4.1.
7. Ministry for the Environment, 1999. *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand* (Oil Industry Guidelines).
8. Values taken from Table 4.11, 4.14 and 4.20 of the Oil Industry Guidelines.
9. Conservative soil category chosen for comparison with Oil Industry Guidelines Tier 1 acceptance criteria to best represent soils observed on site.
10. Building Research Association of New Zealand, November 2017. *New Zealand Guidelines for Assessing and Managing Asbestos in Soil* (BRANZ Guidelines). Values taken from Table 5 of the BRANZ Guidelines.
11. Canadian Council for Ministers of the Environment (CCME), 2002 and updates. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health.

* - Value for Chromium VI
NA - indicates contaminant is not limiting as estimated health-based criterion is significantly higher than that likely to be encountered on site.
Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.
The following notes indicate the limiting pathway for each criterion:
v - volatilisation, s - soil ingestion, d - dermal exposure, p - produce ingestion, m - maintenance/excavation worker exposure, x – PAH surrogate.

Table D2: Eastern Busways - Howick Bus Depot
Groundwater Analytical Results

Sample Location	DH322	Duplicate	ANZG[1]	Oil Industry Guidelines[3]
Sample Reference	DH322	DUPA		
Laboratory Sample Reference	3023440.1	3023440.2	80% Protection[2]	Commercial/Industrial (Silty Clay)
Sample Date	29-Jun-22	29-Jun-22	Freshwater	2 - 4 m
General Parameters				
pH	7.4	7.4	-	-
Heavy Metals - Dissolved				
Arsenic	0.0023	0.0024	0.14 [5]	-
Cadmium	< 0.00005	< 0.00005	0.0008	-
Chromium	< 0.0005	< 0.0005	0.04 [6]	-
Copper	< 0.0005	< 0.0005	0.0025	-
Lead	< 0.00010	< 0.00010	0.0094	-
Nickel	0.0034	0.0033	0.017	-
Zinc	0.0149	0.0161	0.031	-
Total Petroleum Hydrocarbons (TPH)				
C_7 - C_9	< 0.10	< 0.10	-	**S**
C_{10} - C_{14}	< 0.2	< 0.2	-	**S**
C_{15} - C_{36}	< 0.4	< 0.4	-	**S**
Total Hydrocarbons (C_7 - C_{36})	< 0.7	< 0.7	-	-
Organochlorine Pesticides (OCP)**				
DDT	< 0.00010	< 0.00010	0.00004	-

Notes
All units measured in mg/L unless otherwise indicated.
Grey text represents values below the laboratory limit of reporting (LOR).
Underlined - exceeds ANZG
Bold - exceeds the Oil Industry Guidelines

1. National Water Quality Mangement Strategy, 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG).
2. Values taken from the toxicant Default Guideline Value Database: https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/search
3. Values taken from Table 5.10 MfE Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand 1999 (Oil Industry Guidelines)
5. Guideline for arsenic V.
6. Guideline value for chromium VI.

- No criteria or not analysed
*Limit for C_7 - C_{14} range hydrocarbons
**All remaining OCPs were below the laboratory limit of reporting (LOR)
S= Calcualted water criteria exceeds solubility limit for pure compound in water.

TERMINOLOGY AND SYMBOLS

Eastern Busway

Drilling / Investigation Methods

CFHSA	- Continuous Flight Hollow Stem Auger.
CFSSA	- Continuous Flight Solid Stem Auger.
DC	- Dynamic Coring (eg Terrier Rig).
DCP	- Dynamic Cone Penetrometer.
HA	- Hand Auger.
HQ3	- HQ Triple Tube.
HQWL	- HQ Wire Line.
HWOB	- Heavy Weight Open Barrel.
NQ3	- NQ Triple Tube.
NQWL	- NQ Wire Line.
OB	- 100mm diameter Open Barrel.
OB70	- 70mm diameter Open Barrel.
PERC	- Percussion.
PS	- Piston Sample.
PQ3	- PQ Triple Tube.
PQWL	- PQ Wire Line.
RC	- Reverse Circulation.
RCDHH	- Reverse Circulation Down Hole Hammer.
SPT	- Standard Penetration Test.
SPERC	- Sonic Percussion.
PT	- Push Tube Sample
VAC EX	- Vacuum Excavation.
WASH	- Wash Drilling.

Test Results

SPT "N" value; uncorrected blow count for 300 mm penetration
/# / # / # / # / # blows per 75 mm penetration

ss - Standard Penetration Test - split spoon
sc - Standard Penetrattion Test - solid cone (no sample recovery)
SUOW - Sunk Under Own Weight

Vane Shear Strength Tests

/ # Vane shear strength test results given as peak / remoulded shear strengths (kPa). Test as per NZGS Guideline, 2001.

$^{\#}$ = Vane test performed on core recovered prior to extrusion from core barrel.
* = Vane test performed on excavated material of suitable size.

UTP - Unable to penetrate.

Unit/Geological Boundary Lines

———— Known

— — — - Inferred/Unknown

Installation & Backfill

Standpipe		Grout	
Slotted Standpipe		Cement	
Collapse/Cuttings /Spoil		Gravel Pack Filter	
Bentonite		Sand Pack Filter	
Inclinometer		Gravel Backfill	

Groundwater Records

Water Level (During Drilling)	2.0
Water Inflow/Seep	
Water Outflow	
Complete Water Loss	
Regain Circulation	

2.0 Fluid level measurement during drilling

Samples

PT	- Thin Wall Push Sample
PS	- Piston Sample
U	- Undisturbed
D	- Disturbed (Core)
B	- Disturbed (Pit)

Rock Descriptions

Relative Strength

		USC (MPa)
ES	- Extremely strong	> 250
VS	- Very Strong	100 - 250
S	- Strong	50 - 100
MS	- Moderately Strong	20 - 50
W	- Weak	5 - 20
VW	- Very Weak	1 - 5
EW	- Extremely Weak	< 1

Weathering

UW	- Unweathered
SW	- Slightly Weathered
MW	- Moderately Weathered
HW	- Highly Weathered
CW	- Completely Weathered

Soil Descriptions

Consistency Cohesive Soils

	Su (kPa)
Very Soft	< 12
Soft	12 - 25
Firm	25 - 50
Stiff	50 - 100
Very Stiff	100 - 200
Hard	200 - 500

Relative Density Non-cohesive soils

	SPT "N" Value (uncorrected)
Very Loose	< 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

Rock Defect Abbreviations

Defect Type
BP = Bedding Plane Defect
CZ = Crush Zone
DB = Drilling Break
FZ = Fracture Zone
HJ = Healed Joint
J = Joint
SZ = Shear Zone
Ve = Vein

Defect Aperture
T = Tight (Nil)
VN = Very Narrow (>0-2mm)
N = Narrow (2-6mm)
MN = Moderately Narrow (6-20mm)
MW = Moderately Wide (20-60mm)
W = Wide (60-200mm)
VW = Very Wide (>200mm)

Defect Roughness
Pl = Planar
St = Stepped
Ud = Undulating
Ro = Rough
Sm = Smooth
Slk = Slickensided
\\ = Parallel
Po = Polished

Infill Thickness
Sn = Stained
Vn = Veneer (<0.5mm)
Cg = Coating
P = Partially infilled
C = Completely Infilled

Infill Colour
bl = Blue
bn = Brown
bk = Black
gn = Green
gy = Grey
or = Orange
pk = Pink
rd = Red
wh = White
ye = Yellow

Infill Material
Calc = Calcareous
Cb = Carbonaceous
Cc = Calcite
Cl = Clay
Fe = Iron Oxide
Mn = Manganese
NF = No Infill
Py = Pyrite
Qtz = Quartz
S = Sand
Slt = Silt

Graphic Log (typical symbols)

Peat	Mudstone
Clay	Siltstone
Silt	Sandstone
Sand	Basalt
Gravel / Cobbles	No recovery
Welded Tuff	

Core Measurements

TCR - Total Core Recovery
RQD - Rock Quality Designation

Soil and rock descriptions generally as in "Guidelines for the Field Description of Soil and Rock for Engineering Purposes" by the NZ Geotechnical Society Inc, December 2005.

Eastern Busway

LOG OF DRILLHOLE

HOLE IDENTIFICATION **DH322_P**

Client Auckland Transport
Project Eastern Busway
Project number 60644113

Co-ordinates 412397.84mE 794695.97mN
Orientation -90° Elevation 6.44m
Location Reserve: 23R Kenwick Place
Feature Retaining Wall

GEOLOGICAL DESCRIPTION	Test Records	Drilling Method	Core Loss/Lift	Relative Strength	Rock Weathering	Depth	Graphic Log	TCR [RQD] (%)	Spacing of Natural Defects	SOIL PROPERTIES / DEFECT DESCRIPTION	Instrumentation
Weathering, Colour, Fabric, ROCK NAME. Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc).	Shear Vane/ SPT; SPT N Values 0 - 50	Casing remarks	0 - 100%	S MS W VW	SW MW HW				(mm) 500 100 50 10	Subordinate MAJOR minor; colour, structure. Strength, moisture condition, grading, bedding, plasticity, sensitivity, major fraction description, subordinate fraction description, minor fraction description, additional structures, additional information, etc. (Joints, Bedding Seams, Shatter, Shear and Crush Zones, Foliation, Schistosity, Attitude, Spacing, continuity, roughness, infilling, etc.)	
0.0m: TOPSOIL.										0.0m: Topsoil.	
0.2m: ALLUVIUM comprising clay, sand, silt, organic clay and peat.		HA				1		100		0.2m: Silty fine to medium SAND; whitish grey. Very dense, dry, well graded. (Pumice).	
	ss 0,0,0, 1,0,1 N=2	SPT						100			
		HQ3				2		100		1.3m: Silty CLAY with some fine to medium sand; brownish grey with light grey and orange staining/mottling. Firm, moist, high plasticity.	
	ss 1,2,2, 3,2,3 N=10	SPT				3		100			
		HQ3				4		100		3.35m: Silty CLAY; bluish grey. Stiff, moist, high plasticity.	
	ss 0,1,1, 1,1,1 N=4	SPT				5		100			
		HQ3						100			
	ss 0,0,0, 0,0,1 N=1	SPT				6		100		6.35m: Spongy PEAT; black. Firm, moist, high plasticity.	
		HQ3				7		100		6.55m: Organic CLAY with decomposed wood flecks; dark brown. Soft, moist, high plasticity.	
	ss 0,0,1, 0,1,2 N=4	SPT						100		7.05m: Silty fine to medium SAND with some clay and trace organics; brown. Medium dense, moist, well graded.	
		HQ3				8		100		7.35m: Becomes bluish grey.	
	ss 0,0,0, 0,0,0 N=0 SUOW	SPT				9		100		7.5m: Silty CLAY with trace fine micaceous sand and organics; bluish grey. Stiff, moist, high plasticity.	
										8.7m: Becomes firm.	
										9.7 to 10.35m: With some fine to medium sand.	

TAURANGA GROUP

For explanation of symbols and observations, see key sheet

FLUID DEPTHS AND DRILLING PROGRESS (m)

Date Time	Drilled Depth	Casing Depth	Fluid Depth
21/01/2022 17:15	19.50	13.4	3.4
24/01/2022 08:30	19.50	13.4	2
24/01/2022 11:45	27.00	13.4	1.6

Hand Held Shear Vane

vane shear strength per NZGS guideline

RELATIVE STRENGTH
VS - Very strong
S - Strong
MS - Moderately strong
W - Weak
VW - Very weak
EW - Extremely weak

WEATHERING
UW - Unweathered
SW - Slightly weathered
MW - Moderately weathered
HW - Highly weathered
CW - Completely weathered

Date logged 24/01/2022
Logged SK
Checked GP

Remarks
50 mm standpipe piezometer installed on completion.

Horizontal / Vertical Survey Datums: NZGD2000 - Mount Eden 2000 / New Zealand Vertical Datum 2016

Driller McMillan
Started 20/01/2022
Finished 24/01/2022
Drill Rig N119
Core Boxes 9

2021 EB DRILLHOLE LOG 2022-04-12 SBS MASTER.GPJ BASE.GDT 12/04/22

12/04/2022

Eastern Busway

LOG OF DRILLHOLE

HOLE IDENTIFICATION **DH322_P**

Client Auckland Transport
Project Eastern Busway
Project number 60644113

Co-ordinates 412397.84mE 794695.97mN
Orientation -90° Elevation 6.44m
Location Reserve: 23R Kenwick Place
Feature Retaining Wall

GEOLOGICAL DESCRIPTION	Test Records	Drilling Method	Core Loss/Lift	Relative Strength	Rock Weathering	Depth	Graphic Log	TCR [RQD] (%)	Spacing of Natural Defects (mm)	SOIL PROPERTIES / DEFECT DESCRIPTION	Instrumentation
Weathering, Colour, Fabric, ROCK NAME. Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc).	Shear Vane/ SPT; SPT N Values 0 - 50	Casing remarks	0 - 100%	S MS W VW	SW MW HW				500 100 50 10	Subordinate MAJOR minor; colour, structure. Strength, moisture condition, grading, bedding, plasticity, sensitivity, major fraction description, subordinate fraction description, minor fraction description, additional structures, additional information, etc. (Joints, Bedding Seams, Shatter, Shear and Crush Zones, Foliation, Schistosity, Attitude, Spacing, continuity, roughness, infilling, etc.)	

TAURANGA GROUP

7.5m: Silty CLAY with trace fine micaceous sand and organics; bluish grey. Stiff, moist, high plasticity. *(continued)*

10.35 to 10.4m: Fine to medium SAND with some organics.

10.6m: Silty fine to medium SAND with trace organics; grey. Medium dense, moist, well graded.

12.8m: Becomes very dense.

EAST COAST BAYS FORMATION

13.09m: Highly weathered, grey, SILTSTONE. Extremely weak.

13.09m: Clayey SILT; grey. Very stiff.
13.09 to 13.16m: Silty fine SAND.
13.26 to 13.31m: Silty fine SAND.
13.5m: 114mm diameter HWT casing to 13.5m.

14.25 to 14.32m: Silty fine to medium SAND.

14.9m: Moderately weathered, fine to coarse, grey SANDSTONE. Extremely weak.

14.9m: Silty fine to coarse SAND; grey. Very dense.

15.7m: Highly weathered, grey, SILTSTONE. Extremely weak.

15.7m: Clayey SILT; grey. Very stiff to hard.

16.9m: Highly weathered, grey, fine to coarse SANDSTONE. Extremely weak.

16.9m: Silty fine to coarse SAND; grey. Medium dense.

17.7m: Moderately weathered, grey, SILTSTONE. Extremely weak. Very thickly bedded, indistinct.

17.7m: Clayey SILT; grey. Very stiff to hard.

19.6 to 19.7m: Fine to medium SAND.

Depth	Test Records	Drilling Method	TCR [RQD] (%)
0		HQ3	100
1	ss 0,4,5, 3,3,2 N=13	SPT	100
2		HQ3	100
3	ss 1,1,2, 2,2,3 N=9	SPT	100
4		HQ3	100
5	ss 2,2,4, 3,5,4 N=16	114 HWT SPT	100
6		HQ3	100
7	ss 5,9,16, 14,13,7 for 40mm N>50	SPT	100
8		HQ3	100
9	ss 2,3,4, 5,7,10 N=26	SPT	100
10		HQ3	100
11	ss 4,6,8, 9,11,11 N=39	SPT	100
12		HQ3	100
13	ss 6,8,10, 12,13,15 for 70mm	SPT	99

For explanation of symbols and observations, see key sheet

FLUID DEPTHS AND DRILLING PROGRESS (m)
Date Time Drilled Depth Casing Depth Fluid Depth

Hand Held Shear Vane

vane shear strength per NZGS guideline

RELATIVE STRENGTH
VS - Very strong
S - Strong
MS - Moderately strong
W - Weak
VW - Very weak
EW - Extremely weak

WEATHERING
UW - Unweathered
SW - Slightly weathered
MW - Moderately weathered
HW - Highly weathered
CW - Completely weathered

Date logged 24/01/2022
Logged SK
Checked GP

Driller McMillan
Started 20/01/2022
Finished 24/01/2022
Drill Rig N119
Core Boxes 9

Remarks
50 mm standpipe piezometer installed on completion.

Horizontal / Vertical Survey Datums: NZGD2000 - Mount Eden 2000 / New Zealand Vertical Datum 2016

2021 EB DRILLHOLE LOG 2022-04-12 SBS MASTER.GPJ BASE.GDT 12/04/22

12/04/2022

Eastern Busway

LOG OF DRILLHOLE

HOLE IDENTIFICATION **DH322_P**

Client Auckland Transport
Project Eastern Busway
Project number 60644113

Co-ordinates 412397.84mE 794695.97mN
Orientation -90° Elevation 6.44m
Location Reserve: 23R Kenwick Place
Feature Retaining Wall

GEOLOGICAL DESCRIPTION (Weathering, Colour, Fabric, ROCK NAME. Strength, Discontinuities, Lithological Features (bedding, foliation, mineralogy, cement, etc).)	Test Records: Shear Vane/ SPT	Test Records: SPT N Values (0 - 50)	Drilling Method (Casing remarks)	Core Loss/Lift (0 - 100%)	Relative Strength (S, MS, W, VW)	Rock Weathering (SW, MW, HW)	Depth	Graphic Log	TCR [RQD] (%)	Spacing of Natural Defects (mm: 500, 100, 50, 10)	SOIL PROPERTIES / DEFECT DESCRIPTION (Joints, Bedding Seams, Shatter, Shear and Crush Zones, Foliation, Schistosity, Attitude, Spacing, continuity, roughness, infilling, etc.)	Instrumentation
EAST COAST BAYS FORMATION 17.7m: Moderately weathered, grey, SILTSTONE. Extremely weak. Very thickly bedded, indistinct. *(continued)*	N>50		HQ3				21		100		17.7m: Clayey SILT; grey. Very stiff to hard. *(continued)* 20.55 to 20.7m: Fine to medium SAND.	
	ss 6,8,11, 11,12,14 N=48		SPT						100			
			HQ3				22		100			
22.45m: MW, grey, fine to coarse SANDSTONE. EW.	ss 14,12,15, 20,15 for 45mm N>50		SPT						100		22.45m: Silty fine to coarse SAND; grey. Very dense.	
22.85m: Moderately weathered, grey, SILTSTONE. Extremely weak. Moderately thickly bedded, indistinct.			HQ3				23		57		22.85m: Clayey SILT; grey. Hard.	
	ss 8,10,14, 13,15,8 for 50mm N>50		SPT				24		100			
24.8m: Moderately weathered, grey, silty fine to coarse SANDSTONE. Extremely weak.			HQ3				25		87		24.8m: Silty fine to coarse SAND; grey. Very dense.	
25.5m: Moderately weathered, grey, SILTSTONE. Extremely weak. Moderately thickly bedded, indistinct.	ss 9,11,12, 16,17,5 for 25mm N>50		SPT						100		25.5m: Clayey SILT; grey. Hard. 25.5 to 27.0m: Moderately widely spaced drilling breaks, planar or irregular.	
			HQ3				26		100			
							27				DH322_P terminated at 27.0m Depth Criteria Achieved	
							28					
							29					

For explanation of symbols and observations, see key sheet

FLUID DEPTHS AND DRILLING PROGRESS (m)
Date Time Drilled Depth Casing Depth Fluid Depth

Hand Held Shear Vane

vane shear strength per NZGS guideline

RELATIVE STRENGTH
VS - Very strong
S - Strong
MS - Moderately strong
W - Weak
VW - Very weak
EW - Extremely weak

WEATHERING
UW - Unweathered
SW - Slightly weathered
MW - Moderately weathered
HW - Highly weathered
CW - Completely weathered

Date logged 24/01/2022
Logged SK
Checked GP

Remarks
50 mm standpipe piezometer installed on completion.

Horizontal / Vertical Survey Datums: NZGD2000 - Mount Eden 2000 / New Zealand Vertical Datum 2016

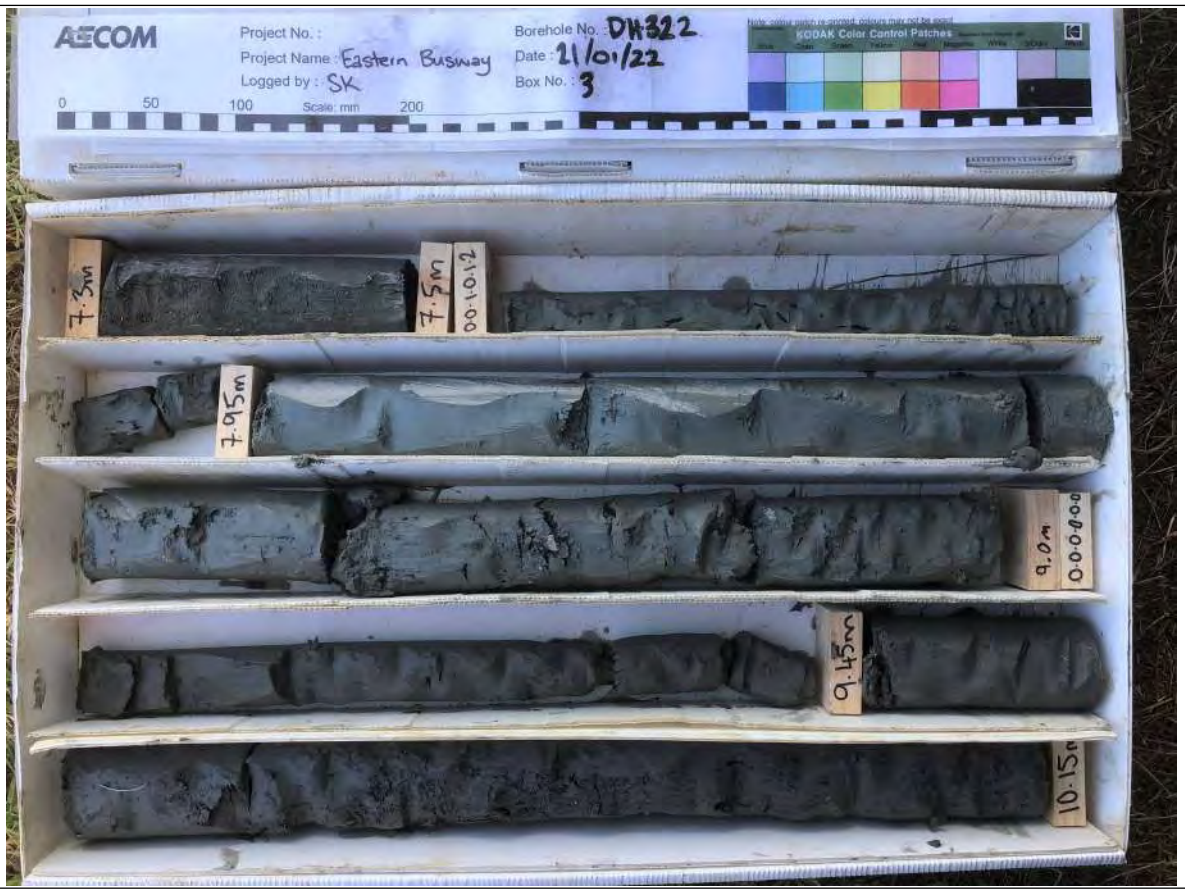
Driller McMillan
Started 20/01/2022
Finished 24/01/2022
Drill Rig N119
Core Boxes 9

Box: 1 of 9 - Depth: 01.50m to 04.50m of 27.00m

Date Drilled 20/01/2022 to 24/01/2022 - Date Photographed: 21/01/2022

Box: 2 of 9 - Depth: 04.50m to 07.30m of 27.00m

Date Drilled 20/01/2022 to 24/01/2022 - Date Photographed: 21/01/2022



Box: 3 of 9 - Depth: 07.30m to 10.15m of 27.00m

Date Drilled 20/01/2022 to 24/01/2022 - Date Photographed: 21/01/2022

Box: 4 of 9 - Depth: 10.15m to 12.90m of 27.00m

Date Drilled 20/01/2022 to 24/01/2022 - Date Photographed: 21/01/2022

Box: 5 of 9 - Depth: 12.90m to 15.50m of 27.00m

Date Drilled 20/01/2022 to 24/01/2022 - Date Photographed: 21/01/2022

Box: 6 of 9 - Depth: 15.50m to 18.75m of 27.00m

Date Drilled 20/01/2022 to 24/01/2022 - Date Photographed: 21/01/2022

Box: 7 of 9 - Depth: 18.75m to 21.60m of 27.00m

Date Drilled 20/01/2022 to 24/01/2022 - Date Photographed: 24/01/2022

Box: 8 of 9 - Depth: 21.60m to 24.85m of 27.00m

Date Drilled 20/01/2022 to 24/01/2022 - Date Photographed: 24/01/2022

Eastern Busway

PHOTOGRAPHIC LOG OF DRILLHOLE

Project Eastern Busway

Location Reserve: 23R Kenwick Place

HOLE IDENTIFICATION **DH322_P**

Box: 9 of 9 - Depth: 24.85m to 27.00m of 27.00m

Date Drilled 20/01/2022 to 24/01/2022 - Date Photographed: 24/01/2022

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Test Pit Field Log

Hand auger

Project Name:	FBA - Bus Depot	**Project Number:**	60644113	**Borehole No.:**	EHA124
Project Location:	Hornsby Bus Depot	**Client:**	BAT		
PM Name:	Kate Shanksy	**Date Commenced:**	29.6.22	**Sheet**	of
Test Pit Location:	At facet to DH322	**Date Completed:**	29.6.22		
Excavator Contractor:		**Fieldwork Staff:**	HJ, SD		

Field Data

Method	Depth	Graphic Log	USCS Classification	Material Description: Type, colour/mottling, plasticity/particle size, secondary/minor components, soil origin, moisture	PID (ppm)	Sampling	Field Notes: Odour, staining, groundwater observations/regime, additional information
	0.0 – 0.15			Dark brown clayey SILT w/ some rootlets	0.0	0.0-0.15:	No odour
	0.5			Light brown Silty CLAY, dry, firm	0.0	0.5m bgl	
	0.9			Dark grey CLAY, stiff dry			
					0.0	1.1m bgl	
	2.1			Ht refusal, HA terminated @ 2.1 m bgl.	0.0	2.1m bgl	

AECOM

ANZ

Test Pit Field Log

Project Name:	EBA – Bus Depot	**Project Number:**	60644113	**Borehole No.:**	EHA125
Project Location:	Howick bus depot	**Client:**	AT		
PM Name:	Kate Shaskey	**Date Commenced:**	29.6.22	**Sheet** of	
Test Pit Location:	Adjacent to DH323	**Date Completed:**	29.6.22		
Excavator Contractor:	—	**Fieldwork Staff:**	HT, SD.		

Field Data

Method	Depth	Graphic Log	USCS Classification	Material Description: Type, colour/mottling, plasticity/particle size, secondary/minor components, soil origin, moisture	PID (ppm)	Sampling	Field Notes: Odour, staining, groundwater observations/regime, additional information
		0.15		Dark brown Clayey SILT w/ some rootlets	0.1	0.0–0.15	No Odour ↓
					0.8	0.3	
		0.5		light brown silty CLAY, dry firm			
					[illegible]	0.9	
		1.5		Hit Refusal @ 1.5m bgl HA terminated.		1.5	

AECOM

ANZ

Test Pit Field Log

Project Name:	ER - Hornick Bus depot	**Project Number:**	60644113	**Borehole No.:**	ENA126.
Project Location:	Hornick Bus Depot	**Client:**	AT		
PM Name:	Kate Starkey	**Date Commenced:**	29.6.22		
Test Pit Location:	Adjacent to DH324	**Date Completed:**	29.6.22	**Sheet**	of
Excavator Contractor:	—	**Fieldwork Staff:**	HT, SD.		

Field Data

Method	Depth	Material Description: Graphic Log	Material Description: USCS Classification	Material Description: Type, colour/mottling, plasticity/particle size, secondary/minor components, soil origin, moisture	PID (ppm)	Sampling	Field Notes: Odour, staining, groundwater observations/regime, additional information
		0.15		Dark brown Clayey SILT w/ some rootlets + minor gravel, fine to coarse.	0.1	0.0-0.15	No Odour.
					0.0	0.3	
		0.6		light brown Silty CLAY, dry firm			
					0.0	1.1	
		1.5		Hit refusal @ 1.5 m bgl HA terminated.	0.0	1.5	

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ANZ

Test Pit Field Log

Hand auger

Project Name:	EDA - Bus Depot	**Project Number:**	60644113	**Borehole No.:**
Project Location:	Hornick Bus Depot	**Client:**	AT	EHA127
PM Name:	Kate Swaskey	**Date Commenced:**	29.6.22	
Test Pit Location:	Adjacent to DA325	**Date Completed:**	29.6.22	**Sheet** of
Excavator Contractor:	—	**Fieldwork Staff:**	HT. SD.	

Field Data

Method	Depth	Material Description: Graphic Log	Material Description: USCS Classification	Material Description: Type, colour/mottling, plasticity/particle size, secondary/minor components, soil origin, moisture	PID (ppm)	Sampling	Field Notes: Odour, staining, groundwater observations/regime, additional information
	0.15			Dark brown Clayey SILT w some rootlets		0.0-0.15	No odour
	0.3			~~Light brown~~ Dark grey Silty CLAY Dry, Firm		0.3	
	0.9			Dark grey/Orange Silty CLAY dry firm		1.1	
	1.5			Hit Refusal @ 1.5m bgl HA Terminated.		1.5	

Site Contamination Sample Register

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Q4AN(EV)-336-FM16

Date: 29/6/22 Project No.: 60644113 Project Location: EB Howick Bus Depot Personnel: MJ + SD

Grid Reference:

Sample No.	Sample Location	Depth (m)	PID (ppm)	Soil Description	Comments
EHA124_0.0-0.15	EHA124	0.0-0.15	0.0	Dark brown clayey SILT w/ some rootlets	
EHA124_0.5	EHA124	0.5	0.0	light brown silty CLAY, dry, firm	
EHA124_1.1	EHA124	1.1	0.0	Dark Grey CLAY, stiff, dry.	
EHA124_2.1	EHA124	2.1	0.0	Same as EHA124_1.1	Hit refusal
EHA125_0.0-0.15	EHA125	0.0-0.15	0.1	Dark brown clayey SILT w some rootlets.	
EHA125_0.3	EHA125	0.3	0.1	Same as EHA125_0.0-0.3.	
EHA125_0.9	EHA125	0.9	0.0	light brown silty CLAY, dry, firm	
EHA125_1.5	EHA125	1.5	0.0	Same as EHA125_0.9	Hit refusal
~~EHA126_0.0-0.15~~	~~EHA126~~				
EHA126_0.0-0.15	EHA126	0.0-0.15	0.1	Dark brown clayey SILT w/ some rootlets + minor gravel	
EHA126_0.3	EHA126	0.3	0.0	Same as EHA126_0.0-0.15	
EHA126_1.1	EHA126	1.1	0.0	light brown silty CLAY, dry, firm	
EHA126_1.5	EHA126	1.5	0.0	Same as 1.1	Hit refusal.
EHA127_0.0-0.15	EHA127	0.0-0.15	0.0	Dark brown clayey SILT w/ some rootlets	
EHA127_0.3	EHA127	0.3	0.0	Same as EHA127_0.0-0.15	
EHA127_1.1	EHA127	1.1	0.0	dark grey/orange silty CLAY, dry, firm	
EHA127_1.5	EHA127	1.5	0.0	Same as EHA127_1.1	Hit refusal

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Site Contamination Analysis Water Level Data Sheet

Q4AN(EV)-336-FM9

Project Name: EB- Howick Bus Depot			
Project Number: 60644113	Recorded by: HJT		Date: 29/6
Instrument Model: —		Weather conditions: Overcast	

Well ID	Time	Depth to product	DTW (mbgl)	DTB (mbgl)	Well condition	Comments
DH322	8.36 am	—	3.134	7.10.	Good	PID - 0.0 ppm

Notes: Measurements in m bgl (meters below ground level) DTW = Depth to Water DTB = Depth to Base

3.134

Hill Laboratories
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Hamilton 3240 New Zealand

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Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	3023440	SPv1
Contact:	Harry Jones	**Date Received:**	29-Jun-2022	
	C/- AECOM New Zealand Limited	**Date Reported:**	05-Jul-2022	
	PO Box 4241	**Quote No:**	118522	
	Shortland Street	**Order No:**	60644113/1.1	
	Auckland 1140	**Client Reference:**	EBA	
		Submitted By:	Kate Shaskey	

Sample Type: Aqueous

Sample Name:		DH322 29-Jun-2022	DUPA 29-Jun-2022			
Lab Number:		3023440.1	3023440.2			
Individual Tests						
pH	pH Units	7.4	7.4	-	-	-
Chloride	g/m³	144	144	-	-	-
Sulphate	g/m³	6.0	6.0	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	0.0023	0.0024	-	-	-
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	-	-	-
Dissolved Chromium	g/m³	< 0.0005	< 0.0005	-	-	-
Dissolved Copper	g/m³	< 0.0005	< 0.0005	-	-	-
Dissolved Lead	g/m³	< 0.00010	< 0.00010	-	-	-
Dissolved Nickel	g/m³	0.0034	0.0033	-	-	-
Dissolved Zinc	g/m³	0.0149	0.0161	-	-	-
Nutrient Profile						
Total Ammoniacal-N	g/m³	0.82	0.82	-	-	-
Nitrite-N	g/m³	0.004	0.004	-	-	-
Nitrate-N	g/m³	0.023	0.018	-	-	-
Nitrate-N + Nitrite-N	g/m³	0.027	0.022	-	-	-
Dissolved Reactive Phosphorus	g/m³	< 0.004	0.006	-	-	-
Organochlorine Pesticides Screening in Water, By Liq/Liq						
Aldrin	g/m³	< 0.00010	< 0.00010	-	-	-
alpha-BHC	g/m³	< 0.0002	< 0.0002	-	-	-
beta-BHC	g/m³	< 0.0002	< 0.0002	-	-	-
delta-BHC	g/m³	< 0.0002	< 0.0002	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.0002	< 0.0002	-	-	-
cis-Chlordane	g/m³	< 0.00010	< 0.00010	-	-	-
trans-Chlordane	g/m³	< 0.00010	< 0.00010	-	-	-
2,4'-DDD	g/m³	< 0.0002	< 0.0002	-	-	-
4,4'-DDD	g/m³	< 0.0002	< 0.0002	-	-	-
2,4'-DDE	g/m³	< 0.0002	< 0.0002	-	-	-
4,4'-DDE	g/m³	< 0.0002	< 0.0002	-	-	-
2,4'-DDT	g/m³	< 0.0002	< 0.0002	-	-	-
4,4'-DDT	g/m³	< 0.0002	< 0.0002	-	-	-
Dieldrin	g/m³	< 0.00010	< 0.00010	-	-	-
Endosulfan I	g/m³	< 0.0002	< 0.0002	-	-	-
Endosulfan II	g/m³	< 0.0002	< 0.0002	-	-	-
Endosulfan sulphate	g/m³	< 0.0002	< 0.0002	-	-	-
Endrin	g/m³	< 0.00010	< 0.00010	-	-	-
Endrin aldehyde	g/m³	< 0.00010	< 0.00010	-	-	-
Endrin ketone	g/m³	< 0.0002	< 0.0002	-	-	-

Sample Type: Aqueous						
Sample Name:		DH322 29-Jun-2022	DUPA 29-Jun-2022			
Lab Number:		3023440.1	3023440.2			
Organochlorine Pesticides Screening in Water, By Liq/Liq						
Heptachlor	g/m³	< 0.00010	< 0.00010	-	-	-
Heptachlor epoxide	g/m³	< 0.00010	< 0.00010	-	-	-
Hexachlorobenzene	g/m³	< 0.0008	< 0.0008	-	-	-
Methoxychlor	g/m³	< 0.00010	< 0.00010	-	-	-
Total Petroleum Hydrocarbons in Water						
C7 - C9	g/m³	< 0.10	< 0.10	-	-	-
C10 - C14	g/m³	< 0.2	< 0.2	-	-	-
C15 - C36	g/m³	< 0.4	< 0.4	-	-	-
Total hydrocarbons (C7 - C36)	g/m³	< 0.7	< 0.7	-	-	-

Analyst's Comments

Appendix No.1 - Chain of Custody

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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
pH	pH meter. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23rd ed. 2017.	0.5 g/m³	1-2
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 23rd ed. 2017.	0.010 g/m³	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) 23rd ed. 2017.	0.002 g/m³	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) 23rd ed. 2017.	0.002 g/m³	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) 23rd ed. 2017.	0.004 g/m³	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23rd ed. 2017.	0.5 g/m³	1-2
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.00005 - 0.0010 g/m³	1-2
Nutrient Profile		0.0010 - 0.010 g/m³	1-2
Organochlorine Pesticides Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-ECD analysis. In-house based on US EPA 8081.	0.00010 - 0.0008 g/m³	1-2
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m³	1-2
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m³	1-2
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m³	1-2
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m³	1-2

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

Testing was completed between 01-Jul-2022 and 05-Jul-2022. For completion dates of individual analyses please contact the laboratory.

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

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Hill Laboratories
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ANALYSIS REQUEST

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Job No: **302 3440**

Date Recv: 29-Jun-22 16:59

Received by: Sanaya Hansotia

3180234402

Quote No 118522

Primary Contact Harry Jones 282198

Submitted By

Client Name AECOM New Zealand Limited 71022

Address PO Box 4241, Shortland Street
Auckland 1140

Phone 09 967 9200 *Mobile*

Email

Charge To AECOM New Zealand Limited 71022

Client Reference ~~60644113 11.1~~ EBA

Order No 60644113 11.1

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

- [x] Email Primary Contact
- [ ] Email Submitter
- [ ] Email Client
- [x] Email Other Kate.Sharkey@aecom.com
- [ ] Other

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time:
Name:
Signature:
- [ ] *Tick if you require COC to be emailed back*

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition
- [ ] Room Temp
- [ ] Chilled
- [ ] Frozen

Temp:

- [ ] Sample & Analysis details checked

Signature:

ADDITIONAL INFORMATION / KNOWN HAZARDS

1x sample could not be collected - Please proceed with analysis.

Priority
- [ ] Low
- [ ] Normal
- [x] High
- [ ] Urgent (ASAP, extra charge applies, please contact lab first)

NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

Quoted Sample Types

Ground Water (GW)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	DH322	29.6.22	GW	as per quote
2	DUPA	↓	↓	↓
3				
4				
5				
6				
7				
8				
9				
10				

Hill Laboratories
TRIED, TESTED AND TRUSTED

ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22
T +64 7 856 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **302 3440**

Date Recv: 29-Jun-22 16:59

Received by: Sanaya Hansotia

3180234402

Quote No 118522

Primary Contact Harry Jones 282198

Submitted By

Client Name AECOM New Zealand Limited 71022

Address PO Box 4241, Shortland Street
Auckland 1140

Phone 09 967 9200 *Mobile*

Email

Charge To AECOM New Zealand Limited 71022

Client Reference ~~60644113 - 11.1~~ EBA

Order No 60644113 11.1

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

- [x] Email Primary Contact
- [ ] Email Submitter
- [ ] Email Client
- [x] Email Other Kate.Sharkey@aecom.com
- [ ] Other

Dates of testing are not routinely included in the Certificates of Analysis. Please inform the laboratory if you would like this information reported.

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time:
Name:
Signature:
- [ ] *Tick if you require COC to be emailed back*

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition *Temp:*
- [ ] Room Temp
- [ ] Chilled
- [ ] Frozen

- [ ] Sample & Analysis details checked

Signature:

ADDITIONAL INFORMATION / KNOWN HAZARDS

1x sample could not be collected - Please proceed with analysis.

Priority
- [ ] Low
- [ ] Normal
- [x] High
- [ ] Urgent (ASAP, extra charge applies, please contact lab first)

NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 5 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

Quoted Sample Types

Ground Water (GW)

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	DH322	29.6.22	GW	as per quote
2	DUPA	↓	↓	↓
3				
4				
5				
6				
7				
8				
9				
10				

Hill Laboratories
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R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job Information Summary

Client:	AECOM New Zealand Limited	**Lab No:**	3023440
Contact:	Harry Jones	**Date Registered:**	30-Jun-2022 8:53 am
	C/- AECOM New Zealand Limited	**Priority:**	High
	PO Box 4241	**Quote No:**	118522
	Shortland Street	**Order No:**	60644113/1.1
	Auckland 1140	**Client Reference:**	EBA
		Add. Client Ref:	
		Submitted By:	Kate Shaskey
		Charge To:	AECOM New Zealand Limited
		Target Date:	07-Jul-2022 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	DH322 29-Jun-2022	Ground Water	UP1L, Org500, TPH250, FN100	Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn; pH; Nutrient Profile; Chloride; Sulphate; Organochlorine Pesticides Screening in Water, By Liq/Liq; Total Petroleum Hydrocarbons in Water
2	DUPA 29-Jun-2022	Ground Water	UP1L, Org500, TPH250, FN100	Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn; pH; Nutrient Profile; Chloride; Sulphate; Organochlorine Pesticides Screening in Water, By Liq/Liq; Total Petroleum Hydrocarbons in Water

Summary of Methods

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

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
pH	pH meter. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23rd ed. 2017.	0.5 g/m³	1-2
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 23rd ed. 2017.	0.010 g/m³	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) 23rd ed. 2017.	0.002 g/m³	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) 23rd ed. 2017.	0.002 g/m³	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) 23rd ed. 2017.	0.004 g/m³	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23rd ed. 2017.	0.5 g/m³	1-2
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.00005 - 0.0010 g/m³	1-2
Nutrient Profile		0.0010 - 0.010 g/m³	1-2
Organochlorine Pesticides Screening in Water, By Liq/Liq	Liquid / liquid extraction, GC-ECD analysis. In-house based on US EPA 8081.	0.00010 - 0.0008 g/m³	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Petroleum Hydrocarbons in Water			
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.10 g/m^3	1-2
C10 - C14	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.2 g/m^3	1-2
C15 - C36	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	0.4 g/m^3	1-2
Total hydrocarbons (C7 - C36)	Calculation: Sum of carbon bands from C7 to C36. In-house based on US EPA 8015.	0.7 g/m^3	1-2

Hill Laboratories
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R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	3023442 SPv1
Contact:	Harry Jones	**Date Received:**	29-Jun-2022
	C/- AECOM New Zealand Limited	**Date Reported:**	04-Jul-2022
	PO Box 4241	**Quote No:**	81048
	Shortland Street	**Order No:**	60644113-1.1
	Auckland 1140	**Client Reference:**	EBA - Bus Depot
		Submitted By:	Kate Shaskey

Sample Type: Soil

Sample Name:		EHA124_0.5 29-Jun-2022	EHA124_2.1 29-Jun-2022	EHA125_0.3 29-Jun-2022	EHA125_0.9 29-Jun-2022	EHA126_0.0-0.15 29-Jun-2022
Lab Number:		3023442.2	3023442.4	3023442.6	3023442.7	3023442.9
Individual Tests						
Dry Matter	g/100g as rcvd	-	70	80	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	7	< 2	< 2	< 2	< 2
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	45	17	16	14	15
Total Recoverable Copper	mg/kg dry wt	17	10	3	4	41
Total Recoverable Lead	mg/kg dry wt	21	12.3	8.2	6.4	9.2
Total Recoverable Nickel	mg/kg dry wt	37	21	6	6	14
Total Recoverable Zinc	mg/kg dry wt	30	39	18	15	23
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	-	< 20	< 20	-	-
C10 - C14	mg/kg dry wt	-	< 20	< 20	-	-
C15 - C36	mg/kg dry wt	-	< 40	< 40	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	-	< 80	< 80	-	-

Sample Name:		EHA126_0.3 29-Jun-2022	EHA126_1.5 29-Jun-2022	EHA127_0.3 29-Jun-2022	EHA127_1.1 29-Jun-2022	EHA127_1.5 29-Jun-2022
Lab Number:		3023442.10	3023442.12	3023442.14	3023442.15	3023442.16
Individual Tests						
Dry Matter	g/100g as rcvd	-	-	-	78	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	2	< 2	2	-	< 2
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	10	15	-	12
Total Recoverable Copper	mg/kg dry wt	7	3	10	-	4
Total Recoverable Lead	mg/kg dry wt	12.8	5.2	12.3	-	5.3
Total Recoverable Nickel	mg/kg dry wt	10	4	17	-	5
Total Recoverable Zinc	mg/kg dry wt	29	11	26	-	15
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	-

Analyst's Comments

Appendix No.1 - Chain of Custody

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 Laboratories, 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, 4, 6-7, 9-10, 12, 14, 16
Dry Matter (Env)	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, 6, 15
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 4, 6-7, 9-10, 12, 14, 16
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, 6, 15
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, 6, 15
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, 6, 15
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, 6, 15

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

Testing was completed between 01-Jul-2022 and 04-Jul-2022. 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

Hill Laboratories
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ANALYSIS REQUEST

R J Hill Laboratories Limited
Ground Floor, 28 Heather Street
Parnell
Auckland 1052, New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hillLabs.co.nz
W www.hill-laboratories.com

Job No: **302 3442**

Date Recv: 29-Jun-22 17:00

Received by: Sanaya Hansotia

31302344 26

Quote No

Primary Contact Harry Jones

Submitted By Harry Jones

Client Name AECOM

Address 8 Mahuhu Cres

AKL CBD *Postcode*

Phone *Mobile* 021 348 799

Email Harry.Jones@aecom.com

Charge To AECOM

Client Reference EBA - Bus Depot

Order No 60644113 - 1.1

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other Kate.shaskey@aecom.com

☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time:

Name:

☐ *Tick if you require COC to be emailed back*

Signature:

Samples will be processed at a Hill Laboratories site with the appropriate testing capability and capacity. Please inform the Laboratory if you wish samples to be retained and analysed at the site of receipt.

Received at Hill Laboratories

Date & Time:

Name:

Signature:

ADDITIONAL INFORMATION

Priority ☐ Low ☐ Normal ☐ High

☐ **Urgent** (ASAP extra charge applies, please contact lab first)

Requested Reporting Date:

Please ensure all asbestos samples are individually double bagged upon submission to the laboratory.

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	EHA124_0.0-0.15	Soil	—	29.6.22	Hold Cold
2	EHA124_0.5				
3	EHA124_1.1				
4	EHA124_2.0				
5	EHA125_0.0_0.15				
6	EHA125_0.3				
7	EHA125_0.9				
8	EHA125_1.5				
9	EHA126_0.0-0.15				
10	EHA126_0.3				
	EHA126_1.1				
	EHA126_1.5				
	EHA127_0.0-0.15				
	EHA127_0.3				
	EHA127_1.1				
	EHA127_1.5				

KB Item: 40421 Version: 6

Hill Laboratories

Carla Johnstone <carla.johnstone@hill-labs.co.nz>

RE: [EXTERNAL] Hill Laboratories Job Request Form and Summary Page for Job Number 3023442; Ref: EBA - Bus Depot

1 message

Jones, Harry <Harry.Jones@aecom.com> 30 June 2022 at 11:50
To: "env.csm@hill-labs.co.nz" <env.csm@hill-labs.co.nz>, Carla Johnstone <carla.johnstone@hill-labs.co.nz>
Cc: "Shaskey, Kate" <Kate.Shaskey@aecom.com>, "Holroyd, Shannon" <Shannon.Holroyd@aecom.com>

Hi there,

Could we please schedule the following analysis (highlighted box with X) for the attached above CoCs

	Heavy Metals	Asbestos semi-quant	TPH
EHA124_0.0-0.15	Hold Cold		
EHA124_0.5	X		
EHA124_1.1	Hold Cold		
EHA124_2.1	X		X
EHA125_0.0-0.15		X	
EHA125_0.3	X		X
EHA125_0.9	X		
EHA125_1.5	Hold Cold		
EHA126_0.0-0.15	X		
EHA126_0.3	X		
EHA126_1.1	Hold Cold		
EHA126_1.5	X		
EHA127_0.0-0.15		X	
EHA127_0.3	X		
EHA127_1.1			X
EHA127_1.5	X		

Kind Regards

Harry Jones
Environmental Scientist
D +64 21 348 799
harry.jones@aecom.com

AECOM
AECOM House
8 Mahuhu Crescent
Auckland, New Zealand
T +64 9 967 9200
aecom.com

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ANALYSIS REQUEST

R J Hill Laboratories Limited
Ground Floor, 28 Heather Street
Parnell
Auckland 1052, New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **302 3442**

Date Recv: 29-Jun-22 17:00

Received by: Sanaya Hansotia

31302344 26

Quote No

Primary Contact Harry Jones

Submitted By Harry Jones

Client Name AECOM

Address 8 Mahuhu Cres

AKL CBD *Postcode*

Phone *Mobile* 021 348 799

Email Harry.Jones@aecom.com

Charge To AECOM

Client Reference EBA - Bus Depot

Order No 60644113 - 1.1

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other Kate.shaskey@aecom.com

☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time:

Name:

☐ *Tick if you require COC to be emailed back*

Signature:

Samples will be processed at a Hill Laboratories site with the appropriate testing capability and capacity. Please inform the Laboratory if you wish samples to be retained and analysed at the site of receipt.

Received at Hill Laboratories

Date & Time:

Name:

Signature:

ADDITIONAL INFORMATION

Priority ☐ Low ☐ Normal ☐ High

☐ **Urgent** (ASAP extra charge applies, please contact lab first)

Requested Reporting Date:

Please ensure all asbestos samples are individually double bagged upon submission to the laboratory.

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	EHA124_0.0-0.15	Soil	—	29.6.22	Hold Cold
2	EHA124_0.5				
3	EHA124_1.1				
4	EHA124_2.0				
5	EHA125_0.0_0.15				
6	EHA125_0.3				
7	EHA125_0.9				
8	EHA125_1.5				
9	EHA126_0.0-0.15				
10	EHA126_0.3				

EHA126_1.1
EHA126_1.5
EHA127_0.0-0.15
EHA127_0.3
EHA127_1.1
EHA127_1.5

Carla Johnstone <carla.johnstone@hill-labs.co.nz>

RE: [EXTERNAL] Hill Laboratories Job Request Form and Summary Page for Job Number 3023442; Ref: EBA - Bus Depot

1 message

Jones, Harry <Harry.Jones@aecom.com> 30 June 2022 at 11:50
To: "env.csm@hill-labs.co.nz" <env.csm@hill-labs.co.nz>, Carla Johnstone <carla.johnstone@hill-labs.co.nz>
Cc: "Shaskey, Kate" <Kate.Shaskey@aecom.com>, "Holroyd, Shannon" <Shannon.Holroyd@aecom.com>

Hi there,

Could we please schedule the following analysis (highlighted box with X) for the attached above CoCs

	Heavy Metals	Asbestos semi-quant	TPH
EHA124_0.0-0.15	Hold Cold		
EHA124_0.5	X		
EHA124_1.1	Hold Cold		
EHA124_2.1	X		X
EHA125_0.0-0.15		X	
EHA125_0.3	X		X
EHA125_0.9	X		
EHA125_1.5	Hold Cold		
EHA126_0.0-0.15	X		
EHA126_0.3	X		
EHA126_1.1	Hold Cold		
EHA126_1.5	X		
EHA127_0.0-0.15		X	
EHA127_0.3	X		
EHA127_1.1			X
EHA127_1.5	X		

Kind Regards

Harry Jones
Environmental Scientist
D +64 21 348 799
harry.jones@aecom.com

AECOM
AECOM House
8 Mahuhu Crescent
Auckland, New Zealand
T +64 9 967 9200
aecom.com

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Private Bag 3205
Hamilton 3240 New Zealand

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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job Information Summary

Client:	AECOM New Zealand Limited	**Lab No:**	3023442
Contact:	Harry Jones	**Date Registered:**	30-Jun-2022 8:58 am
	C/- AECOM New Zealand Limited	**Priority:**	High
	PO Box 4241	**Quote No:**	81048
	Shortland Street	**Order No:**	60644113-1.1
	Auckland 1140	**Client Reference:**	EBA - Bus Depot
		Add. Client Ref:	
		Submitted By:	Kate Shaskey
		Charge To:	AECOM New Zealand Limited
		Target Date:	04-Jul-2022 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	EHA124_0.0-0.15 29-Jun-2022	Soil	GSoil300	Hold Cold
2	EHA124_0.5 29-Jun-2022	Soil	GSoil300	Heavy Metals, Screen Level
3	EHA124_1.1 29-Jun-2022	Soil	GSoil300	Hold Cold
4	EHA124_2.1 29-Jun-2022	Soil	GSoil300	Heavy Metals, Screen Level; Total Petroleum Hydrocarbons in Soil
5	EHA125_0.0-0.15 29-Jun-2022	Soil	GSoil300	Hold Cold
6	EHA125_0.3 29-Jun-2022	Soil	GSoil300	Heavy Metals, Screen Level; Total Petroleum Hydrocarbons in Soil
7	EHA125_0.9 29-Jun-2022	Soil	GSoil300	Heavy Metals, Screen Level
8	EHA125_1.5 29-Jun-2022	Soil	GSoil300	Hold Cold
9	EHA126_0.0-0.15 29-Jun-2022	Soil	GSoil300	Heavy Metals, Screen Level
10	EHA126_0.3 29-Jun-2022	Soil	GSoil300	Heavy Metals, Screen Level
11	EHA126_1.1 29-Jun-2022	Soil	GSoil300	Hold Cold
12	EHA126_1.5 29-Jun-2022	Soil	GSoil300	Heavy Metals, Screen Level
13	EHA127_0.0-0.15 29-Jun-2022	Soil	cGSoil	Hold Cold
14	EHA127_0.3 29-Jun-2022	Soil	GSoil300	Heavy Metals, Screen Level
15	EHA127_1.1 29-Jun-2022	Soil	cGSoil	Total Petroleum Hydrocarbons in Soil
16	EHA127_1.5 29-Jun-2022	Soil	cGSoil	Heavy Metals, Screen Level

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Laboratories, 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, 4, 6-7, 9-10, 12, 14, 16
Dry Matter (Env)	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, 6, 15
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	2, 4, 6-7, 9-10, 12, 14, 16
Total Petroleum Hydrocarbons in Soil			
Client Chromatogram for TPH by FID	Small peaks associated with QC compounds may be visible in chromatograms with low TPH concentrations. QC peaks are as follows: one peak in the C12 - 14 band, the C21 - 25 band and the C30 - 36 band. All QC peaks are corrected for in the reported TPH concentrations.	-	4, 6, 15

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
C7 - C9	Solvent extraction, GC-FID analysis. In-house based on US EPA 8015.	20 mg/kg dry wt	4, 6, 15
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, 6, 15
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, 6, 15
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, 6, 15

Hill Laboratories
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R J Hill Laboratories Limited
101C Waterloo Road
Hornby
Christchurch 8042 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	AECOM New Zealand Limited	**Lab No:**	3023452	A2Pv1
Contact:	Harry Jones	**Date Received:**	29-Jun-2022	
	C/- AECOM New Zealand Limited	**Date Reported:**	04-Jul-2022	
	PO Box 4241	**Quote No:**	81048	
	Shortland Street	**Order No:**	60644113-1.1	
	Auckland 1140	**Client Reference:**	EBA - Bus Depot	
		Add. Client Ref:	Sampled: 29/6/22	
		Submitted By:	Harry Jones	

Sample Type: Soil

Sample Name:		EHA125_0.0-0.15	EHA127_0.0-0.15			
Lab Number:		3023452.3	3023452.7			
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	-	-	-
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	-	-	-
As Received Weight	g	855.0	1,057.6	-	-	-
Dry Weight	g	640.3	776.7	-	-	-
Moisture	%	25	27	-	-	-
Sample Fraction >10mm	g dry wt	< 0.1	173.2	-	-	-
Sample Fraction <10mm to >2mm	g dry wt	48.6	274.1	-	-	-
Sample Fraction <2mm	g dry wt	590.1	327.0	-	-	-
<2mm Subsample Weight	g dry wt	55.3	59.9	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	-	-	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	-	-	-
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	-	-	-

Glossary of Terms

• Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
• Trace - Trace levels of asbestos, as defined by AS4964-2004.
For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

Analyst's Comments

Appendix No.1 - Chain of Custody

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 Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Weight of Asbestos as Asbestos Fines in <10mm >2mm Fraction*	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	3, 7
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	3, 7
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	3, 7
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	3, 7
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	3, 7
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	3, 7
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	3, 7
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	3, 7
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	3, 7
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3, 7
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3, 7
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3, 7
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3, 7
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3, 7
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3, 7
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3, 7

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

Testing was completed on 04-Jul-2022. For completion dates of individual analyses please contact the laboratory.

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

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

John Keneth Paglingayen BApSc
Laboratory Technician - Asbestos

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ANALYSIS REQUEST

R J Hill Laboratories Limited
Ground Floor, 28 Heather Street
Parnell
Auckland 1052, New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **302 3452**

Date Recv: 29-Jun-22 17:08

Received by: Sanaya Hansotia

9130234527

Quote No

Primary Contact Hamy Jones

Submitted By Hamy Jones

Client Name AECOM

Address 8 Mahuhu Cres

AKL CBD *Postcode*

Phone *Mobile* 021 348 799

Email Hamy.Jones@aecom.com

Charge To AECOM

Client Reference EBA - Bus Depot

Order No 60644113 - 1.1

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other Kate.shaskey@aecom.com

☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time:

Name:

☐ *Tick if you require COC to be emailed back*

Signature:

Samples will be processed at a Hill Laboratories site with the appropriate testing capability and capacity. Please inform the Laboratory if you wish samples to be retained and analysed at the site of receipt.

Received at Hill Laboratories

Date & Time:

Name:

Signature:

ADDITIONAL INFORMATION

Priority ☐ Low ☐ Normal ☐ High

☐ Urgent (ASAP extra charge applies, please contact lab first)

Requested Reporting Date:

Please ensure all asbestos samples are individually double bagged upon submission to the laboratory.

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	EHA124_0.0-0.15	Soil	—	29.6.22	Hold Cold
2	EHA124_0.5				
3	EHA124_1.1				
4	EHA124_2.0				
5	EHA125_0.0_0.15				
6	EHA125_0.3				
7	EHA125_0.9				
8	EHA125_1.5				
9	EHA126_0.0-0.15				
10	EHA126_0.3				

EHA126_1.1
EHA126_1.5
EHA127_0.0-0.15
EHA127_0.3
EHA127_1.1
EHA127_1.5

Hill Laboratories

Carla Johnstone <carla.johnstone@hill-labs.co.nz>

RE: [EXTERNAL] Hill Laboratories Job Request Form and Summary Page for Job Number 3023442; Ref: EBA - Bus Depot

1 message

Jones, Harry <Harry.Jones@aecom.com> 30 June 2022 at 11:50
To: "env.csm@hill-labs.co.nz" <env.csm@hill-labs.co.nz>, Carla Johnstone <carla.johnstone@hill-labs.co.nz>
Cc: "Shaskey, Kate" <Kate.Shaskey@aecom.com>, "Holroyd, Shannon" <Shannon.Holroyd@aecom.com>

Hi there,

Could we please schedule the following analysis (highlighted box with X) for the attached above CoCs

	Heavy Metals	Asbestos semi-quant	TPH
EHA124_0.0-0.15	Hold Cold		
EHA124_0.5	X		
EHA124_1.1	Hold Cold		
EHA124_2.1	X		X
EHA125_0.0-0.15		X	
EHA125_0.3	X		X
EHA125_0.9	X		
EHA125_1.5	Hold Cold		
EHA126_0.0-0.15	X		
EHA126_0.3	X		
EHA126_1.1	Hold Cold		
EHA126_1.5	X		
EHA127_0.0-0.15		X	
EHA127_0.3	X		
EHA127_1.1			X
EHA127_1.5	X		

Kind Regards

Harry Jones
Environmental Scientist
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harry.jones@aecom.com

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8 Mahuhu Crescent
Auckland, New Zealand
T +64 9 967 9200
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ANALYSIS REQUEST

R J Hill Laboratories Limited
Ground Floor, 28 Heather Street
Parnell
Auckland 1052, New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job No: **302 3452**

Date Recv: 29-Jun-22 17:08

Received by: Sanaya Hansotia

9130234527

Quote No

Primary Contact Hamy Jones

Submitted By Hamy Jones

Client Name AECOM

Address 8 Mahuhu Cres

AKL CBD *Postcode*

Phone *Mobile* 021 348 799

Email Hamy.Jones@aecom.com

Charge To AECOM

Client Reference EBA - Bus Depot

Order No 60644113 - 1.1

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☑ Email Other Kate.shaskey@aecom.com

☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:*

Name:

☐ *Tick if you require COC to be emailed back*

Signature:

Samples will be processed at a Hill Laboratories site with the appropriate testing capability and capacity. Please inform the Laboratory if you wish samples to be retained and analysed at the site of receipt.

Received at Hill Laboratories *Date & Time:*

Name:

Signature:

ADDITIONAL INFORMATION

Priority ☐ Low ☐ Normal ☐ High

☐ Urgent (ASAP extra charge applies, please contact lab first)

Requested Reporting Date:

Please ensure all asbestos samples are individually double bagged upon submission to the laboratory.

No.	Sample Name	Sample Material	Sample Location	Sample Date	Tests Required (if not as per Quote)
1	EHA124_0.0-0.15	Soil	—	29.6.22	Metal Cold
2	EHA124_0.5				
3	EHA124_1.1				
4	EHA124_2.0				
5	EHA125_0.0_0.15				
6	EHA125_0.3				
7	EHA125_0.9				
8	EHA125_1.5				
9	EHA126_0.0-0.15				
10	EHA126_0.3				

EHA126_1.1
EHA126_1.5
EHA127_0.0-0.15
EHA127_0.3
EHA127_1.1
EHA127_1.5

Carla Johnstone <carla.johnstone@hill-labs.co.nz>

RE: [EXTERNAL] Hill Laboratories Job Request Form and Summary Page for Job Number 3023442; Ref: EBA - Bus Depot

1 message

Jones, Harry <Harry.Jones@aecom.com> 30 June 2022 at 11:50
To: "env.csm@hill-labs.co.nz" <env.csm@hill-labs.co.nz>, Carla Johnstone <carla.johnstone@hill-labs.co.nz>
Cc: "Shaskey, Kate" <Kate.Shaskey@aecom.com>, "Holroyd, Shannon" <Shannon.Holroyd@aecom.com>

Hi there,

Could we please schedule the following analysis (highlighted box with X) for the attached above CoCs

	Heavy Metals	Asbestos semi-quant	TPH
EHA124_0.0-0.15	Hold Cold		
EHA124_0.5	X		
EHA124_1.1	Hold Cold		
EHA124_2.1	X		X
EHA125_0.0-0.15		X	
EHA125_0.3	X		X
EHA125_0.9	X		
EHA125_1.5	Hold Cold		
EHA126_0.0-0.15	X		
EHA126_0.3	X		
EHA126_1.1	Hold Cold		
EHA126_1.5	X		
EHA127_0.0-0.15		X	
EHA127_0.3	X		
EHA127_1.1			X
EHA127_1.5	X		

Kind Regards

Harry Jones
Environmental Scientist
D +64 21 348 799
harry.jones@aecom.com

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T +64 9 967 9200
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Hill Laboratories
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R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job Information Summary

Client:	AECOM New Zealand Limited	**Lab No:**	3023452
Contact:	Harry Jones	**Date Registered:**	30-Jun-2022 7:54 am
	C/- AECOM New Zealand Limited	**Priority:**	High
	PO Box 4241	**Quote No:**	81048
	Shortland Street	**Order No:**	60644113-1.1
	Auckland 1140	**Client Reference:**	EBA - Bus Depot
		Add. Client Ref:	Sampled: 29/6/22
		Submitted By:	Harry Jones
		Charge To:	AECOM New Zealand Limited
		Target Date*:	05-Jul-2022 4:30 pm

* As the samples require analysis at a Hill Laboratories location that is different to where they were received, the Target Date for reporting has been extended.

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	EHA124_0.0-0.15	Soil	PSoil500Asb	Hold
2	EHA124_0.5	Soil	cPSoil500Asb	Hold
3	EHA125_0.0-0.15	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
4	EHA125_0.3	Soil	PSoil500Asb	Hold
5	EHA126_0.0-0.15	Soil	cPSoil500Asb	Hold
6	EHA126_0.3	Soil	PSoil500Asb	Hold
7	EHA127_0.0-0.15	Soil	PSoil500Asb	New Zealand Guidelines Semi Quantitative Asbestos in Soil
8	EHA127_0.3	Soil	PSoil500Asb	Hold

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Weight of Asbestos as Asbestos Fines in <10mm >2mm Fraction	Measurement on analytical balance, from the <10mm >2mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.00001 g dry wt	3, 7
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	3, 7
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	3, 7
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	3, 7
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	3, 7
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	3, 7
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g dry wt	3, 7
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	3, 7
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	3, 7

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3, 7
Asbestos in ACM as % of Total Sample	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3, 7
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3, 7
Asbestos as Fibrous Asbestos as % of Total Sample	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3, 7
Weight of Asbestos as Asbestos Fines (Friable)	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	3, 7
Asbestos as Asbestos Fines as % of Total Sample	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3, 7
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	3, 7