2

VOLUME 2

APPENDIX I

Ground Contamination Assessment,
Tonkin and Taylor (2019)

REPORT

Tonkin+Taylor

Ground Contamination Assessment of Environmental Effects

Ryman Village, Kohimarama Road, Auckland

Prepared for
Ryman Healthcare Limited
Prepared by
Tonkin & Taylor Ltd
Date
November 2019
Job Number
30314.001.v2

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Document Control

Title: Ground Contamination Assessment of Environmental Effects					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
12 Aug 2019	1	Draft for review	PEW	CADV	PMM
5 Nov 2019	2	Incorporating review comments	PEW	CADV	PMM

Distribution:

Ryman Healthcare Limited	1 electronic copy
Chapman Tripp	1 electronic copy
Tonkin & Taylor Ltd (FILE)	1 electronic copy

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1 Executive Summary

Ryman Healthcare Limited proposes to construct and operate a comprehensive care retirement village ("Proposed Village") at 223 Kohimarama Road and 7 John Rymer Place, Kohimarama, Auckland ("the Site").

The Site currently comprises a vacant residential lot predominately covered by grass with patches of native and exotic shrubs and trees (223 Kohimarama Road property) and a vacant residential lot predominantly covered with overgrown grass (7 John Rymer Place property).

A review of information pertaining to the history of the Site indicates that the Site has been largely undeveloped. The 223 Kohimarama Road property has been used as a sports field, with ground disturbance work to the level the site having taken place in the late 1960s.

The potential for a range of potential contaminants to be present, including asbestos, metals, organochlorine pesticides and polyromantic hydrocarbons was identified associated with the use of the Site as a sports field, the suspected use of imported fill, and evidence of localised fly tipped waste.

Tonkin & Taylor completed soil sampling across the Site with analysis for the potential contaminants of concern. The key findings and conclusions from the Tonkin & Taylor investigation can be summarised as:

- Low levels of contaminants have been detected in the soils at the Site. Asbestos has been detected at low levels in three localised areas. Concentrations for all contaminants (except asbestos) are at or below standards for high density residential land use.
- The NES Soil Regulations will apply to soil disturbance at the Site and consent will be required from Auckland Council under Regulation 9(1) of the NES Soil.
- Contaminant concentrations were detected below AUP discharge criteria, and on this basis there is no evidence to indicate that discharges of contaminants to ground resulting from the disturbance of soils during earthworks would have an adverse effect on the environment.
- Although there is no evidence to indicate that the asbestos levels detected would present an unacceptable risk to human health, best practice requires that exposure to asbestos is minimised to the extent practicable.
- Unless completely removed prior to or during construction, to protect future residents, asbestos-containing materials should be placed beneath sealed, or landscaped areas with appropriate thicknesses of soft cover.
- During the disturbance of these materials (to remove off Site or encapsulate on Site) standard earthworks controls supplemented with personnel and equipment decontamination, signage and segregation, personal protective equipment can be implemented to manage the low potential for worker exposure to asbestos.
- If asbestos contaminated fill is retained on Site, to protect future workers involved in disturbance of contaminated soil, limited controls should be implemented as applied during disturbance. The recommended controls should be implemented through a SMP (construction phase) and LTMP (operational phase).
- Providing these controls are implemented, from a contamination perspective the Site is considered suitable for the Proposed Village.

2 Introduction

2.1 Introduction

Ryman Healthcare Limited ("Ryman") engaged Tonkin + Taylor Ltd ("T+T") to undertake a ground contamination assessment for the construction and operation of a comprehensive care retirement village ("Proposed Village") at 223 Kohimarama Road and 7 John Rymer Place, Kohimarama, Auckland ("the Site"). The location of the Site is shown in Figure 2.1.

Figure 2.1: Site Location Plan (source: LINZ, Crown copyright reserved).

This report has been prepared in general accordance with the requirements for a Preliminary and Detailed Site Investigation ("PSI" and "DSI") referred to in the NES Soil regulations[1] and as outlined in the MfE's Contaminated Land Management Guidelines[2]. The persons undertaking, managing reviewing and certifying this investigation are suitably qualified and experienced practitioners as defined in the NES Soil User's Guide (April 2012).

The contaminated land, geotechnical engineering and civil engineering aspects of design are integrated. This report is to be read together with the Geotechnical Environmental Effects Assessment[3], Groundwater Take Effects Report[4] and the Civil Design Report[5].

[1] Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.
[2] Ministry for the Environment (MfE), updated 2011, Contaminated land management guidelines No. 1: *Reporting on Contaminated Sites in New Zealand*.
[3] Geotechnical effects report. 223 Kohimarama Road and 7 John Rymer Place, Kohimarama, Auckland. Tonkin & Taylor Ltd. 30314.v2. August 2019.
[4] Bore permit and amenity groundwater take effects report. 223 Kohimarama Road and 7 John Rymer Place, Kohimarama, Auckland. Tonkin & Taylor Ltd. 30314.v2. October 2019.
[5] 223 Kohimarama Road – Civil Design Report. Beca Limited. 24 October 2019.

2.2 Proposed Village

The Proposed Village will comprise the following buildings:

- A single 6 level main building (B01) with communal amenities, assisted living suites, care beds and basement carparking;
- Three 5 level apartment buildings (B02, B04 and B06);
- Two 3 level apartment buildings (B03 and B05); and
- A shared basement carpark/podium covering the footprint of building B02 to B06 with a bowling green.

A main accessway through from John Rymer Place to Kohimarama Road will be constructed between Building B01 and Building B02-B03.

The design and layout of the Proposed Village is presented in the architectural drawing set prepared by Beca and described in detail in the Assessment of Environmental Effects. Further, the Civil Design Report by Beca details the earthworks and infrastructure services that will be required to construct and operate the Proposed Village.

Of relevance to this assessment, the Site will be earthworked and terraced to form building platforms, access roads and other amenity areas.

3 Site Description

3.1 Site identification

The Site is located at 223 Kohimarama Road and 7 John Rymer Place, the boundaries of which are adjoining. The Site forms an irregular triangle on the south-western side of Kohimarama Road. The Site is shown on Figure 3.1 and described in Table 3.1 below.

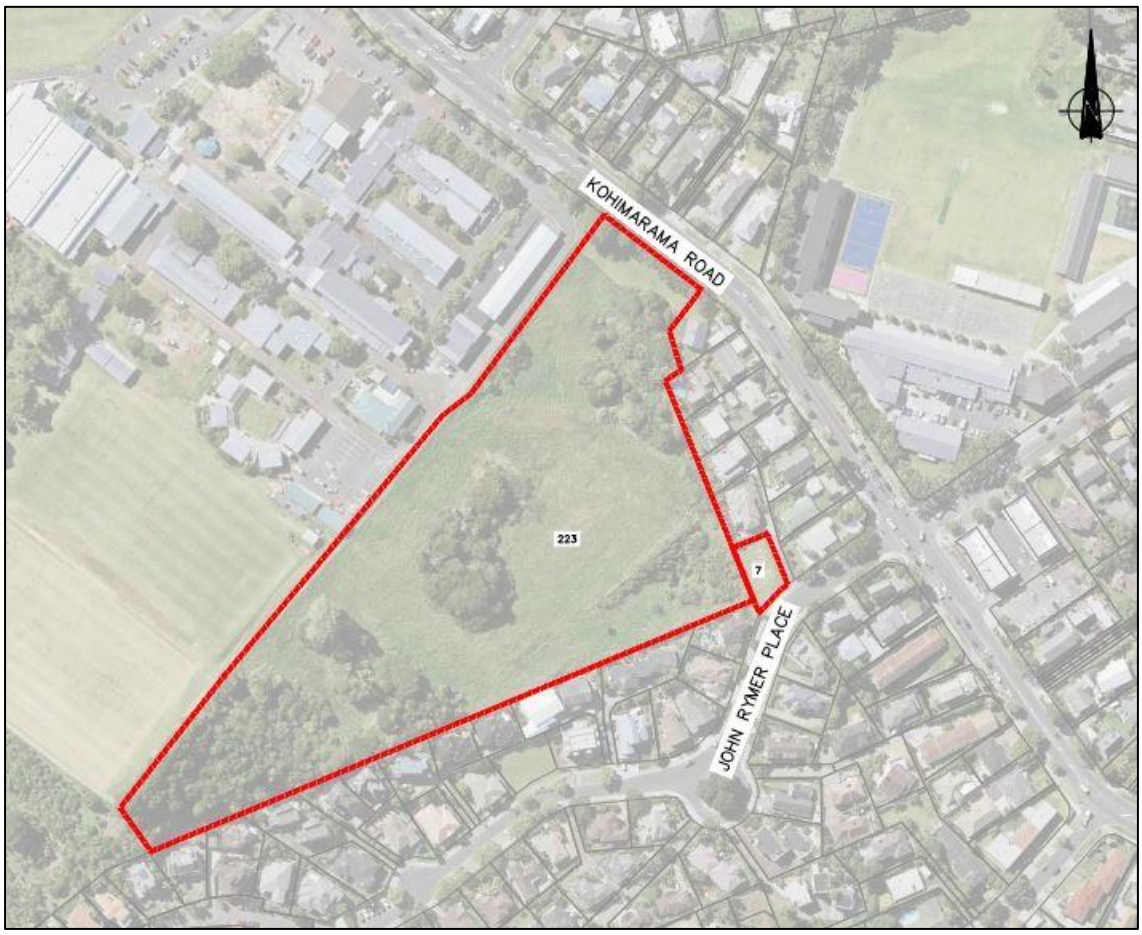

Figure 3.1: Site plan (source: Auckland Council GIS Viewer).

Table 3.1: Property description

Address	Legal Description	Zoning (Auckland Unitary Plan)	Certificate of Title	Area (Hectares)
223 Kohimarama Road	Lot 1 DP 332284	Mixed Housing Urban	132397 (property) 312220 (leasehold)	3.0770
7 John Rymer Place	Lot 51 DP 163242		NA98B/894	0.0451

3.2 Site condition

A site walkover inspection was undertaken by a contaminated land specialist on 4 October 2018. Key site features observed during the inspection are described below and shown on Figure 6.1. Selected photographs are included as Photographs 1 to 7 in Appendix A.

7 John Rymer Place:

- The property is currently a vacant residential lot and is predominantly covered with overgrown grass.
- The property slopes down gently to the south east following the general gradient of John Rymer Place.
- The boundary of the property with 223 Kohimarama Road is defined by native and exotic trees and shrubs, which populate the slope into the valley to the south west (Photograph 1).

223 Kohimarama Road:

- The property is currently a large vacant residential lot and is predominately covered by grass with patches of native and exotic shrubs and trees (Photographs 2 and 3).
- Much of the property slopes down to the south east towards the base of the valley and the residential properties below. The main topographic feature is the presence of the valley and an area located in the centre of the Site which appears to have been filled to create a level field (Photographs 2, 4, 5 and 6).
- The south western third (approximate) of the property is largely covered with native and exotic trees and shrubs. Central and northern portions of the property are also covered with exotic trees and shrubs and grass (Photograph 7).
- A strip of grass on the northern portion of the property, parallel to Kohimarama Road, appears to be regularly mowed and the vegetation maintained. This portion of the property connects directly to the driveway of the neighbouring residential property (located at 245 Kohimarama Road) where maintenance equipment including a mower were parked. The strip is likely used as access by Selwyn College grounds maintenance staff to and from 245 Kohimarama Road (Photograph 8).
- Some isolated areas of soil fly tipping and clearing of vegetation for wood chopping were evident near the boundary with 245 Kohimarama Road (Photographs 9 and 10).
- Evidence of minor and localised (less than 1 m^3) fly tipping was observed in the vegetated area in the north east corner of the property near the boundary with 245 Kohimarama Road (Photographs 9 and 10).
- No buildings were observed on site. However, maintenance sheds and/or workshops and a laydown area on Selwyn College were observed up against the western boundary of the site. Mowing equipment and other grounds-maintenance machinery was parked here and potential refuelling and mechanical maintenance works appear to have occurred in this area (Photograph 11).

3.3 Surrounding land use

The surrounding land use is generally low to medium density residential properties. The specific land uses in the area immediately surrounding the Site include:

- Northeast – Kohimarama Road, Residential - Mixed Housing Urban zoned residential properties with predominantly low to medium density residential housing.
- South – Residential - Mixed Housing Suburban zoned residential properties, and valley.
- East – Residential - Mixed Housing Urban zoned residential properties, St. Thomas School, and light commercial uses consisting of local convenience stores (a dairy, hairdresser, liquor store and restaurants/ fast food eateries).
- Northwest – Residential - Mixed Housing Urban zoned Selwyn College and associated grounds, Selwyn Tennis Courts and Eastern Bays Early Childhood Learning Centre.

3.4 Geology

3.4.1 Published geology

The geology beneath the Site is described in the Kermode (1992)[6] publication as consisting of alternating sandstone, siltstone, mudstone and grit of the East Coast Bays Formation ("ECBF"), and soils weathered from the ECBF.

3.4.2 Site geological information

Site specific geological information has been obtained from a geotechnical investigation[3] conducted concurrently with this ground contamination investigation.

The soil profile encountered during the geotechnical investigations was generally consistent with the published geology of the region. The Site is underlain by residual ECBF soils, overlying moderately weathered ECBF, overlying ECBF rock. Fill material was encountered across the entire Site and was observed to be deepest (to a depth of 9.4 m) beneath the playing field in the centre of the Site. The soil profile is discussed further in Section 6.2.1 below.

The fill material encountered consisted predominantly of topsoil (dark brown clays and silts encountered to a maximum depth of 0.3 m) overlying reworked weathered ECBF soils (encountered between 0.2 and 9.4 m).

3.5 Hydrogeology and hydrology

On the lower part of the Site (south east and south), measured groundwater levels typically range from 1.5 to 10.0 metres below ground level (mbgl); and are generally within 4 m of the ground surface. On the slope along the northern/north-western boundary close to the ridgeline, piezometers indicate groundwater levels ranging from 4.0 to 9.9 mbgl. The groundwater regime appears to be generally hydrostatic at the Site.

Regional groundwater is predicted to flow to the southwest toward Purewa Creek. However, based on the variability of the groundwater levels at the Site (as set out above), the Site topography is likely to influence groundwater flow. The topographic low for the Site occurs along the south western boundary (refer Figure 3.2), and localised groundwater flow may be in a westerly direction. Groundwater is expected to discharge to Purewa Creek, located approximately 300 m to the southwest of the Site (refer Figure 2.1). Purewa Creek and deeper groundwater below the level of the creek is expected to discharge to Orakei Basin and the Waitemata Harbour further to the west of the Site (refer Figure 2.1).

[6] Kermode, L.O. (1992): Geology of the Auckland Urban Area 1:50,000. Institute of Geological & Nuclear Sciences Geological Map 2.

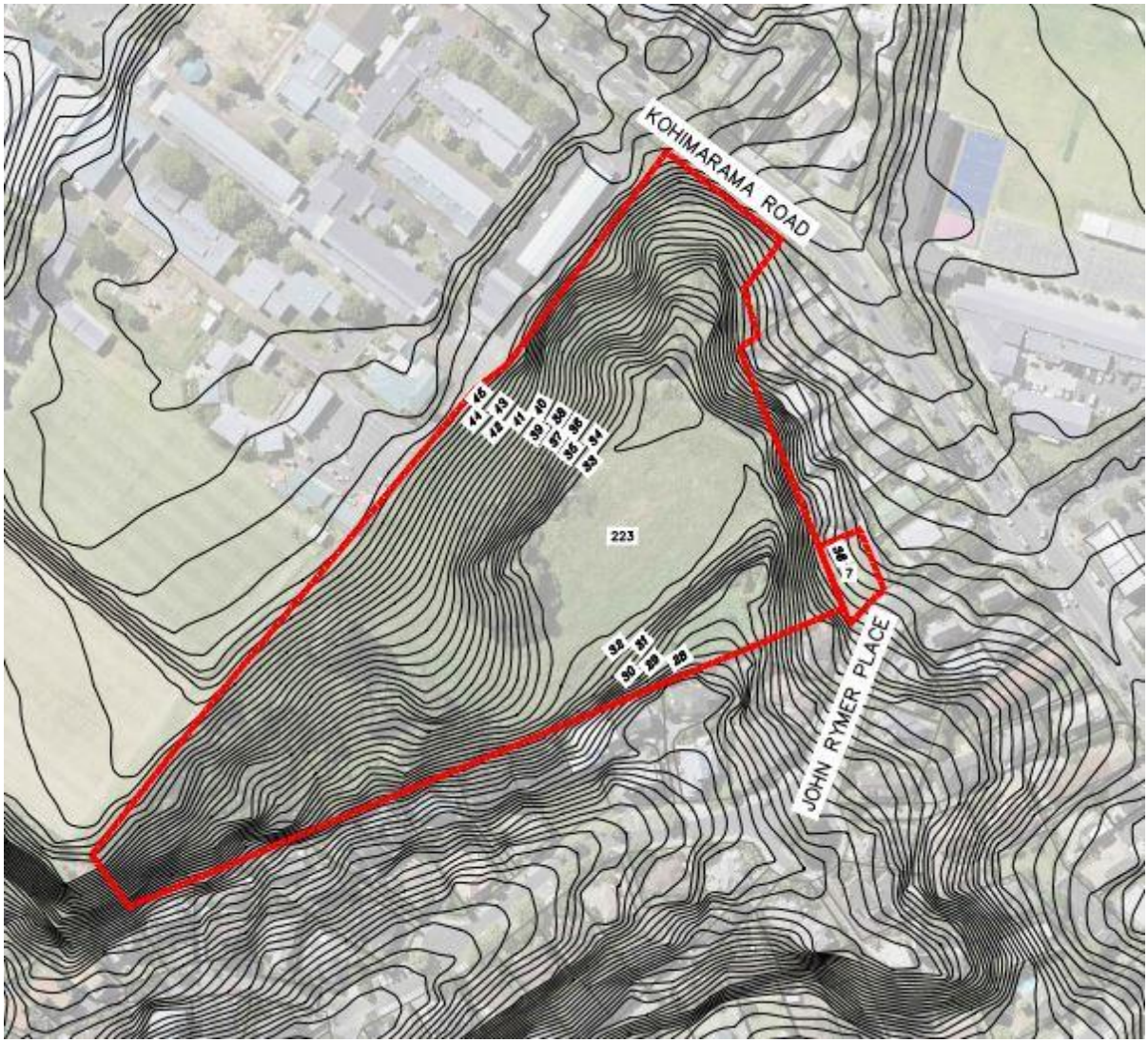

Figure 3.2: General topographic contour of the Site (source: Auckland Council Geomaps Service).

3.6 Planning context

The planning context for the Site and the Proposed Village is addressed in the Assessment of Environmental Effects. In a ground contamination context, the relevant planning matters to be considered include the following:

3.6.1 Auckland Unitary Plan ("AUP")

The AUP includes objectives, policies and rules relating to the management of discharges from contaminated land into air, into water or onto land.

Discharges of contaminants from disturbing soil on land containing elevated levels of contaminants and from land not used for rural production activities is a permitted activity under Rules E30.4.1 (A2) and (A4), subject to compliance with permitted standards. Compliance with those standards is assessed later in Section 7.

3.6.2 NES Soil:

The NES Soil applies to soil disturbance and land development activities on a site where an activity on the Ministry for the Environment's Hazardous Activities and Industries List (HAIL) has occurred.

The likelihood of any HAIL activities having occurred on the site is assessed in Section 4. The NES Soil requirements are assessed in Section 7.

4 Site History

4.1 Site history

The history of the Site has been ascertained from:

- Review of Auckland Council ("AC") property files.
- Review of an AC contamination enquiry for the Site.
- Review of selected historical aerial photographs from the AC GIS Viewer and Google Earth.
- Review of current and historical certificates of title.
- Review of a site investigation report prepared by AECOM New Zealand Limited[7].
- A walkover inspection of the Site on 4 October 2018.

Those sources document on-Site activities, except for the aerial photographs which also provide information on readily observable surrounding land use. The information that has been reviewed is summarised in this section. A more detailed review of the information is included in Appendix B.

No evidence of modified structures, other than the former levelled playing field on 223 Kohimarama Road, was found in the AC property files or the aerial imagery for both properties.

7 John Rymer Place:

The property remains undeveloped as far back as the 1940s where historic aerial imagery indicates the property was largely pastoral/grassed as it remains today. In recent years the property appears to be well maintained and aerial imagery from 2003 to 2015 suggests some localised grass cutting and de-vegetation.

Property files obtained from AC indicate the property has been subject to a number of building consents for various private / residential owners, however none of the proposed residential developments appear to have come to fruition based on the aerial photographs.

223 Kohimarama Road:

In general, the history of this property is dominated by pastoral uses until the early 1960s. After that time, school uses appear to have had the most influence over the use and development of the land. Aerial imagery from the early 1960s shows ground disturbance works occurring along the northwest boundary with Selwyn College. Succeeding aerial imagery from 1968 suggests the establishment of a level playing field in the central portion of the property and the discontinuation of ground disturbance work.

Historical aerial imagery suggests ongoing maintenance of the playing field and grassed areas of the property occurred up until circa 2015. That date corresponds to the approximate changeover of leasehold from the School to Rainbow Holdings NZ Limited, as discussed in the following section.

4.2 Previous investigations

A ground contamination assessment for the Site was completed in 2015 by AECOM New Zealand Limited. The report was prepared for Rainbow Holdings NZ Ltd to assess potential ground contamination present at the Site to support a proposed subdivision and residential development.

Consistent with the historical review above, earthworks across the Site were identified and it was noted that the earthworks may have included the use of non-engineered fill of an unknown quantity.

[7] AECOM 2015, Site Investigation (Contamination) – 223 Kohimarama Road Residential Development and Subdivision. Prepared for Rainbow Holdings NZ Limited by AECOM New Zealand Limited, dated 14 September 2015 (Reference 60430368).

Filling activities were recognised as the main activity to have occurred on the Site since the 1940s and posing the primary source for contamination to occur (if present).

As part of the investigation, five hand soil bores were hand excavated and a total of 26 soil samples collected for analytical purposes. Samples were analysed for a suite of analytes targeting potential contamination associated with filling activities. The analytical suite included heavy metals, semi-volatile organic compounds ("SVOC"), polycyclic aromatic hydrocarbons ("PAH"), organochlorine pesticides ("OCP") and organonitrogen pesticides ("ONP"). Despite fill of unknown origin being identified as a potential source of contamination, analysis for asbestos was not undertaken.

The soil analytical results reported by AECOM in 2015 did not indicate the presence of contamination in the samples analysed and AECOM concluded that the soils on the Site were suitable for the intended future land use.

5 Potential for Contamination

The Site historical information indicates that HAIL activities have occurred at the Site. The activities, potential contaminants and an assessment of the likelihood, potential magnitude and possible extent of contamination are presented in Table 5.1 below.

Table 5.1: Potential for contamination

Land use/ activity	Potential/known contaminants	Likelihood, magnitude and possible extent of contamination	HAIL reference
Imported filling (levelling for sports playing field)	Range of contaminants possible depending on source of material. Potential contaminants include metals, PAHS and asbestos.	Filling appears to have occurred predominantly on the 223 Kohimarama Road property. Based on previous experience of filled areas in Auckland, there is moderate to high potential for contamination above background levels within fill material in the playing field.	Potentially I – Intentional or accidental release of a contaminant (imported fill) (only if contaminant present in sufficient quantity to present a risk to human health or the environment).
Spray use for vegetation control between C1968 and 2015	Metals (As, Cu, Pb) and OCPs.	Low concentrations possible in shallow soil (typically to 400 mm depth) across the Site associated with historic use of sprays containing persistent organochlorine compounds used prior to the late 1970s.	Potentially A10 – persistent pesticide bulk storage or use.
Machinery maintenance on neighbouring property (Selwyn College)	Lead and hydrocarbons (total petroleum hydrocarbons (TPH) and PAH)	Low concentrations of lead and hydrocarbons are possible in shallow soils in an isolated area of the western boundary. Significant contamination is unlikely as there have been no recorded pollution incidents.	Potentially H – Migration of a contaminant (fuel or oils) (if in sufficient quantity to present a risk to human health or the environment).
Fly tipping near northern boundary	Various depending on nature of tipping, but potentially including metals and asbestos.	Low potential for low levels of contamination in an isolated area where fly tipping has occurred. Unlikely to extend below topsoil if tipping is confined to the surface (i.e. no buried waste).	Potentially I – Intentional or accidental release of a contaminant (waste) (if in sufficient quantity to present a risk to human health or the environment).

6 T+T 2018 Soil Sampling Investigation

6.1 Investigation approach

6.1.1 Rationale

In October 2018, T+T undertook additional soil sampling at the Site. The principal objectives of the sampling were to:

- Obtain samples across a broader coverage of the Site with respect to inorganic and organic pesticides;
- Target potential sources of contamination not addressed in the previous Site investigation completed by AECOM (2015); and
- Assess the fill for the presence of asbestos, which had not been previously assessed by AECOM in 2015.

6.1.2 Scope

Table 6.1 summarises the T+T investigation scope. The investigation locations are shown on Figure 6.1.

Table 6.1: Summary of T+T (2018) investigation scope.

Contaminant source/area of interest	Investigation scope	T+T (2018) Investigation location
Area of filling (sports field).	Collection of samples using hand augers on an approximate 20 m grid. Samples collected from 0.1 m at all locations, with additional samples collected from 0.4 m based on field observations. Samples analysed for metals, asbestos, OCPs and PAHs.	HA06-HA12
Potential historic use of persistent pesticides.	Sampling on an approximate 20 m grid across the Site (including 7 John Rymer Place). Samples collected from 0.1 m at all locations, with additional samples collected from 0.5 m and 1.0 m based on field observations to target reworked material. All samples analysed for metals and PAHs. Selected samples analysed for OCPs and asbestos.	HA1-HA5, HA13-HA24, BH1, BH2, BH5
Potential contamination associated with Selwyn College Maintenance Shed.	Surface soil sample only. Analysed for metals, PAHs and TPH.	EHA01
Fly-tipping near northern boundary.	Surface soil sample only. Analysed for metals, PAHs and TPH.	Grab01

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SITE LOCATION
SCALE 1:1000

LEGEND

- SITE BOUNDARY
- PROPERTY BOUNDARIES
- INVESTIGATION LOCATION - MACHINE BOREHOLE (WITH SPT TESTING)
- INVESTIGATION LOCATION - MACHINE BOREHOLE (NO SPT TESTING)
- HAND AUGER SAMPLE
- EXISTING HAND AUGER SAMPLE
- GRAB SAMPLE
- INFERRED ASBESTOS IMPACT AREA

SELWYN COLLEGE
KOHIMARAMA ROAD
223
7
JOHN RYMER PLACE
SPORTS FIELD
FLY TIPPING
GRAB 1
BH1
BH2
BH5
EHA01
HA01
HA02
HA03
HA04
HA05
HA06
HA07
HA08
HA09
HA10
HA11
HA12
HA13
HA14
HA15
HA16
HA17
HA18
HA19
HA20
HA21
HA22
HA23
HA24

A3 SCALE 1: 1000
0 5 10 15 20 30 40 50 (m)

ORIGINAL IN COLOUR

SITE PLAN
SCALE 1:1000

NOTES:
1. AERIAL PHOTOGRAPH AND PARCEL BOUNDARIES SOURCED FROM AUCKLAND COUNCIL GEOMAPS SERVICE UNDER CC BY 3.0-NZ LICENCE.
2. MAP SOURCED FROM OPENSTREETMAP UNDER CC BY-SA LICENSE, (C) OPENSTREETMAP CONTRIBUTORS.

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PROJECT No.	30314.0001		
DESIGNED	CADV	Oct.18	
DRAWN	KMJA	Oct.18	
CHECKED			
APPROVED	DATE		

CLIENT RYMAN HEALTHCARE LIMITED
PROJECT RYMAN SITE 3 - CONTAMINATION
TITLE 223 KOHIMARAMA ROAD AND 7 JOHN RYMER PLACE RYMAN INVESTIGATION LOCATIONS PLAN
SCALE (A3) 1:1000 FIG No. 30314.0001-F6.1 REV 1

6.1.3 Methodology

Soil samples were collected in general accordance with the MfE's *Contaminated Land Management Guidelines No.5*. Soil samples were collected according to the following procedure:

- Soil samples were collected from the hand augers at surface then at each new geological unit or at intervals of no greater than 0.5 m in fill and 1.0 m in natural soils.
- The materials encountered were logged in general accordance with the NZ Geotechnical Society '*Guidelines for the classification and field description of soils and rocks for engineering purposes'*.
- Freshly gloved hands were used to collect soil samples from the recovered core. All samples were placed immediately into laboratory provided 300 ml glass jars.
- Any equipment used to collect the samples was decontaminated between sample locations using clean water and Decon 90 solution (a phosphate-free detergent).
- Samples were stored and delivered to Hills Laboratories, Hamilton, in chilled containers under chain of custody documentation.
- Two duplicate samples were collected for quality assurance purposes.

Samples for asbestos analysis were collected using a gloved hand by scraping approximately 100 g of surface soil into laboratory provided plastic containers and transported to Hills Laboratories, Hamilton under chain of custody documentation.

Soil samples were screened in the field using a calibrated portable field-use photo-ionisation detector (PID) with a 10.6 eV lamp. The PID was used as a screening tool for potential volatile organic compounds which may be present in the soils and was also used to inform the sample analytical schedule, where applicable.

6.1.4 Assessment criteria

Analytical results for the samples collected by T+T have been compared against the following assessment criteria:

- The NES Soil Contaminant Standards (NES Soil SCS) for high-density residential use to establish potential risk to future site occupants. The exposure factors used to derive this standard provides a conservative screening criteria for the Proposed Village.
- The NES Soil SCS for commercial/ industrial land use as a proxy for assessing risk to Site workers during earthworks.
- New Zealand Guidelines for Asbestos in Soil 'all site uses' criteria of <0.001 % w/w asbestos fibres and fibrous asbestos (AF and FA respectively) and 0.04% w/w for Asbestos Containing Material to assess risks to future Site users based on high-density residential land use.
- New Zealand Guidelines for Asbestos in Soil (various values) to assess potential risks to workers during earthworks.
- Auckland Unitary Plan: Operative in Part (AUP) permitted activity discharge criteria to establish consenting requirements in relation to potential environmental effects beyond human health.
- Background concentrations for non-volcanic soils in Auckland to assess the potential for disposal of Site soils to cleanfill.

6.1.5 Data quality

A quality assurance and quality control (QA/QC) program was implemented as part of field procedures, which included:

- Sampling equipment decontamination between sampling locations.
- Preservation of samples with ice during transport from the field to the laboratory.
- Transportation of samples with accompanying Chain of Custody documentation.
- Compliance with laboratory sample holding times.

The laboratory testing was undertaken by Hill Laboratories Ltd, which is accredited for the analysis undertaken and audited annually by International Accreditation New Zealand (IANZ). The laboratory's quality control measures include testing of blanks with all batches of samples and frequent replicates and spikes, along with peer review of worksheets.

In addition to standard laboratory QA/QC, two duplicate samples were collected in the field during the investigation. Table 6.2 presents the QA/QC analytical results.

Table 6.2: Summary of QA/QC data (all values in mg/kg)

Sample	BH05_0.1 m	DUP 1	*RPD %*	HA19_0.1 m	DUP 2	*RPD %*
Arsenic	3	2	**40**	3	3	0
Cadmium	< 0.10	< 0.10	-	0.13	0.11	17
Chromium	15	15	0	23	21	9
Copper	8	8	0	24	21	13
Lead	9.3	10.2	9	132	110	18
Nickel	7	8	13	31	26	18
Zinc	20	23	14	53	48	10

The QA duplicate results compared well with the respective samples and generally gave relative percentage differences (RPD) of less than 40%. The arsenic concentrations in samples BH05_0.1 and DUP 1 showed a RPD of 40%. This may have been due to a combination of comparing low values and sample heterogeneity. However, the other RPD values in this sample pair are within an expected range and we do not think the observed variability is significant for this sample suite. We therefore consider the results suitable for interpretation.

6.2 Investigation findings

6.2.1 Observations

The shallow geological units encountered were generally consistent with the published geology of the region.

Surficial soils (topsoil) comprised clay and silt with organics to approximately 0.1 m to 0.4 mbgl, with some sandy silt observed in HA01 located on 7 John Rymer Place. The topsoil was typically underlain by reworked weathered ECBF, consisting of pale grey and orange brown orange-brown silty clay or clayey silt with natural ECBF clays encountered at approximately 1.0 mbgl (BH01). One location, HA09 (BH04), excavated from within the former playing field footprint, encountered gravelly sand at 0.4 mbgl, which may have been imported as a sub-grade drainage material below the playing field. The gravelly sand was not encountered elsewhere on the Site.

Soils underlying vegetated areas were found to comprise topsoil overlying reworked natural of similar depth to the material encountered beneath grassed areas, suggesting the subsurface materials are generally uniform across the Site.

No odours or staining were observed in soil and no asbestos fragments were identified on the ground surface or within fill material.

A maximum PID reading of 20 parts per million (ppm) was recorded in samples collected from EHA01. PID readings were generally below 10 ppm which considering the wet weather conditions at the time of sampling (which can result in falsely elevated PID readings) indicates that detectable concentrations of volatile contaminants were generally not present.

6.2.2 Analytical results

Key findings from the T+T 2018 investigation are discussed below. Analytical results are summarised in Table 6.3. Laboratory transcripts for the T+T (2018) soil analyses are included in Appendix C.

6.2.2.1 Overview of results

- Three fill units were identified in the investigation, comprising; topsoil, reworked ECBF soils (both of which occur across the entire Site) and a sandy fill material which appears isolated to the western corner of the playing field (refer to Figure 6.1).
- Asbestos:
  - A single sample of sandy fill material at 0.4 m depth within the former sports field contained asbestos (recorded as Chrysotile fibres) at a concentration equal (and therefore complying with) to the guideline value for high-density residential land use (0.001% weight for weight (w/w)).
  - A single grab sample of fly tipped soil near the Caretaker's residence contained asbestos (recorded as Amosite and Chrysotile), however concentrations were below the guideline value for high-density residential land use.
  - Asbestos was detected within a sample of reworked natural material (clayey silt) collected from the north of the Site (HA15). Chrysotile fibres were detected in this sample at a concentration equal to (and therefore complying with) the guideline value for high-density residential land use.
  - Asbestos was detected at levels that trigger the lowest (least stringent) asbestos related controls required to protect workers during earthworks (0.001% w/w) as specified in the New Zealand Guidelines for Asbestos in Soil.
- Chemical contaminants (metals, TPH, PAHs, OCPs):
  - None of the soil samples collected contained metal concentrations exceeding NES SCS health-based criteria for high-density residential use or commercial / industrial use (worker protection criteria).
  - A number of surface samples (topsoil and reworked ECBF) contained metal concentrations exceeding background concentrations. Subsurface samples did not contain metals above background concentrations.
  - Pesticides were not detected in the samples analysed.
  - TPHs were not detected in the samples analysed.
  - A number of samples at surface and two of six samples at depth contained PAH compounds marginally above the laboratory limit of reporting and therefore exceeding cleanfill criteria (all fill types). All detected PAH concentrations were below the NES SCS.
  - None of the samples exceeded the AUP permitted activity environmental discharge criteria.

Table 6.3: Summary of Laboratory Analytical Results

Property Reference	NES Soil SCS - High-density Residential [1]	NES Soil SCS - Commercial [1]	AUP Permitted Activity Criteria [3]	Published non volcanic background concentrations [5]	Maximum	7 John Rymer Place		223 Kohimarama Road															
Sample ID						HA01_0.1	HA02_0.1	BH01_0.1	BH01_1.0	HA03_0.1	HA04_0.1	HA04_0.5	HA05_0.1	BH02_0.1	BH02_1.0	HA13-0.1	HA14-0.1	HA15-0.1	HA15-0.5	HA16-0.1	HA17-0.1	HA18-0.1	HA18-0.5	BH5-0.1
Depth (m)						0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.5	0.1
Sampling Date						10-Oct-18	10-Oct-18	8-Oct-18	8-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18
Lab report reference						2063571.9	2063571.1	2063571.3	2063571.5	2063571.1	2063571.2	2063571.2	2063571.2	2063571.3	2063571.4	2064272.3	2064272.5	2064272.7	2064272.8	2064272.9	2064272.11	2064272.13	2064272.14	2064272.15
Strata						Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill
Asbestos																								
Asbestos type	-	-	-	-	-	Asbestos NOT detected.	-	-	-	-	-	Asbestos NOT detected.	-	-	-	-	-	-	Chrysotile (White asbetsos detected)	-	-	-	-	-
Combined FA + AF (w/w%)	**0.001** [6]	**0.001** [6]	-	-	**<LD**	< 0.001	-	-	-	-	-	< 0.001	-	-	-				0.001					
Asbestos as ACM (w/w %)	**0.04** [6]	**0.05** [6]	-	-	**<LD**	< 0.001	-	-	-	-	-	< 0.001	-	-	-				0.001					
Metals																								
Arsenic	45	70	100	12	15	15	4	2	< 2	3	9	4	4	4	< 2	43	12	4	5	4	4	3	2	3
Cadmium	230	1,300	7.5	0.65	0.56	< 0.10	0.11	< 0.10	< 0.10	< 0.10	0.56	< 0.10	0.15	0.16	< 0.10	0.46	0.26	0.14	< 0.10	0.17	0.28	0.13	< 0.10	< 0.10
Chromium	1,500	6,300	400	55	26	26	22	21	6	14	17	23	24	35	6	70	37	30	36	37	39	22	40	15
Copper	>10,000	240,000 [2]	325	45	41	29	16	7	2	15	41	18	18	40	11	54	25	24	22	30	27	16	13	8
Lead	500	3,300	250	65	165	165	26	6.6	4.1	13.3	103	17.3	15.6	47	6.3	98	56	21	21	23	19.8	17.2	7	9.3
Nickel	-	6,000 [2]	105	35	37	37	16	8	< 2	8	9	18	22	61	3	25	17	26	26	36	55	16	16	7
Zinc	-	400,000 [2]	400	180	174	80	62	16	< 4	43	174	44	49	70	7	151	89	70	44	67	84	41	29	20
Organochlorine Pesticides (OCP)																								
Aldrin	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
alpha-BHC	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
beta-BHC	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
delta-BHC	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
gamma-BHC (Lindane)	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
cis-Chlordane	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
trans-Chlordane	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Total Chlordane [(cis+trans)*100/42]	-	-	-	-	<LD	< 0.04	< 0.04	< 0.04	-	< 0.04	< 0.04	-	< 0.04	< 0.04	-	< 0.04	-	-	-	< 0.04	-	< 0.04	-	< 0.04
2,4'-DDD	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
4,4'-DDD	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
2,4'-DDE	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
4,4'-DDE	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
2,4'-DDT	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
4,4'-DDT	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Total DDT Isomers	240	1,000	12	-	<LD	< 0.09	< 0.09	< 0.08	-	< 0.10	< 0.09	-	< 0.09	< 0.09	-	< 0.06	-	-	-	< 0.06	-	< 0.06	-	< 0.06
Dieldrin	45	160	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Endosulfan I	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Endosulfan II	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Endosulfan sulphate	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Endrin	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Endrin aldehyde	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Endrin ketone	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Heptachlor	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Heptachlor epoxide	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Hexachlorobenzene	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Methoxychlor	-	-	-	-	<LD	< 0.014	< 0.015	< 0.013	-	< 0.017	< 0.015	-	< 0.015	< 0.015	-	< 0.010	-	-	-	< 0.010	-	< 0.010	-	< 0.010
Polycyclic Aromatic Hydrocarbons (PAH)																								
1-Methylnaphthalene	-	-	-	<LD	<LD	< 0.014	< 0.016	< 0.013	< 0.013	< 0.017	< 0.015	< 0.013	< 0.015	< 0.015	< 0.013	< 0.012	< 0.014	< 0.017	< 0.013	< 0.014	< 0.014	< 0.018	< 0.013	< 0.016
2-Methylnaphthalene	-	-	-	<LD	<LD	< 0.014	< 0.016	< 0.013	< 0.013	< 0.017	< 0.015	< 0.013	< 0.015	< 0.015	< 0.013	< 0.012	< 0.014	< 0.017	< 0.013	< 0.014	< 0.014	< 0.018	< 0.013	< 0.016
Perylene	-	-	-	<LD	0.059	0.059	0.038	< 0.013	< 0.013	< 0.017	< 0.015	< 0.013	< 0.015	0.08	< 0.013	< 0.012	< 0.014	< 0.017	0.015	0.023	< 0.014	< 0.018	< 0.013	< 0.016
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	-	-	-	<LD	0.32	0.32	0.09	< 0.04	< 0.04	< 0.04	0.04	0.06	< 0.04	0.48	< 0.04	0.09	< 0.04	0.09	0.13	0.14	< 0.04	< 0.05	< 0.04	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	-	-	-	<LD	0.33	0.33	0.09	< 0.04	< 0.04	< 0.05	0.04	0.06	< 0.04	0.48	< 0.04	0.09	< 0.04	0.09	0.13	0.14	< 0.04	< 0.05	< 0.04	< 0.04
Acenaphthylene	-	-	-	<LD	0.017	0.017	< 0.016	< 0.013	< 0.013	< 0.017	< 0.015	< 0.013	< 0.015	0.046	< 0.013	< 0.012	< 0.014	< 0.017	< 0.013	< 0.014	< 0.014	< 0.018	< 0.013	< 0.016
Acenaphthene	-	-	-	<LD	<LD	< 0.014	< 0.016	< 0.013	< 0.013	< 0.017	< 0.015	< 0.013	< 0.015	< 0.015	< 0.013	< 0.012	< 0.014	< 0.017	< 0.013	< 0.014	< 0.014	< 0.018	< 0.013	< 0.016
Anthracene	-	-	-	<LD	0.023	0.023	< 0.016	< 0.013	< 0.013	< 0.017	< 0.015	< 0.013	< 0.015	0.038	< 0.013	< 0.012	< 0.014	< 0.017	0.015	< 0.014	< 0.014	< 0.018	< 0.013	< 0.016
Benzo[a]anthracene	-	-	-	<LD	0.162	0.162	0.05	< 0.013	< 0.013	< 0.017	0.026	0.022	0.027	0.27	< 0.013	0.03	< 0.014	0.037	0.062	0.049	< 0.014	< 0.018	< 0.013	< 0.016
Benzo[a]pyrene (BAP)	-	-	-	<LD	0.21	0.21	0.054	< 0.013	< 0.013	< 0.017	0.029	0.051	< 0.015	0.32	< 0.013	0.047	0.022	0.063	0.092	0.088	0.018	< 0.018	< 0.013	< 0.016
Benzo[b]fluoranthene + Benzo[j]fluoranthene	-	-	-	<LD	0.23	0.23	0.074	< 0.013	< 0.013	< 0.017	0.035	0.041	0.03	0.35	< 0.013	0.077	0.019	0.051	0.075	0.07	< 0.014	< 0.018	< 0.013	< 0.016
Benzo[e]pyrene	-	-	-	<LD	0.129	0.129	0.045	< 0.013	< 0.013	< 0.017	0.025	0.024	< 0.015	0.193	< 0.013	0.043	< 0.014	0.028	0.032	0.036	< 0.014	< 0.018	< 0.013	< 0.016
Benzo[g,h,i]perylene	-	-	-	<LD	0.146	0.146	0.057	< 0.013	< 0.013	< 0.017	0.027	0.024	0.016	0.196	< 0.013	0.057	< 0.014	0.036	0.045	0.06	< 0.014	< 0.018	< 0.013	< 0.016
Benzo[k]fluoranthene	-	-	-	<LD	0.094	0.094	0.027	< 0.013	< 0.013	< 0.017	< 0.015	0.017	< 0.015	0.146	< 0.013	0.03	< 0.014	0.02	0.025	0.032	< 0.014	< 0.018	< 0.013	< 0.016
Chrysene	-	-	-	<LD	0.165	0.165	0.06	< 0.013	< 0.013	< 0.017	0.026	0.026	0.028	0.28	< 0.013	0.059	< 0.014	0.033	0.049	0.047	< 0.014	< 0.018	< 0.013	< 0.016
Dibenzo[a,h]anthracene	-	-	-	<LD	0.048	0.048	0.016	< 0.013	< 0.013	< 0.017	< 0.015	< 0.013	< 0.015	0.051	< 0.013	0.019	< 0.014	< 0.017	< 0.013	0.026	< 0.014	< 0.018	< 0.013	< 0.016
Fluoranthene	-	-	-	<LD	0.29	0.29	0.127	< 0.013	< 0.013	0.046	0.048	0.046	0.064	0.43	< 0.013	0.081	0.025	0.066	0.117	0.093	0.018	< 0.018	< 0.013	< 0.016
Fluorene	-	-	-	<LD	<LD	< 0.014	< 0.016	< 0.013	< 0.013	< 0.017	< 0.015	< 0.013	< 0.015	< 0.015	< 0.013	< 0.012	< 0.014	< 0.017	< 0.013	< 0.014	< 0.014	< 0.018	< 0.013	< 0.016
Indeno(1,2,3-c,d)pyrene	-	-	-	<LD	0.163	0.163	0.053	< 0.013	< 0.013	< 0.017	0.028	0.022	0.015	0.2	< 0.013	0.066	< 0.014	0.043	0.058	0.07	< 0.014	< 0.018	< 0.013	< 0.016
Naphthalene	63	(210)^	NL [4]	<LD	<LD	< 0.07	< 0.08	< 0.07	< 0.07	< 0.09	< 0.08	< 0.07	< 0.08	< 0.08	< 0.07	< 0.06	< 0.07	< 0.09	< 0.07	< 0.07	< 0.07	< 0.09	< 0.07	< 0.08
Phenanthrene	-	-	-	<LD	0.072	0.072	0.035	< 0.013	< 0.013	< 0.017	0.014	< 0.013	< 0.015	0.113	< 0.013	0.015	< 0.014	< 0.017	0.036	< 0.014	< 0.014	< 0.018	< 0.013	< 0.016
Pyrene	(1,600)^	NL	NL [4]	<LD	0.29	0.29	0.114	< 0.013	< 0.013	0.02	0.054	0.055	0.038	0.47	< 0.013	0.068	0.026	0.076	0.11	0.094	0.02	< 0.018	< 0.013	< 0.016
Total of Reported PAHs	-	-	-	<LD	2.1	2.1	0.8	< 0.4	< 0.4	< 0.4	0.4	0.3	< 0.4	3.2	< 0.4	0.6	< 0.4	0.5	0.8	0.7	< 0.4	< 0.5	< 0.3	< 0.4
Total Petroleum Hydrocarbons (TPH)*																								
C7 - C9	`(500)	`(2,700)	<LD	<LD	<LD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C10 - C14	`(510)	`(560)	<LD	<LD	<LD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C15 - C36	NL	NL	<LD	<LD	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total hydrocarbons (C7 - C36)	-	-	<LD	<LD	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

All values in mg/kg

<LD = Less than laboratory detection; NL = Non Limiting

Shaded values indicate concentrations above published background concentration

1 - MfE, April 2012. Users Guide: National Environmental Standard for assessing and managing contaminants in soil to protect Human Health (unless otherwise stated).

2 - National Environment Protection (Assessment of Site Contamination) Measure 1999 (Updated April 2013). Guideline on the Investigation Levels for Soil and Groundwater - Commercial/Industrial

3 - Auckland Unitary Plan (AUP) Permitted Activity Soil Criteria

4 - MfE 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Sandy silt, soils <1m

5 - Auckland Council, 2001. Background Concentrations of Inorganic Elements in Soils from the Auckland Region: Technical Publication No. 153.

6 - BRANZ Ltd, 2017. New Zealand Guidelines for Assessing and Managing Asbestos in Soil

* TPH criteria are based on Ministry for the Environment (MfE) 2011 Tier 1 Soil accepance criteria (ALL Pathways), using crieteria for sandy silt soils.

^ Inidcate the limiting pathway for these criterion are for the protection of homegrown produce.

() brackets denote screening values exceed threshold likely correspond to the formation of residual separate phase hydrocarbons.

` Inidcate the limiting pathway for these criterion are for the protection of maintenance / excavation workers and for the PAH surrogate.

Table 6.3: Summary of Laboratory Analytical Results

Property Reference	NES Soil SCS - High-density Residential [1]	NES Soil SCS - Commercial [1]	AUP Permitted Activity Criteria [3]	Published non volcanic background concentrations [5]	Maximum	Former Sport Field / Fill Area																Selwyn College Maintendnace Area	Fly Tipping Area
Sample ID						HA19-0.1	HA20-0.1	HA20-0.5	HA21-0.1	HA22-0.1	HA22-0.5	HA23-0.1	HA24-0.1	HA06_0.1	HA06_0.4	HA07_0.1	HA08_0.1	HA09_0.1	HA09_0.4	HA10_0.1	HA11_0.1	HA12_0.1	HA12_0.4	EHA01_0.1	Grab01
Depth (m)						0.1	0.1	0.5	0.1	0.1	0.5	0.1	0.1	0.1	0.4	0.1	0.1	0.1	0.4	0.1	0.1	0.1	0.4	0.1	0.0 - .0.1
Sampling Date						11-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18	11-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18	8-Oct-18	11-Oct-18
Lab report reference						2064272.17	2064272.19	2064272.2	2064272.21	2064272.23	2064272.24	2064272.25	2064272.27	2063571.2	2063571.2	2063571.2	2063571.2	2063571.3	2063571.3	2063571.3	2063571.3	2063571.3	2063571.3	2063571.1	2064272.1
Strata						Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill
Asbestos																									
Asbestos type	-	-	-	-	-	-	-	-	-	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	-	Amosite (Brown Asbestos) and Chrysotile (White Asbestos) detected.
Combined FA + AF (w/w%)	**0.001** [6]	**0.001** [6]	-	-	**<LD**									< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Asbestos as ACM (w/w %)	**0.04** [6]	**0.05** [6]	-	-	**<LD**									< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.001
Metals																									
Arsenic	45	70	100	12	15	3	3	3	3	5	2	3	3	3	4	3	3	5	11	4	3	3	3	4	23
Cadmium	230	1,300	7.5	0.65	0.56	0.13	0.14	< 0.10	< 0.10	0.13	< 0.10	0.35	0.12	0.3	< 0.10	0.22	0.26	0.18	0.12	0.29	0.23	0.28	< 0.10	0.22	0.19
Chromium	1,500	6,300	400	55	26	23	20	22	18	22	18	30	12	28	15	21	28	21	6	32	19	28	12	30	20
Copper	>10,000	240,000 [2]	325	45	41	24	19	11	14	17	7	23	12	21	20	19	20	17	6	23	16	22	11	24	34
Lead	500	3,300	250	65	165	132	68	8.2	24	15	6.9	18.5	19.8	16.7	10.2	13.2	16.1	14.4	3.6	14.8	16	14.9	6.2	19.5	53
Nickel	-	6,000 [2]	105	35	37	31	21	11	13	14	9	49	10	34	7	28	31	27	8	44	17	36	2	29	11
Zinc	-	400,000 [2]	400	180	174	53	49	16	30	30	15	89	39	69	20	62	64	52	34	79	45	68	7	77	168
Organochlorine Pesticides (OCP)																									
Aldrin	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
alpha-BHC	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
beta-BHC	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
delta-BHC	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
gamma-BHC (Lindane)	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
cis-Chlordane	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
trans-Chlordane	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Total Chlordane [(cis+trans)*100/42]	-	-	-	-	<LD	< 0.04	< 0.04	-	-	-	-	-	-	< 0.04	-	< 0.04	< 0.04	< 0.04	-	< 0.04	< 0.04	< 0.04	-	-	< 0.04
2,4'-DDD	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
4,4'-DDD	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
2,4'-DDE	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
4,4'-DDE	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
2,4'-DDT	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
4,4'-DDT	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Total DDT Isomers	240	1,000	12	-	<LD	< 0.06	< 0.06	-	-	-	-	-	-	< 0.11	-	< 0.10	< 0.10	< 0.09	-	< 0.10	< 0.11	< 0.10	-	-	< 0.06
Dieldrin	45	160	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Endosulfan I	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Endosulfan II	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Endosulfan sulphate	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Endrin	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Endrin aldehyde	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Endrin ketone	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Heptachlor	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Heptachlor epoxide	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Hexachlorobenzene	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Methoxychlor	-	-	-	-	<LD	< 0.010	< 0.010	-	-	-	-	-	-	< 0.017	-	< 0.016	< 0.017	< 0.014	-	< 0.016	< 0.017	< 0.016	-	-	< 0.010
Polycyclic Aromatic Hydrocarbons (PAH)																									
1-Methylnaphthalene	-	-	-	<LD	<LD	< 0.016	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	< 0.012
2-Methylnaphthalene	-	-	-	<LD	<LD	< 0.016	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	< 0.012
Perylene	-	-	-	<LD	0.059	< 0.016	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	< 0.012
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	-	-	-	<LD	0.32	0.07	< 0.05	< 0.04	< 0.04	< 0.04	< 0.03	< 0.04	< 0.07	< 0.05	< 0.04	< 0.04	< 0.04	< 0.04	< 0.03	< 0.04	< 0.05	< 0.04	< 0.04	< 0.04	0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	-	-	-	<LD	0.33	0.07	< 0.05	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.07	< 0.05	< 0.04	< 0.04	< 0.05	< 0.04	< 0.03	< 0.04	< 0.05	< 0.04	< 0.04	< 0.04	0.04
Acenaphthylene	-	-	-	<LD	0.017	< 0.016	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	< 0.012
Acenaphthene	-	-	-	<LD	<LD	< 0.016	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	< 0.012
Anthracene	-	-	-	<LD	0.023	< 0.016	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	< 0.012
Benzo[a]anthracene	-	-	-	<LD	0.162	0.024	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	0.025	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	0.013
Benzo[a]pyrene (BAP)	-	-	-	<LD	0.21	0.047	0.022	< 0.013	0.018	< 0.013	< 0.013	0.016	< 0.03	0.024	< 0.013	0.022	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	0.023
Benzo[b]fluoranthene + Benzo[j]fluoranthene	-	-	-	<LD	0.23	0.045	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	0.033	< 0.013	0.037	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	0.018
Benzo[e]pyrene	-	-	-	<LD	0.129	0.025	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	0.021	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	< 0.012
Benzo[g,h,i]perylene	-	-	-	<LD	0.146	0.034	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	0.027	< 0.013	0.021	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	0.018
Benzo[k]fluoranthene	-	-	-	<LD	0.094	< 0.016	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	< 0.012
Chrysene	-	-	-	<LD	0.165	0.028	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	0.019	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	0.012
Dibenzo[a,h]anthracene	-	-	-	<LD	0.048	< 0.016	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	< 0.012
Fluoranthene	-	-	-	<LD	0.29	0.044	0.022	< 0.013	0.023	< 0.013	< 0.013	0.019	< 0.03	0.029	< 0.013	0.038	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	0.023
Fluorene	-	-	-	<LD	<LD	< 0.016	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	< 0.012
Indeno(1,2,3-c,d)pyrene	-	-	-	<LD	0.163	0.036	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	0.027	< 0.013	0.022	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	0.021
Naphthalene	63	(210)^	NL [4]	<LD	<LD	< 0.08	< 0.09	< 0.07	< 0.08	< 0.07	< 0.07	< 0.08	< 0.13	< 0.09	< 0.07	< 0.08	< 0.09	< 0.07	< 0.06	< 0.08	< 0.09	< 0.08	< 0.07	< 0.08	< 0.06
Phenanthrene	-	-	-	<LD	0.072	< 0.016	< 0.018	< 0.013	< 0.016	< 0.013	< 0.013	< 0.015	< 0.03	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013	< 0.015	< 0.012
Pyrene	(1,600)^	NL	NL [4]	<LD	0.29	0.04	0.019	< 0.013	0.02	< 0.013	< 0.013	0.015	< 0.03	0.027	< 0.013	0.04	< 0.017	< 0.014	< 0.011	< 0.016	0.02	< 0.016	< 0.013	< 0.015	0.023
Total of Reported PAHs	-	-	-	<LD	2.1	< 0.4	< 0.5	< 0.4	< 0.4	< 0.4	< 0.3	< 0.4	< 0.7	< 0.5	< 0.4	< 0.4	< 0.4	< 0.4	< 0.3	< 0.4	< 0.5	< 0.4	< 0.4	< 0.4	< 0.3
Total Petroleum Hydrocarbons (TPH)*																									
C7 - C9	`(500)	`(2,700)	<LD	<LD	<LD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 9	-
C10 - C14	`(510)	`(560)	<LD	<LD	<LD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 20	-
C15 - C36	NL	NL	<LD	<LD	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77	-
Total hydrocarbons (C7 - C36)	-	-	<LD	<LD	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77	-

Notes:

All values in mg/kg

<LD = Less than laboratory detection; NL = Non Limiting

Shaded values indicate concentrations above published background concentration

1 - MfE, April 2012. Users Guide: National Environmental Standard for assessing and managing contaminants in soil to protect Human Health (unless o

2 - National Environment Protection (Assessment of Site Contamination) Measure 1999 (Updated April 2013). Guideline on the Investigation Levels for

3 - Auckland Unitary Plan (AUP) Permitted Activity Soil Criteria

4 - MfE 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Sandy silt, soils <1m

5 - Auckland Council, 2001. Background Concentrations of Inorganic Elements in Soils from the Auckland Region: Technical Publication No. 153.

6 - BRANZ Ltd, 2017. New Zealand Guidelines for Assessing and Managing Asbestos in Soil

* TPH criteria are based on Ministry for the Environment (MfE) 2011 Tier 1 Soil accepance criteria (ALL Pathways), using crieteria for sandy silt soils.

^ Inidcate the limiting pathway for these criterion are for the protection of homegrown produce.

() brackets denote screening values exceed threshold likely correspond to the formation of residual separate phase hydrocarbons.

` Inidcate the limiting pathway for these criterion are for the protection of maintenance / excavation workers and for the PAH surrogate.

6.2.3 Discussion of results

The T+T (2018) soil sampling results indicate the following:

- Surface soils are likely to contain low levels of metals and PAHs. The levels detected are below NES SCS criteria but in some cases above background concentrations.
- Subsurface soils contain lower concentrations of metals (below published background), and in most samples, non-detectable levels of PAHs.
- Pesticides and TPH were not detected.
- A low level of asbestos (equal to and therefore complying with the guideline value for high-density residential land use) was detected in one sample of fill collected from beneath the sports field area. The fill in this sample comprised a gravelly sand material which was not encountered elsewhere. It is considered that the extent of this material, and therefore asbestos contaminated fill is limited (refer to Figure 6.1).
- A low level of asbestos (below the guideline value for high-density residential land use) was detected in surface soil in an area of suspected fly tipping in the north of the Site. It is considered that the area of asbestos impact is localised and can be visually segregated on the basis of localised ground disturbance (refer Figure 6.1).
- A low level of asbestos was detected in one sample collected from reworked natural material at a concentration equal to the guideline value for high-density residential land use. The material encountered at this location is visually similar to that encountered across the Site and no features were observed that could account for the presence of asbestos in this sample. On this basis, and as no other subsurface sample collected from weathered natural material contained asbestos, this result is considered anomalous and is considered to be a localised hotspot.

7 Ground Contamination Assessment of Effects

7.1 Development context

The construction of the Proposed Village will involve earthworks across the majority of the Site for foundations, basements, infrastructure and pavement areas. Earthworks will generate excess material which will require off-Site disposal – with the calculations documented in the Civil Design Report by Beca.

It is possible that some or all of this material will be retained on Site as part of the earthworks design for the Proposed Village. Based on the contaminant concentrations detected, there is no evidence to indicate that earthworks within this material and the retention of this material will have adverse environmental effects on groundwater resources or the intermittent watercourse in the western part of the site.

Unless completely removed prior to construction, the presence of low levels of asbestos in two localised areas presents a low risk to construction workers and future Site users that can be managed through the implementation of limited controls. These are discussed in brief in Section 7.2, and in more detail in the Framework Site Management Plan which is included in Appendix A.

Specific discussion of environmental effects in the context of the contamination-related planning matters to be considered is provided below.

7.2 NES Soil

The NES Soil manages the human health effects associated with various activities on sites where a HAIL activity has, or has more likely than not, occurred.

Table 5.1 summarises the HAIL activities which are suspected to have occurred on the Site. As there was no direct evidence of HAIL activities taking place, whether a suspected HAIL activity actually had taken place was dependent on the presence of certain contaminants (for HAIL category A10) or the presence of contaminants at a level that would present a risk to human health or the environment (for HAIL Categories H and I).

The soil sampling data do not suggest that persistent pesticides have been used on the Site. On this basis, HAIL category A10 does not apply to the Site. The sampling data do not indicate that contamination from the Selwyn College maintenance shed has impacted the Site. Therefore HAIL category H does not apply to the Site.

Asbestos has been detected below the ‘all site uses’ soil guideline value of 0.001% w/w in three locations at the Site. Although this concentration is In addition, asbestos related controls (albeit limited) are required to protect workers involved in earthworks in this material in order to comply with the Health and Safety at Work (Asbestos) Regulation’s 2016. On that basis, asbestos is present at a level which could present a risk to human health. HAIL category I therefore applies to the Site, and in accordance Regulation 5(7) of the NES Soil, the provisions of the NES Soil will apply to soil disturbance associated with development earthworks at the Site.

In accordance with Regulation 5(6) of the NES Soil, as the detected contaminant concentrations are below or equal to applicable soil guideline values, the NES Soil does not apply to the change of land use at the Site.

As earthworks volumes will exceed permitted activity thresholds, consent under the NES Soil will be required. Consent as a controlled activity will be required, on the basis that this report satisfies the standards set out in Regulation 9(1), and addressed the matters of control set out in Regulation 9(2) of the NES Soil.

In the context of the Proposed Village, the people that could be exposed to contaminated soils are:

- Site workers during construction, particularly those involved in earthworks;
- Future Site users (i.e. residents); and
- Future maintenance workers, if exposed to contaminated soil.

For most of the Site (outside of the three localised areas of asbestos in soil), contaminant concentrations are below the applicable criteria. Accordingly, the soils are not expected to present a risk to human health.

Soils in three localised areas contain low levels of asbestos, which is considered to present a low risk to workers involved in the disturbance of these materials (during construction and in the future). Although the levels of asbestos detected are below residential land use standards, it is best practice to limit exposure to asbestos as far as practicable.

For construction workers, the potential for exposure to asbestos fibres derived from these materials can be mitigated through the application of controls including:

- Dust suppression;
- Stockpile management;
- Signage and segregation of works involving asbestos contaminated soils;
- Erosion and sedimentation controls; and
- Personnel and equipment decontamination.

A Site Management Plan ("SMP") will be prepared to document the required controls. A framework SMP, which provides a summary of the anticipated controls has been prepared to support resource consent applications and is included in Appendix E.

The localised areas of asbestos impact can be removed through excavation and offsite disposal. In the event the asbestos contaminated soils are reused on Site (i.e. not completely removed during construction), the risks to residents can be managed by placing this material beneath sealed surfaces (buildings, pavements) or landscaped areas. Risks to future maintenance workers that may be required to disturb retained borrow pit material can be mitigated using similar controls to those implemented during construction. These controls will be presented in a Long Term Management Plan ("LTMP") which will be prepared once earthworks are complete.

7.3 Auckland Unitary Plan

The AUP manages broader (non-human health) effects associated within contaminated soils. Most relevant to the construction of the Proposed Village, the AUP manages the discharge of contaminants to groundwater or surface water. The AUP defers to the NES Soil with respect to the management of human health effects.

As all detected contaminant concentrations are below the AUP permitted activity discharge criteria, there is no evidence to indicate that on Site earthworks will result in adverse environmental effects.

8 Recommendations

Based on the investigations and assessment described above, we recommend the following:

- The Site is suitable for the construction and operation of the Proposed Village, subject to the implementation of limited controls to manage risks to human health associated with low levels of asbestos in soil in three defined areas of the Site. Outside of those areas, no contamination-specific controls are required.
- Unless completely removed prior to or during construction, to protect future residents, these materials should be placed beneath sealed, or landscaped areas with appropriate thicknesses of soft cover. These controls will not apply if all asbestos contaminated fill is removed from the Site prior to construction.
- During the disturbance of these materials (to remove off Site or encapsulate on Site) standard earthworks controls supplemented with personnel and equipment decontamination, signage and segregation, personal protective equipment can be implemented to manage the low potential for exposure to asbestos.
- The controls should be documented in a SMP. A framework SMP is included in Appendix A of this report. The SMP will also include advice relating to the disposal of excess materials.
- If asbestos contaminated fill is retained on Site; to protect future workers involved in disturbance of contaminated soil, limited controls should be implemented as applied during disturbance. These controls will not apply if all asbestos contaminated fill is removed from Site prior to construction.
- If asbestos contaminated material is retained on Site, potential risks associated with the future disturbance of this material can be managed through the implementation of similar controls to those described above for earthworks. These controls can be documented in a LTMP.

9 Conclusions

Based on the investigations and assessment described above:

- Low levels of contaminants have been detected in the soils at the Site. Concentrations for all contaminants (except asbestos) are at or below standards for high density residential land use. On this basis there is no evidence to suggest that there would be adverse health effects on future residents.
- Contaminant concentrations were detected below AUP discharge criteria, and on this basis there is no evidence to indicate that discharges of contaminants to ground resulting from the disturbance of soils during earthworks would have an adverse effect on the environment.
- Asbestos has been detected at or below the residential land use standard within three localised areas. Although there is no evidence to indicate that the levels detected would present an unacceptable risk to human health, best practice requires that exposure to asbestos is minimised to the extent practicable.
- Based on the low levels of asbestos detected, we recommend limited controls to mitigate the risk of human exposure to asbestos fibres.
- Providing the recommendations in Section 8 are implemented, from a contamination perspective the Site is considered suitable for residential development.

10 Applicability

This report has been prepared for the exclusive use of our client Ryman Healthcare Limited, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Recommendations and opinions contained in this report are based on our visual inspection and sampling of material within the proposed works area. The nature and continuity of the subsoil away from the test and sample locations is inferred but it must be appreciated that actual conditions may vary from the assumed model.

We understand and agree that our client will submit this report in support of an application for resource consent and that Auckland City Council as the consenting authority will use this report for the purpose of assessing that application.**]**

We understand and agree that this report will be used by Auckland City Council in undertaking its regulatory functions in connection with the Ryman Village development

Tonkin & Taylor Ltd

Report prepared by:

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Paul Walker

Technical Director

Reviewed by:

.....

Cara Di Vito

Environmental Scientist

Authorised for Tonkin & Taylor Ltd by:

.....

Pierre Malan

Project Director

PEW
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Appendix A: Site Walkover Photographs

Photograph 1: View of boundary between 7 John Rymer Pace and 223 Kohimarama Road (looking north) consisting of native bush.

Photograph 2: Site vegetation coverage consisting of predominantly overgrown grassy areas with patches of shrubbery and native and exotic trees.

Photograph 3: Example of site vegetation consisting of native and exotic plants/trees.

Photograph 4: Site landform looking north which slopes to the south east towards the base of the valley and residential houses.

Photograph 5: Site landform looking north west which slopes to the south east. Selwyn College is present at the top of the hill.

Photograph 6: North west portion of the site slopes towards levelled playing field in the south east. Levelling for the playing field has infilled former natural drainage channels / gully.

Photograph 7: Dense vegetation covering south west portion of the site.

Photograph 8: Mowed area parallel to Kohimarama Road, looking east. Caretaker's property in the distance with maintenance equipment parked in the driveway.

Photograph 9: Area of ground disturbance and apparent fly tipping next to Caretaker's residence.

Photograph 10: Area of ground disturbance near the Caretaker's residence. Evidence of potential fly tipping.

Photograph 11: Selwyn College maintenance and laydown area.

Appendix B: Site History Review

Historical information relating to the site has been collected from a variety of sources. The information presented documents on-site activities, except for the aerial photograph review where comments are also provided on readily observable surrounding land use. The information that has been reviewed is summarised in this appendix.

Certificates of title

T+T conducted a review of current and historic certificates of titles. This information, combined with that obtained from the other historic information sources described in this section, indicate the property located at 7 John Rymer Place has been owned by Rainbow Holdings Limited since 1995. Prior to 1995 there were a number of consecutive private owners. The preceding ownership, dating back to 1925, was by St John College.

Certificates of title relating to 223 Kohimarama Road indicate the property is currently owned by the local Iwi trust 'Whai Rawa Property Holdings' which is leasing the land to Rainbow Holdings Limited, a real estate entity based in China. Prior to Rainbow Holdings Limited, the property was leased to Education Holdings Limited between 2006 and 2015. Prior to Iwi ownership (from 2006 to current), the site was Crown land for the purpose of the secondary school.

Copies of the certificates of title are provided herein (Appendix B).

A chronological summary of the site ownership is presented in bullet point below.

7 John Rymer Place:

- The current title was issued in 2015 to Rainbow Holdings Limited, prior to which, Education Holdings Limited owned the site since 2008.
- A series of transfers occurred to private owners, these included:
- Surendra Prasad Sharma and Monica Devi Sharma, 1995.
- Valerie Freda Thompson and Nelson Walker Thompson, 1987.
- The prior title was issued in 1970 to St Johns College Trust Board and included land to the north west of the site including residential sections along Kohimarama Road (excluding the properties which cover Selwyn College and 223 Kohimarama Road) and land north west of Selwyn College. The leaseholds on the CT are generally illegible and are likely to apply to the residential lots along Kohimarama Road and to the north west of Selwyn College.
- The earliest available title is dated 1925 and was issued to St Johns College Trust Board.

223 Kohimarama Road:

It is noted the property located at 223 Kohimarama Road (Lot 1, DP 332284) is currently subject to a leasehold title agreement. The current and historic leasehold owners are summarised below along with the sequential list of property title owners.

- The current leasehold title was issued to Education Holdings Limited in 2006 and was transferred to Rainbow Holdings Limited in 2015.
- The original property title indicates the land was owned by the Crown until 2006 where the title indicates the property was used for a secondary school. This is consistent with the leasehold title which was held by Education Holdings Limited at the time.
- In 2006, the property title was transferred to the local Iwi Trust, Ngati Whatua O Orakei Maori Trust Board, and then to Whai Rawa Properties Holdings LP in 2013 (also an Iwi Trust).

A copy of the current certificate of title is provided in herein (Appendix B).

Historical aerial photographs

Historic aerial photographs were obtained from the T+T library and Auckland Council online interactive map and Retrolens historical imagery online database (viewed online at http://retrolens.nz/ on 1 October 2018) and reviewed. Relevant features of the site and surrounds are summarised from each aerial photograph in Table B1.

Table B1: Summary of aerial photograph review

Aerial photograph (date and source)	Key points identified	Surrounding land features
1940 Auckland Council GIS viewer	• Both properties are vacant and appear pastoral in use.	The surrounding land use is largely pastoral in nature. Kohimarama Road is established.
1951 Retrolens 1918/12	• Few changes to both properties and the surrounding area are evident.	
1958 Retrolens No. 250/114.36	• Few significant changes to both properties.	Considerable residential development has occurred in the surrounding land and suburb of Kohimarama to the north. To the north east of the site new roads have been established (Allum Street and Hopkins Crescent). To the west of 223 Kohimarama Road is Selwyn School.
1959 Auckland Council GIS viewer	• Few significant changes to both properties.	Few significant changes to the surrounding area are evident.
1961 Retrolens 3235/23	• Few significant changes to both properties with the exception of surface disturbances observed on the west of 223 Kohimarama.	Ground disturbance indicating a large development is observed to the south east of both properties.
1968 Retrolens 5045/19 N42/5C	• What appears to be a rectangular sports playing field has been constructed (likely requiring vegetation clearing, and filling (for levelling activities) on the site located at 223 Kohimarama Road.	The residential development to the south east of the properties appears completed, John Rymer Place has been established.
1972 Retrolens 4601/17	• Few significant changes to both properties with the exception of the land at 223 Kohimarama Road, much of the land appears to have been cleared, perhaps used as an extension to the field at Selwyn School. A hedge has also been planted along the edge of property along Kohimarama Road.	Few significant changes to the surrounding area are evident.
1987 Retrolens	• Few significant changes to both properties with the exception of	Few significant changes to the surrounding area are evident, with

Aerial photograph (date and source)	Key points identified	Surrounding land features
SN 8772 L/6	the land at 223 Kohimarama Road. The grass no longer appears in a kept state. Shrubbery appears overgrown in comparison to the 1972 aerial.	the exception of Selwyn School to the west of 223 Kohimarama Road which has increased in size.
1996 Auckland Council GIS viewer	• Few significant changes to both properties.	Few significant changes to the surrounding area are evident. Ground disturbance works for residential development on John Rymer Place is evident.
2001 Auckland Council GIS viewer	• Few significant changes to both properties. The sports field on 223 Kohimarama Road appears to have been well maintained and vegetation from previous imagery has been cleared.	Few significant changes to the surrounding area are evident. Residential development on John Rymer Place has been completed.
2003 Auckland Council GIS viewer	• Few significant changes to both properties.	Few significant changes to the surrounding area are evident.
2006 Auckland Council GIS viewer	• Few significant changes to both properties.	Few significant changes to the surrounding area are evident.
2008 Auckland Council GIS viewer	• Few significant changes to both properties.	Few significant changes to the surrounding area are evident.
2010/2011 Auckland Council GIS viewer	• Few significant changes to both properties.	Few significant changes to the surrounding area are evident.
2015/2016 Auckland Council GIS viewer	• Few significant changes to both properties. Maintenance of the sports field on 223 Kohimarama Road appears to have ceased.	Few significant changes to the surrounding area are evident.
2017 Auckland Council GIS viewer	• Few significant changes to both properties.	Few significant changes to the surrounding area are evident.

The aerial photography review confirms the site has been subject to HAIL activities relating to filling. The property at 223 Kohimarama Road was likely filled and levelled by the neighbouring Selwyn College where it appears to have been used as a sports field until recent times (circa (C) mid-2000) when leasehold of the property (223 Kohimarama Road) changed from Education Holdings Limited to Rainbow Holdings Limited. Since the change of leasehold, the site was observed in the historic aerial photographs to revegetate and evidence of use of the sports field diminish. However, the property at 7 John Rymer Place has remained vacant despite successive residential ownership and ownership by St John College.

Council property files

Auckland Council property files for the site were reviewed on 12 October 2018. Key documents are summarised below.

7 John Rymer Place:

- A building permit application was submitted in 2001 by Stephen and Grace Wong to erect a two-storey residential dwelling with basement and associated services (drainage and sewer).

No record of an approved building consent was found in the information obtained from Council.

- A building permit application was submitted in 2005 by Surendra Sharma to erect a two-storey residential dwelling and retaining wall. Council approval of the Consent was granted and subsequent revisions to the building design were sought and granted by Council in September 2006. However, the property owner discontinued the development in December 2006.
- Council issued a bylaw breach notice for the property due to overgrown vegetation on the property causing nuisance to neighbours and potential to attract rodents. Council requested that overgrown vegetation be cut back and property be maintained so that it remains in a conditions that does not cause a nuisance to neighbours.
- In November 1994, St John College Trust Board submitted an application for subdivision of the properties along John Rymer Place. Consent was granted by Council in January 1995.
- In 2016, Rainbow Holdings NZ Limited applied for a Resource Consent to develop the properties at 7 John Rymer Place and 223 Kohimarama Road into residential housing (apartments and units with parking) with ancillary reta/café. To inform this application and suitability of the site for residential development, Rainbow Holdings NZ Limited engaged AECOM New Zealand Limited to complete a contamination and geotechnical assessment for the site.

223 Kohimarama Road:

- A Consent for the extension of the public sewer was granted for the Ministry of Education (Education Holdings Limited) in 2003.
- A subdivision was granted by Council in 2004 for the properties located at Selwyn College and 223 Kohimarama Road, Kohimarama (Subdivision 35010375003).
- In 2007, CANENZ Association to Conserve and Nurture Education Zones Incorporated (CANENZ) wrote to Council registering themselves as an interested party, requesting notification of a change in plan for the site. In their letter CANENZ state: "*We have a particular interest in retaining the existing Special Purpose 2 (Education) zone for 223 Kohimarama Road…Lot 1 DP 332284*".
- In 2016, Rainbow Holdings NZ Limited applied for a Resource Consent to develop the properties at 7 John Rymer Place and 223 Kohimarama Road (as described above).

Council contamination enquiry

A contamination enquiry was placed with Auckland Council and a response received on the 3 October 2018. The information provided is included herein (**Appendix B**).

The Council's regulator records indicate the following:

- Potential for horticultural uses within the region and on the site however, individual horticultural sites were not identified by Council.
- Potential for current and/or historic land use activities on or adjacent to the site that fall within published MfE (2011) HAIL activities (likely relating to filling activities associated with the development of the sports field).
- Up to 15 registered bores exist relating to the site.
- Six of which relate to geotechnical investigation and groundwater investigation bores (120 mm diameter standpipes to approximately 20m) installed by AECOM Consulting Services (NZ) Limited (Consent number 53267).
- Up to nine which relate to geotechnical investigation and monitoring (100 mm diameter steel casing to approximate depths between 10 m and 30 m) installed by Babbage Consultants Limited.

- Two environmental incidents registered with Council have occurred on properties within 200 m of the site. A summary of the incident and the location of the occurrence from the site is listed in Table B2:

Table B2: Reported Environmental Incidents within 200 m of the site

Incident Address	Date	Incident description	Location from site
245 Kohimarama Road, Kohimarama	2014	Release of 10-200 Litres (L) of Hydrocarbons to land / water	<10 m north of the site boundary.
136 – 138 Allum Street, Kohimarama	2011	<10 L of disinfectant poured down drain	<100 m north of the site boundary.

No contamination-related consents have been issued for activities within 200 m of the site.

Appendix C: Laboratory Transcripts

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:	Tonkin & Taylor	**Lab No:**	2063571	SPv1
Contact:	Cara Di Vitto	**Date Received:**	11-Oct-2018	
	C/- Tonkin & Taylor	**Date Reported:**	17-Oct-2018	
	PO Box 5271	**Quote No:**		
	Auckland 1141	**Order No:**	30314.1000	
		Client Reference:	30314.1000	
		Submitted By:	Cara Di Vitto	

Sample Type: Soil

Sample Name:		EHA01_0.1 08-Oct-2018 10:30 am	BH01_0.1 08-Oct-2018 9:30 am	BH01_1.0 08-Oct-2018 12:00 pm	HA01_0.1 [09:13-09:20] 10-Oct-2018	HA02_0.1 10-Oct-2018 9:45 am
Lab Number:		2063571.1	2063571.3	2063571.5	2063571.9	2063571.11
Individual Tests						
Dry Matter	g/100g as rcvd	68	77	77	70	65
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	2	< 2	15	4
Total Recoverable Cadmium	mg/kg dry wt	0.22	< 0.10	< 0.10	< 0.10	0.11
Total Recoverable Chromium	mg/kg dry wt	30	21	6	26	22
Total Recoverable Copper	mg/kg dry wt	24	7	2	29	16
Total Recoverable Lead	mg/kg dry wt	19.5	6.6	4.1	165	26
Total Recoverable Nickel	mg/kg dry wt	29	8	< 2	37	16
Total Recoverable Zinc	mg/kg dry wt	77	16	< 4	80	62
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	-	-	-	517.4	-
Dry Weight	g	-	-	-	375.6	-
Ashed Weight	g	-	-	-	340.3	-
Moisture	%	-	-	-	27	-
Dry Sample Fraction >10mm	g ashed wt	-	-	-	4.9	-
Sample Fraction <10mm to >2mm	g ashed wt	-	-	-	21.7	-
Sample Fraction <2mm	g ashed wt	-	-	-	312.9	-
<2mm Subsample Weight	g ashed wt	-	-	-	52.0	-
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	-

Sample Type: Soil						
Sample Name:		EHA01_0.1 08-Oct-2018 10:30 am	BH01_0.1 08-Oct-2018 9:30 am	BH01_1.0 08-Oct-2018 12:00 pm	HA01_0.1 [09:13-09:20] 10-Oct-2018	HA02_0.1 10-Oct-2018 9:45 am
Lab Number:		2063571.1	2063571.3	2063571.5	2063571.9	2063571.11
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
alpha-BHC	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
beta-BHC	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
delta-BHC	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
cis-Chlordane	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
trans-Chlordane	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	< 0.04	-	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
4,4'-DDD	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
2,4'-DDE	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
4,4'-DDE	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
2,4'-DDT	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
4,4'-DDT	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Total DDT Isomers	mg/kg dry wt	-	< 0.08	-	< 0.09	< 0.09
Dieldrin	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Endosulfan I	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Endosulfan II	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Endosulfan sulphate	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Endrin	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Endrin aldehyde	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Endrin ketone	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Heptachlor	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Heptachlor epoxide	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Hexachlorobenzene	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Methoxychlor	mg/kg dry wt	-	< 0.013	-	< 0.014	< 0.015
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.016
2-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.016
Perylene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.059	0.038
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	< 0.04	< 0.04	0.32	0.09
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.04	< 0.04	< 0.04	0.33	0.09
Acenaphthylene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.017	< 0.016
Acenaphthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.016
Anthracene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.023	< 0.016
Benzo[a]anthracene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.162	0.050
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.21	0.054
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.23	0.074
Benzo[e]pyrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.129	0.045
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.146	0.057
Benzo[k]fluoranthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.094	0.027
Chrysene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.165	0.060
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.048	0.016
Fluoranthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.29	0.127
Fluorene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.016
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.163	0.053
Naphthalene	mg/kg dry wt	< 0.08	< 0.07	< 0.07	< 0.07	< 0.08
Phenanthrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.072	0.035
Pyrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.29	0.114
Total of Reported PAHs in Soil*	mg/kg	< 0.4	< 0.4	< 0.4	2.1	0.8

Sample Type: Soil						
Sample Name:		EHA01_0.1 08-Oct-2018 10:30 am	BH01_0.1 08-Oct-2018 9:30 am	BH01_1.0 08-Oct-2018 12:00 pm	HA01_0.1 [09:13-09:20] 10-Oct-2018	HA02_0.1 10-Oct-2018 9:45 am
Lab Number:		2063571.1	2063571.3	2063571.5	2063571.9	2063571.11
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	77	-	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	77	-	-	-	-

Sample Name:		HA03_0.1 10-Oct-2018 10:30 am	HA04_0.1 10-Oct-2018 10:48 am	HA05_0.1 [11:15-11:20] 10-Oct-2018	HA06_0.1 10-Oct-2018 11:30 am	HA07_0.1 10-Oct-2018 1:45 pm
Lab Number:		2063571.13	2063571.15	2063571.17	2063571.19	2063571.21
Individual Tests						
Dry Matter	g/100g as rcvd	61	66	66	58	61
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	9	4	3	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.56	0.15	0.30	0.22
Total Recoverable Chromium	mg/kg dry wt	14	17	24	28	21
Total Recoverable Copper	mg/kg dry wt	15	41	18	21	19
Total Recoverable Lead	mg/kg dry wt	13.3	103	15.6	16.7	13.2
Total Recoverable Nickel	mg/kg dry wt	8	9	22	34	28
Total Recoverable Zinc	mg/kg dry wt	43	174	49	69	62
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	-	-	-	605.1	399.5
Dry Weight	g	-	-	-	364.9	250.8
Ashed Weight	g	-	-	-	308.4	232.6
Moisture	%	-	-	-	40	37
Dry Sample Fraction >10mm	g ashed wt	-	-	-	< 0.1	< 0.1
Sample Fraction <10mm to >2mm	g ashed wt	-	-	-	1.3	8.9
Sample Fraction <2mm	g ashed wt	-	-	-	306.4	223.0
<2mm Subsample Weight	g ashed wt	-	-	-	54.2	56.7
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
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
alpha-BHC	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
beta-BHC	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
delta-BHC	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
gamma-BHC (Lindane)	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
cis-Chlordane	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
trans-Chlordane	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
4,4'-DDD	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
2,4'-DDE	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016

Sample Type: Soil						
Sample Name:		HA03_0.1 10-Oct-2018 10:30 am	HA04_0.1 10-Oct-2018 10:48 am	HA05_0.1 [11:15-11:20] 10-Oct-2018	HA06_0.1 10-Oct-2018 11:30 am	HA07_0.1 10-Oct-2018 1:45 pm
Lab Number:		2063571.13	2063571.15	2063571.17	2063571.19	2063571.21
Organochlorine Pesticides Screening in Soil						
4,4'-DDE	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
2,4'-DDT	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
4,4'-DDT	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Total DDT Isomers	mg/kg dry wt	< 0.10	< 0.09	< 0.09	< 0.11	< 0.10
Dieldrin	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Endosulfan I	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Endosulfan II	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Endosulfan sulphate	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Endrin	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Endrin aldehyde	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Endrin ketone	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Heptachlor	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Heptachlor epoxide	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Hexachlorobenzene	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Methoxychlor	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
2-Methylnaphthalene	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Perylene	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	0.04	< 0.04	< 0.05	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.05	0.04	< 0.04	< 0.05	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Acenaphthene	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Anthracene	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Benzo[a]anthracene	mg/kg dry wt	< 0.017	0.026	0.027	< 0.017	0.025
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.017	0.029	< 0.015	0.024	0.022
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.017	0.035	0.030	0.033	0.037
Benzo[e]pyrene	mg/kg dry wt	< 0.017	0.025	< 0.015	< 0.017	0.021
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.017	0.027	0.016	0.027	0.021
Benzo[k]fluoranthene	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Chrysene	mg/kg dry wt	< 0.017	0.026	0.028	< 0.017	0.019
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Fluoranthene	mg/kg dry wt	0.046	0.048	0.064	0.029	0.038
Fluorene	mg/kg dry wt	< 0.017	< 0.015	< 0.015	< 0.017	< 0.016
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.017	0.028	0.015	0.027	0.022
Naphthalene	mg/kg dry wt	< 0.09	< 0.08	< 0.08	< 0.09	< 0.08
Phenanthrene	mg/kg dry wt	< 0.017	0.014	< 0.015	< 0.017	< 0.016
Pyrene	mg/kg dry wt	0.020	0.054	0.038	0.027	0.040
Total of Reported PAHs in Soil*	mg/kg	< 0.4	0.4	< 0.4	< 0.5	< 0.4

Sample Name:		HA08_0.1 10-Oct-2018 2:10 pm	HA09_0.1 10-Oct-2018 2:30 pm	HA10_0.1 10-Oct-2018 3:00 pm	HA11_0.1 10-Oct-2018 3:30 pm	HA12_0.1 10-Oct-2018 3:50 pm
Lab Number:		2063571.23	2063571.25	2063571.27	2063571.29	2063571.31
Individual Tests						
Dry Matter	g/100g as rcvd	60	70	61	57	63
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	5	4	3	3
Total Recoverable Cadmium	mg/kg dry wt	0.26	0.18	0.29	0.23	0.28
Total Recoverable Chromium	mg/kg dry wt	28	21	32	19	28
Total Recoverable Copper	mg/kg dry wt	20	17	23	16	22
Total Recoverable Lead	mg/kg dry wt	16.1	14.4	14.8	16.0	14.9
Total Recoverable Nickel	mg/kg dry wt	31	27	44	17	36

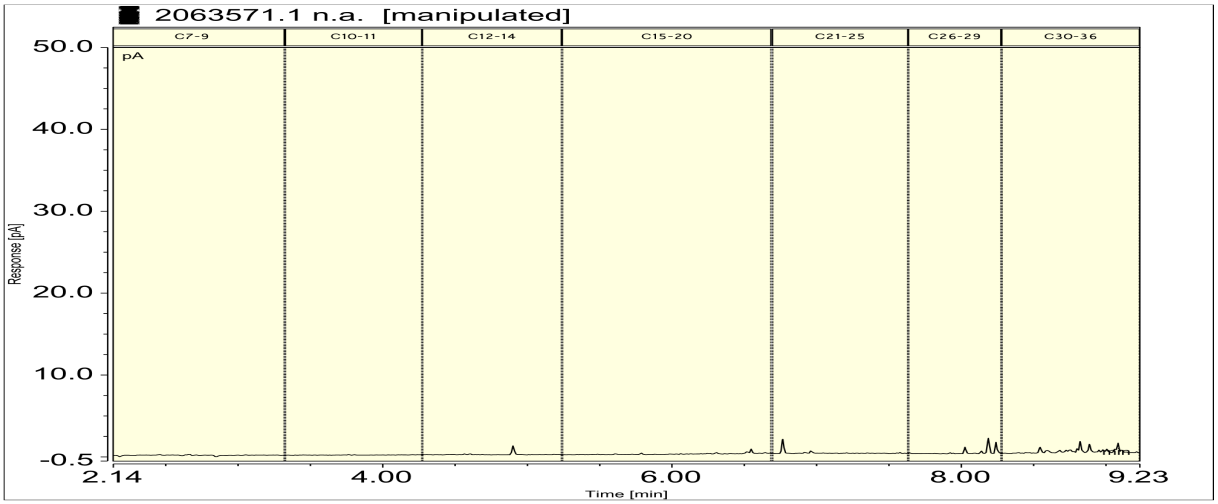
Sample Type: Soil						
Sample Name:		HA08_0.1 10-Oct-2018 2:10 pm	HA09_0.1 10-Oct-2018 2:30 pm	HA10_0.1 10-Oct-2018 3:00 pm	HA11_0.1 10-Oct-2018 3:30 pm	HA12_0.1 10-Oct-2018 3:50 pm
Lab Number:		2063571.23	2063571.25	2063571.27	2063571.29	2063571.31
Heavy Metals, Screen Level						
Total Recoverable Zinc	mg/kg dry wt	64	52	79	45	68
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	828.5	467.9	800.7	500.3	635.3
Dry Weight	g	543.8	315.5	479.7	302.6	405.9
Ashed Weight	g	514.8	296.9	444.4	281.1	381.1
Moisture	%	34	33	40	40	36
Dry Sample Fraction >10mm	g ashed wt	14.5	< 0.1	< 0.1	< 0.1	1.8
Sample Fraction <10mm to >2mm	g ashed wt	74.0	8.3	73.8	25.6	26.8
Sample Fraction <2mm	g ashed wt	424.9	287.8	369.3	254.4	351.7
<2mm Subsample Weight	g ashed wt	56.9	52.8	56.7	55.5	54.9
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Weight of Asbestos as Asbestos Fines (Friable)*	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
alpha-BHC	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
beta-BHC	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
delta-BHC	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
gamma-BHC (Lindane)	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
cis-Chlordane	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
trans-Chlordane	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
4,4'-DDD	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
2,4'-DDE	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
4,4'-DDE	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
2,4'-DDT	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
4,4'-DDT	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Total DDT Isomers	mg/kg dry wt	< 0.10	< 0.09	< 0.10	< 0.11	< 0.10
Dieldrin	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Endosulfan I	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Endosulfan II	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Endosulfan sulphate	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Endrin	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Endrin aldehyde	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Endrin ketone	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Heptachlor	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Heptachlor epoxide	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Hexachlorobenzene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Methoxychlor	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016

Sample Type: Soil						
Sample Name:		HA08_0.1 10-Oct-2018 2:10 pm	HA09_0.1 10-Oct-2018 2:30 pm	HA10_0.1 10-Oct-2018 3:00 pm	HA11_0.1 10-Oct-2018 3:30 pm	HA12_0.1 10-Oct-2018 3:50 pm
Lab Number:		2063571.23	2063571.25	2063571.27	2063571.29	2063571.31
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
2-Methylnaphthalene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Perylene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.05	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.05	< 0.04	< 0.04	< 0.05	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Acenaphthene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Anthracene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Benzo[a]anthracene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Benzo[e]pyrene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Benzo[k]fluoranthene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Chrysene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Fluoranthene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Fluorene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Naphthalene	mg/kg dry wt	< 0.09	< 0.07	< 0.08	< 0.09	< 0.08
Phenanthrene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	< 0.017	< 0.016
Pyrene	mg/kg dry wt	< 0.017	< 0.014	< 0.016	0.020	< 0.016
Total of Reported PAHs in Soil*	mg/kg	< 0.4	< 0.4	< 0.4	< 0.5	< 0.4

Sample Name:		BH02_0.1 10-Oct-2018 12:00 pm	BH02_1.0 10-Oct-2018 4:30 pm			
Lab Number:		2063571.33	2063571.35			
Individual Tests						
Dry Matter	g/100g as rcvd	70	74	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	< 2	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.16	< 0.10	-	-	-
Total Recoverable Chromium	mg/kg dry wt	35	6	-	-	-
Total Recoverable Copper	mg/kg dry wt	40	11	-	-	-
Total Recoverable Lead	mg/kg dry wt	47	6.3	-	-	-
Total Recoverable Nickel	mg/kg dry wt	61	3	-	-	-
Total Recoverable Zinc	mg/kg dry wt	70	7	-	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.015	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.015	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.015	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.015	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.015	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.015	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.015	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.015	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.015	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.015	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.015	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.015	-	-	-	-

Sample Type: Soil						
Sample Name:		BH02_0.1 10-Oct-2018 12:00 pm	BH02_1.0 10-Oct-2018 4:30 pm			
Lab Number:		2063571.33	2063571.35			
Organochlorine Pesticides Screening in Soil						
4,4'-DDT	mg/kg dry wt	< 0.015	-	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.09	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.015	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.015	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.015	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.015	-	-	-	-
Endrin	mg/kg dry wt	< 0.015	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.015	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.015	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.015	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.015	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.015	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.015	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	-	-	-
Perylene	mg/kg dry wt	0.080	< 0.013	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	0.48	< 0.04	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	0.48	< 0.04	-	-	-
Acenaphthylene	mg/kg dry wt	0.046	< 0.013	-	-	-
Acenaphthene	mg/kg dry wt	< 0.015	< 0.013	-	-	-
Anthracene	mg/kg dry wt	0.038	< 0.013	-	-	-
Benzo[a]anthracene	mg/kg dry wt	0.27	< 0.013	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.32	< 0.013	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.35	< 0.013	-	-	-
Benzo[e]pyrene	mg/kg dry wt	0.193	< 0.013	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.196	< 0.013	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	0.146	< 0.013	-	-	-
Chrysene	mg/kg dry wt	0.28	< 0.013	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	0.051	< 0.013	-	-	-
Fluoranthene	mg/kg dry wt	0.43	< 0.013	-	-	-
Fluorene	mg/kg dry wt	< 0.015	< 0.013	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.20	< 0.013	-	-	-
Naphthalene	mg/kg dry wt	< 0.08	< 0.07	-	-	-
Phenanthrene	mg/kg dry wt	0.113	< 0.013	-	-	-
Pyrene	mg/kg dry wt	0.47	< 0.013	-	-	-
Total of Reported PAHs in Soil*	mg/kg	3.2	< 0.4	-	-	-

2063571.1
EHA01_0.1 08-Oct-2018 10:30 am
Client Chromatogram for TPH by FID



Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively 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			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 3, 5, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35
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, 3, 5, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35
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, 3, 5, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35
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, 3, 5, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35
Total of Reported PAHs in Soil*	Sonication extraction, SPE cleanup, GC-MS SIM analysis.	0.3 mg/kg	1, 3, 5, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35
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]	-	1
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 5, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	3, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33
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]	-	3, 5, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35
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	9, 19, 21, 23, 25, 27, 29, 31
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	9, 19, 21, 23, 25, 27, 29, 31
Ashed Weight	Sample ashed at 400°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	9, 19, 21, 23, 25, 27, 29, 31
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 %	9, 19, 21, 23, 25, 27, 29, 31
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	9, 19, 21, 23, 25, 27, 29, 31
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	9, 19, 21, 23, 25, 27, 29, 31
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	9, 19, 21, 23, 25, 27, 29, 31
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.	-	9, 19, 21, 23, 25, 27, 29, 31
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	9, 19, 21, 23, 25, 27, 29, 31
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	9, 19, 21, 23, 25, 27, 29, 31
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	9, 19, 21, 23, 25, 27, 29, 31
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	9, 19, 21, 23, 25, 27, 29, 31
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	9, 19, 21, 23, 25, 27, 29, 31
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	9, 19, 21, 23, 25, 27, 29, 31
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	9, 19, 21, 23, 25, 27, 29, 31
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	9, 19, 21, 23, 25, 27, 29, 31

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

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	2063571	SPv2
Contact:	Cara Di Vitto	**Date Received:**	11-Oct-2018	
	C/- Tonkin & Taylor	**Date Reported:**	25-Oct-2018	**(Amended)**
	PO Box 5271	**Quote No:**		
	Auckland 1141	**Order No:**	30314.1000	
		Client Reference:	30314.1000	
		Submitted By:	Cara Di Vitto	

Sample Type: Soil

Sample Name:		EHA01_0.1 08-Oct-2018 10:30 am	BH01_0.1 08-Oct-2018 9:30 am	BH01_1.0 08-Oct-2018 12:00 pm	HA01_0.1 [09:13-09:20] 10-Oct-2018	HA01_0.5 10-Oct-2018 9:30 am
Lab Number:		2063571.1	2063571.3	2063571.5	2063571.9	2063571.10
Individual Tests						
Dry Matter	g/100g as rcvd	68	77	77	70	80
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	2	< 2	15	< 2
Total Recoverable Cadmium	mg/kg dry wt	0.22	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	30	21	6	26	6
Total Recoverable Copper	mg/kg dry wt	24	7	2	29	5
Total Recoverable Lead	mg/kg dry wt	19.5	6.6	4.1	165	15.6
Total Recoverable Nickel	mg/kg dry wt	29	8	< 2	37	5
Total Recoverable Zinc	mg/kg dry wt	77	16	< 4	80	9
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	-	-	-	517.4	537.1
Dry Weight	g	-	-	-	375.6	427.9
Ashed Weight	g	-	-	-	340.3	421.8
Moisture	%	-	-	-	27	20
Dry Sample Fraction >10mm	g ashed wt	-	-	-	4.9	< 0.1
Sample Fraction <10mm to >2mm	g ashed wt	-	-	-	21.7	2.2
Sample Fraction <2mm	g ashed wt	-	-	-	312.9	419.0
<2mm Subsample Weight	g ashed wt	-	-	-	52.0	51.0
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:		EHA01_0.1 08-Oct-2018 10:30 am	BH01_0.1 08-Oct-2018 9:30 am	BH01_1.0 08-Oct-2018 12:00 pm	HA01_0.1 [09:13-09:20] 10-Oct-2018	HA01_0.5 10-Oct-2018 9:30 am
Lab Number:		2063571.1	2063571.3	2063571.5	2063571.9	2063571.10
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	< 0.013	-	< 0.014	-
alpha-BHC	mg/kg dry wt	-	< 0.013	-	< 0.014	-
beta-BHC	mg/kg dry wt	-	< 0.013	-	< 0.014	-
delta-BHC	mg/kg dry wt	-	< 0.013	-	< 0.014	-
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.013	-	< 0.014	-
cis-Chlordane	mg/kg dry wt	-	< 0.013	-	< 0.014	-
trans-Chlordane	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	< 0.04	-	< 0.04	-
2,4'-DDD	mg/kg dry wt	-	< 0.013	-	< 0.014	-
4,4'-DDD	mg/kg dry wt	-	< 0.013	-	< 0.014	-
2,4'-DDE	mg/kg dry wt	-	< 0.013	-	< 0.014	-
4,4'-DDE	mg/kg dry wt	-	< 0.013	-	< 0.014	-
2,4'-DDT	mg/kg dry wt	-	< 0.013	-	< 0.014	-
4,4'-DDT	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Total DDT Isomers	mg/kg dry wt	-	< 0.08	-	< 0.09	-
Dieldrin	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endosulfan I	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endosulfan II	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endosulfan sulphate	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endrin	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endrin aldehyde	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endrin ketone	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Heptachlor	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Heptachlor epoxide	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Hexachlorobenzene	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Methoxychlor	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.013
Perylene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.059	< 0.013
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	< 0.04	< 0.04	0.32	< 0.03
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.04	< 0.04	< 0.04	0.33	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.017	< 0.013
Acenaphthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.013
Anthracene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.023	< 0.013
Benzo[a]anthracene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.162	< 0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.21	< 0.013
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.23	< 0.013
Benzo[e]pyrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.129	< 0.013
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.146	< 0.013
Benzo[k]fluoranthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.094	< 0.013
Chrysene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.165	< 0.013
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.048	< 0.013
Fluoranthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.29	< 0.013
Fluorene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.163	< 0.013
Naphthalene	mg/kg dry wt	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Phenanthrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.072	< 0.013
Pyrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.29	< 0.013
Total of Reported PAHs in Soil*	mg/kg	< 0.4	< 0.4	< 0.4	2.1	< 0.3

Sample Type: Soil						
Sample Name:		EHA01_0.1 08-Oct-2018 10:30 am	BH01_0.1 08-Oct-2018 9:30 am	BH01_1.0 08-Oct-2018 12:00 pm	HA01_0.1 [09:13-09:20] 10-Oct-2018	HA01_0.5 10-Oct-2018 9:30 am
Lab Number:		2063571.1	2063571.3	2063571.5	2063571.9	2063571.10
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	77	-	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	77	-	-	-	-

Sample Name:		HA02_0.1 10-Oct-2018 9:45 am	HA03_0.1 10-Oct-2018 10:30 am	HA04_0.1 10-Oct-2018 10:48 am	HA04_0.5 10-Oct-2018 10:55 am	HA05_0.1 [11:15-11:20] 10-Oct-2018
Lab Number:		2063571.11	2063571.13	2063571.15	2063571.16	2063571.17
Individual Tests						
Dry Matter	g/100g as rcvd	65	61	66	76	66
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	3	9	4	4
Total Recoverable Cadmium	mg/kg dry wt	0.11	< 0.10	0.56	< 0.10	0.15
Total Recoverable Chromium	mg/kg dry wt	22	14	17	23	24
Total Recoverable Copper	mg/kg dry wt	16	15	41	18	18
Total Recoverable Lead	mg/kg dry wt	26	13.3	103	17.3	15.6
Total Recoverable Nickel	mg/kg dry wt	16	8	9	18	22
Total Recoverable Zinc	mg/kg dry wt	62	43	174	44	49
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	-	-	-	558.8	-
Dry Weight	g	-	-	-	426.8	-
Ashed Weight	g	-	-	-	408.9	-
Moisture	%	-	-	-	24	-
Dry Sample Fraction >10mm	g ashed wt	-	-	-	2.5	-
Sample Fraction <10mm to >2mm	g ashed wt	-	-	-	118.7	-
Sample Fraction <2mm	g ashed wt	-	-	-	286.7	-
<2mm Subsample Weight	g ashed wt	-	-	-	50.5	-
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	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
alpha-BHC	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
beta-BHC	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
delta-BHC	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
gamma-BHC (Lindane)	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
cis-Chlordane	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
trans-Chlordane	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
4,4'-DDD	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
2,4'-DDE	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015

Sample Type: Soil						
Sample Name:		HA02_0.1 10-Oct-2018 9:45 am	HA03_0.1 10-Oct-2018 10:30 am	HA04_0.1 10-Oct-2018 10:48 am	HA04_0.5 10-Oct-2018 10:55 am	HA05_0.1 [11:15-11:20] 10-Oct-2018
Lab Number:		2063571.11	2063571.13	2063571.15	2063571.16	2063571.17
Organochlorine Pesticides Screening in Soil						
4,4'-DDE	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
2,4'-DDT	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
4,4'-DDT	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Total DDT Isomers	mg/kg dry wt	< 0.09	< 0.10	< 0.09	-	< 0.09
Dieldrin	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endosulfan I	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endosulfan II	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endosulfan sulphate	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endrin	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endrin aldehyde	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endrin ketone	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Heptachlor	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Heptachlor epoxide	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Hexachlorobenzene	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Methoxychlor	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
2-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
Perylene	mg/kg dry wt	0.038	< 0.017	< 0.015	< 0.013	< 0.015
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	0.09	< 0.04	0.04	0.06	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	0.09	< 0.05	0.04	0.06	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
Acenaphthene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
Anthracene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
Benzo[a]anthracene	mg/kg dry wt	0.050	< 0.017	0.026	0.022	0.027
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.054	< 0.017	0.029	0.051	< 0.015
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.074	< 0.017	0.035	0.041	0.030
Benzo[e]pyrene	mg/kg dry wt	0.045	< 0.017	0.025	0.024	< 0.015
Benzo[g,h,i]perylene	mg/kg dry wt	0.057	< 0.017	0.027	0.024	0.016
Benzo[k]fluoranthene	mg/kg dry wt	0.027	< 0.017	< 0.015	0.017	< 0.015
Chrysene	mg/kg dry wt	0.060	< 0.017	0.026	0.026	0.028
Dibenzo[a,h]anthracene	mg/kg dry wt	0.016	< 0.017	< 0.015	< 0.013	< 0.015
Fluoranthene	mg/kg dry wt	0.127	0.046	0.048	0.046	0.064
Fluorene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.053	< 0.017	0.028	0.022	0.015
Naphthalene	mg/kg dry wt	< 0.08	< 0.09	< 0.08	< 0.07	< 0.08
Phenanthrene	mg/kg dry wt	0.035	< 0.017	0.014	< 0.013	< 0.015
Pyrene	mg/kg dry wt	0.114	0.020	0.054	0.055	0.038
Total of Reported PAHs in Soil*	mg/kg	0.8	< 0.4	0.4	0.3	< 0.4

Sample Name:		HA06_0.1 10-Oct-2018 11:30 am	HA06_0.4 10-Oct-2018 12:00 pm	HA07_0.1 10-Oct-2018 1:45 pm	HA08_0.1 10-Oct-2018 2:10 pm	HA09_0.1 10-Oct-2018 2:30 pm
Lab Number:		2063571.19	2063571.20	2063571.21	2063571.23	2063571.25
Individual Tests						
Dry Matter	g/100g as rcvd	58	78	61	60	70
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	4	3	3	5
Total Recoverable Cadmium	mg/kg dry wt	0.30	< 0.10	0.22	0.26	0.18
Total Recoverable Chromium	mg/kg dry wt	28	15	21	28	21
Total Recoverable Copper	mg/kg dry wt	21	20	19	20	17
Total Recoverable Lead	mg/kg dry wt	16.7	10.2	13.2	16.1	14.4
Total Recoverable Nickel	mg/kg dry wt	34	7	28	31	27

Sample Type: Soil						
Sample Name:		HA06_0.1 10-Oct-2018 11:30 am	HA06_0.4 10-Oct-2018 12:00 pm	HA07_0.1 10-Oct-2018 1:45 pm	HA08_0.1 10-Oct-2018 2:10 pm	HA09_0.1 10-Oct-2018 2:30 pm
Lab Number:		2063571.19	2063571.20	2063571.21	2063571.23	2063571.25
Heavy Metals, Screen Level						
Total Recoverable Zinc	mg/kg dry wt	69	20	62	64	52
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	605.1	679.2	399.5	828.5	467.9
Dry Weight	g	364.9	551.3	250.8	543.8	315.5
Ashed Weight	g	308.4	543.5	232.6	514.8	296.9
Moisture	%	40	19	37	34	33
Dry Sample Fraction >10mm	g ashed wt	< 0.1	211.4	< 0.1	14.5	< 0.1
Sample Fraction <10mm to >2mm	g ashed wt	1.3	189.2	8.9	74.0	8.3
Sample Fraction <2mm	g ashed wt	306.4	142.5	223.0	424.9	287.8
<2mm Subsample Weight	g ashed wt	54.2	51.6	56.7	56.9	52.8
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Weight of Asbestos as Asbestos Fines (Friable)*	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
alpha-BHC	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
beta-BHC	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
delta-BHC	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
gamma-BHC (Lindane)	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
cis-Chlordane	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
trans-Chlordane	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
4,4'-DDD	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
2,4'-DDE	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
4,4'-DDE	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
2,4'-DDT	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
4,4'-DDT	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Total DDT Isomers	mg/kg dry wt	< 0.11	-	< 0.10	< 0.10	< 0.09
Dieldrin	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endosulfan I	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endosulfan II	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endosulfan sulphate	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endrin	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endrin aldehyde	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endrin ketone	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Heptachlor	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Heptachlor epoxide	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Hexachlorobenzene	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Methoxychlor	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014

Sample Type: Soil						
Sample Name:		HA06_0.1 10-Oct-2018 11:30 am	HA06_0.4 10-Oct-2018 12:00 pm	HA07_0.1 10-Oct-2018 1:45 pm	HA08_0.1 10-Oct-2018 2:10 pm	HA09_0.1 10-Oct-2018 2:30 pm
Lab Number:		2063571.19	2063571.20	2063571.21	2063571.23	2063571.25
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
2-Methylnaphthalene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Perylene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.05	< 0.04	< 0.04	< 0.04	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.05	< 0.04	< 0.04	< 0.05	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Acenaphthene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Anthracene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Benzo[a]anthracene	mg/kg dry wt	< 0.017	< 0.013	0.025	< 0.017	< 0.014
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.024	< 0.013	0.022	< 0.017	< 0.014
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.033	< 0.013	0.037	< 0.017	< 0.014
Benzo[e]pyrene	mg/kg dry wt	< 0.017	< 0.013	0.021	< 0.017	< 0.014
Benzo[g,h,i]perylene	mg/kg dry wt	0.027	< 0.013	0.021	< 0.017	< 0.014
Benzo[k]fluoranthene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Chrysene	mg/kg dry wt	< 0.017	< 0.013	0.019	< 0.017	< 0.014
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Fluoranthene	mg/kg dry wt	0.029	< 0.013	0.038	< 0.017	< 0.014
Fluorene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.027	< 0.013	0.022	< 0.017	< 0.014
Naphthalene	mg/kg dry wt	< 0.09	< 0.07	< 0.08	< 0.09	< 0.07
Phenanthrene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Pyrene	mg/kg dry wt	0.027	< 0.013	0.040	< 0.017	< 0.014
Total of Reported PAHs in Soil*	mg/kg	< 0.5	< 0.4	< 0.4	< 0.4	< 0.4

Sample Name:		HA09_0.4 10-Oct-2018 2:40 pm	HA10_0.1 10-Oct-2018 3:00 pm	HA11_0.1 10-Oct-2018 3:30 pm	HA12_0.1 10-Oct-2018 3:50 pm	HA12_0.4 [16:00-16:10] 10-Oct-2018
Lab Number:		2063571.26	2063571.27	2063571.29	2063571.31	2063571.32
Individual Tests						
Dry Matter	g/100g as rcvd	90	61	57	63	78
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	11	4	3	3	3
Total Recoverable Cadmium	mg/kg dry wt	0.12	0.29	0.23	0.28	< 0.10
Total Recoverable Chromium	mg/kg dry wt	6	32	19	28	12
Total Recoverable Copper	mg/kg dry wt	6	23	16	22	11
Total Recoverable Lead	mg/kg dry wt	3.6	14.8	16.0	14.9	6.2
Total Recoverable Nickel	mg/kg dry wt	8	44	17	36	2
Total Recoverable Zinc	mg/kg dry wt	34	79	45	68	7
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	636.9	800.7	500.3	635.3	597.9
Dry Weight	g	543.3	479.7	302.6	405.9	463.4
Ashed Weight	g	529.7	444.4	281.1	381.1	454.3
Moisture	%	15	40	40	36	22
Dry Sample Fraction >10mm	g ashed wt	55.4	< 0.1	< 0.1	1.8	6.2
Sample Fraction <10mm to >2mm	g ashed wt	103.4	73.8	25.6	26.8	68.8
Sample Fraction <2mm	g ashed wt	370.2	369.3	254.4	351.7	378.5
<2mm Subsample Weight	g ashed wt	57.5	56.7	55.5	54.9	54.7
Asbestos Presence / Absence		Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		Loose Fibres	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

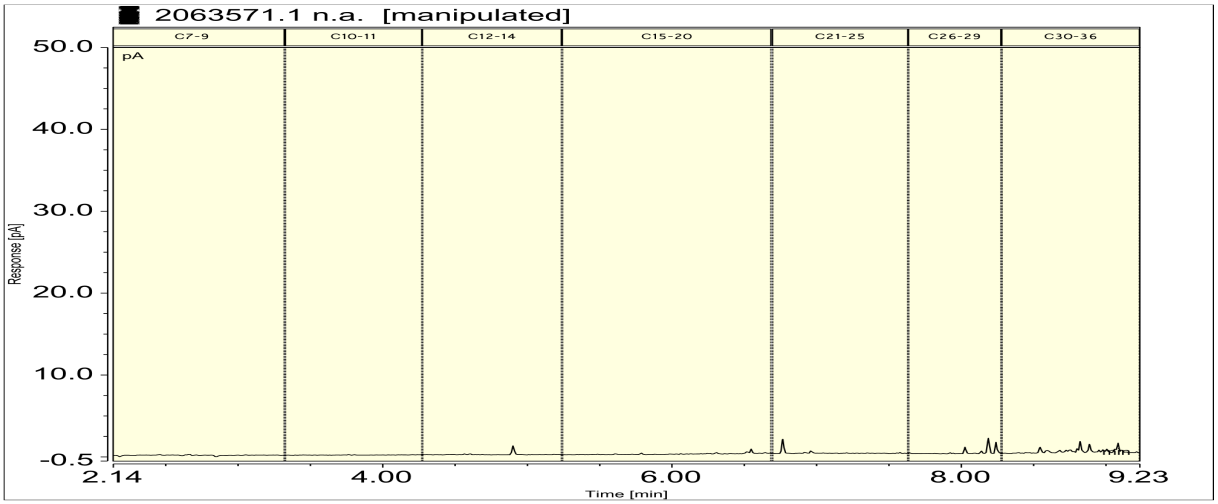
Sample Type: Soil						
Sample Name:		HA09_0.4 10-Oct-2018 2:40 pm	HA10_0.1 10-Oct-2018 3:00 pm	HA11_0.1 10-Oct-2018 3:30 pm	HA12_0.1 10-Oct-2018 3:50 pm	HA12_0.4 [16:00-16:10] 10-Oct-2018
Lab Number:		2063571.26	2063571.27	2063571.29	2063571.31	2063571.32
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Weight of Asbestos as Asbestos Fines (Friable)*	g ashed wt	0.00588	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	0.001	< 0.001	< 0.001	< 0.001	< 0.001
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
alpha-BHC	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
beta-BHC	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
delta-BHC	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
cis-Chlordane	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
trans-Chlordane	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	< 0.04	< 0.04	< 0.04	-
2,4'-DDD	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
4,4'-DDD	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
2,4'-DDE	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
4,4'-DDE	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
2,4'-DDT	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
4,4'-DDT	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Total DDT Isomers	mg/kg dry wt	-	< 0.10	< 0.11	< 0.10	-
Dieldrin	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endosulfan I	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endosulfan II	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endosulfan sulphate	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endrin	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endrin aldehyde	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endrin ketone	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Heptachlor	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Heptachlor epoxide	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Hexachlorobenzene	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Methoxychlor	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Perylene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.03	< 0.04	< 0.05	< 0.04	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.03	< 0.04	< 0.05	< 0.04	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Acenaphthene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Anthracene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[a]anthracene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[e]pyrene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013

Sample Type: Soil						
Sample Name:		HA09_0.4 10-Oct-2018 2:40 pm	HA10_0.1 10-Oct-2018 3:00 pm	HA11_0.1 10-Oct-2018 3:30 pm	HA12_0.1 10-Oct-2018 3:50 pm	HA12_0.4 [16:00-16:10] 10-Oct-2018
Lab Number:		2063571.26	2063571.27	2063571.29	2063571.31	2063571.32
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Chrysene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Fluoranthene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Fluorene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Naphthalene	mg/kg dry wt	< 0.06	< 0.08	< 0.09	< 0.08	< 0.07
Phenanthrene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Pyrene	mg/kg dry wt	< 0.011	< 0.016	0.020	< 0.016	< 0.013
Total of Reported PAHs in Soil*	mg/kg	< 0.3	< 0.4	< 0.5	< 0.4	< 0.4

Sample Name:		BH02_0.1 10-Oct-2018 12:00 pm	BH02_1.0 10-Oct-2018 4:30 pm			
Lab Number:		2063571.33	2063571.35			
Individual Tests						
Dry Matter	g/100g as rcvd	70	74	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	< 2	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.16	< 0.10	-	-	-
Total Recoverable Chromium	mg/kg dry wt	35	6	-	-	-
Total Recoverable Copper	mg/kg dry wt	40	11	-	-	-
Total Recoverable Lead	mg/kg dry wt	47	6.3	-	-	-
Total Recoverable Nickel	mg/kg dry wt	61	3	-	-	-
Total Recoverable Zinc	mg/kg dry wt	70	7	-	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.015	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.015	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.015	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.015	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.015	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.015	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.015	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.015	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.015	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.015	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.015	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.015	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.015	-	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.09	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.015	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.015	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.015	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.015	-	-	-	-
Endrin	mg/kg dry wt	< 0.015	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.015	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.015	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.015	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.015	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.015	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.015	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	-	-	-

Sample Type: Soil							
Sample Name:		BH02_0.1 10-Oct-2018 12:00 pm	BH02_1.0 10-Oct-2018 4:30 pm			
Lab Number:		2063571.33	2063571.35			
Polycyclic Aromatic Hydrocarbons Screening in Soil						
2-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	-	-	-
Perylene	mg/kg dry wt	0.080	< 0.013	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	0.48	< 0.04	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	0.48	< 0.04	-	-	-
Acenaphthylene	mg/kg dry wt	0.046	< 0.013	-	-	-
Acenaphthene	mg/kg dry wt	< 0.015	< 0.013	-	-	-
Anthracene	mg/kg dry wt	0.038	< 0.013	-	-	-
Benzo[a]anthracene	mg/kg dry wt	0.27	< 0.013	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.32	< 0.013	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.35	< 0.013	-	-	-
Benzo[e]pyrene	mg/kg dry wt	0.193	< 0.013	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.196	< 0.013	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	0.146	< 0.013	-	-	-
Chrysene	mg/kg dry wt	0.28	< 0.013	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	0.051	< 0.013	-	-	-
Fluoranthene	mg/kg dry wt	0.43	< 0.013	-	-	-
Fluorene	mg/kg dry wt	< 0.015	< 0.013	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.20	< 0.013	-	-	-
Naphthalene	mg/kg dry wt	< 0.08	< 0.07	-	-	-
Phenanthrene	mg/kg dry wt	0.113	< 0.013	-	-	-
Pyrene	mg/kg dry wt	0.47	< 0.013	-	-	-
Total of Reported PAHs in Soil*	mg/kg	3.2	< 0.4	-	-	-

2063571.1
EHA01_0.1 08-Oct-2018 10:30 am
Client Chromatogram for TPH by FID



Analyst's Comments

Amended Report: This certificate of analysis replaces an earlier certificate issued on 17 Oct 2018 at 12:28 pm
Reason for amendment: Additional testing added.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively 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**

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
Total of Reported PAHs in Soil*	Sonication extraction, SPE cleanup, GC-MS SIM analysis.	0.3 mg/kg	1, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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]	-	1
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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	3, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33
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]	-	3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	9-10, 16, 19-21, 23, 25-27, 29, 31-32
Ashed Weight	Sample ashed at 400°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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 %	9-10, 16, 19-21, 23, 25-27, 29, 31-32

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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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.	-	9-10, 16, 19-21, 23, 25-27, 29, 31-32
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32

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

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TRIED, TESTED AND TRUSTED

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	2063571	SPv2
Contact:	Cara Di Vitto	**Date Received:**	11-Oct-2018	
	C/- Tonkin & Taylor	**Date Reported:**	25-Oct-2018	**(Amended)**
	PO Box 5271	**Quote No:**		
	Auckland 1141	**Order No:**	30314.1000	
		Client Reference:	30314.1000	
		Submitted By:	Cara Di Vitto	

Sample Type: Soil

Sample Name:		EHA01_0.1 08-Oct-2018 10:30 am	BH01_0.1 08-Oct-2018 9:30 am	BH01_1.0 08-Oct-2018 12:00 pm	HA01_0.1 [09:13-09:20] 10-Oct-2018	HA01_0.5 10-Oct-2018 9:30 am
Lab Number:		2063571.1	2063571.3	2063571.5	2063571.9	2063571.10
Individual Tests						
Dry Matter	g/100g as rcvd	68	77	77	70	80
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	2	< 2	15	< 2
Total Recoverable Cadmium	mg/kg dry wt	0.22	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	30	21	6	26	6
Total Recoverable Copper	mg/kg dry wt	24	7	2	29	5
Total Recoverable Lead	mg/kg dry wt	19.5	6.6	4.1	165	15.6
Total Recoverable Nickel	mg/kg dry wt	29	8	< 2	37	5
Total Recoverable Zinc	mg/kg dry wt	77	16	< 4	80	9
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	-	-	-	517.4	537.1
Dry Weight	g	-	-	-	375.6	427.9
Ashed Weight	g	-	-	-	340.3	421.8
Moisture	%	-	-	-	27	20
Dry Sample Fraction >10mm	g ashed wt	-	-	-	4.9	< 0.1
Sample Fraction <10mm to >2mm	g ashed wt	-	-	-	21.7	2.2
Sample Fraction <2mm	g ashed wt	-	-	-	312.9	419.0
<2mm Subsample Weight	g ashed wt	-	-	-	52.0	51.0
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:		EHA01_0.1 08-Oct-2018 10:30 am	BH01_0.1 08-Oct-2018 9:30 am	BH01_1.0 08-Oct-2018 12:00 pm	HA01_0.1 [09:13-09:20] 10-Oct-2018	HA01_0.5 10-Oct-2018 9:30 am
Lab Number:		2063571.1	2063571.3	2063571.5	2063571.9	2063571.10
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	< 0.013	-	< 0.014	-
alpha-BHC	mg/kg dry wt	-	< 0.013	-	< 0.014	-
beta-BHC	mg/kg dry wt	-	< 0.013	-	< 0.014	-
delta-BHC	mg/kg dry wt	-	< 0.013	-	< 0.014	-
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.013	-	< 0.014	-
cis-Chlordane	mg/kg dry wt	-	< 0.013	-	< 0.014	-
trans-Chlordane	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	< 0.04	-	< 0.04	-
2,4'-DDD	mg/kg dry wt	-	< 0.013	-	< 0.014	-
4,4'-DDD	mg/kg dry wt	-	< 0.013	-	< 0.014	-
2,4'-DDE	mg/kg dry wt	-	< 0.013	-	< 0.014	-
4,4'-DDE	mg/kg dry wt	-	< 0.013	-	< 0.014	-
2,4'-DDT	mg/kg dry wt	-	< 0.013	-	< 0.014	-
4,4'-DDT	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Total DDT Isomers	mg/kg dry wt	-	< 0.08	-	< 0.09	-
Dieldrin	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endosulfan I	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endosulfan II	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endosulfan sulphate	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endrin	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endrin aldehyde	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Endrin ketone	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Heptachlor	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Heptachlor epoxide	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Hexachlorobenzene	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Methoxychlor	mg/kg dry wt	-	< 0.013	-	< 0.014	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.013
Perylene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.059	< 0.013
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	< 0.04	< 0.04	0.32	< 0.03
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.04	< 0.04	< 0.04	0.33	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.017	< 0.013
Acenaphthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.013
Anthracene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.023	< 0.013
Benzo[a]anthracene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.162	< 0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.21	< 0.013
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.23	< 0.013
Benzo[e]pyrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.129	< 0.013
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.146	< 0.013
Benzo[k]fluoranthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.094	< 0.013
Chrysene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.165	< 0.013
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.048	< 0.013
Fluoranthene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.29	< 0.013
Fluorene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	< 0.014	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.163	< 0.013
Naphthalene	mg/kg dry wt	< 0.08	< 0.07	< 0.07	< 0.07	< 0.07
Phenanthrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.072	< 0.013
Pyrene	mg/kg dry wt	< 0.015	< 0.013	< 0.013	0.29	< 0.013
Total of Reported PAHs in Soil*	mg/kg	< 0.4	< 0.4	< 0.4	2.1	< 0.3

Sample Type: Soil						
Sample Name:		EHA01_0.1 08-Oct-2018 10:30 am	BH01_0.1 08-Oct-2018 9:30 am	BH01_1.0 08-Oct-2018 12:00 pm	HA01_0.1 [09:13-09:20] 10-Oct-2018	HA01_0.5 10-Oct-2018 9:30 am
Lab Number:		2063571.1	2063571.3	2063571.5	2063571.9	2063571.10
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	77	-	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	77	-	-	-	-

Sample Name:		HA02_0.1 10-Oct-2018 9:45 am	HA03_0.1 10-Oct-2018 10:30 am	HA04_0.1 10-Oct-2018 10:48 am	HA04_0.5 10-Oct-2018 10:55 am	HA05_0.1 [11:15-11:20] 10-Oct-2018
Lab Number:		2063571.11	2063571.13	2063571.15	2063571.16	2063571.17
Individual Tests						
Dry Matter	g/100g as rcvd	65	61	66	76	66
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	3	9	4	4
Total Recoverable Cadmium	mg/kg dry wt	0.11	< 0.10	0.56	< 0.10	0.15
Total Recoverable Chromium	mg/kg dry wt	22	14	17	23	24
Total Recoverable Copper	mg/kg dry wt	16	15	41	18	18
Total Recoverable Lead	mg/kg dry wt	26	13.3	103	17.3	15.6
Total Recoverable Nickel	mg/kg dry wt	16	8	9	18	22
Total Recoverable Zinc	mg/kg dry wt	62	43	174	44	49
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	-	-	-	558.8	-
Dry Weight	g	-	-	-	426.8	-
Ashed Weight	g	-	-	-	408.9	-
Moisture	%	-	-	-	24	-
Dry Sample Fraction >10mm	g ashed wt	-	-	-	2.5	-
Sample Fraction <10mm to >2mm	g ashed wt	-	-	-	118.7	-
Sample Fraction <2mm	g ashed wt	-	-	-	286.7	-
<2mm Subsample Weight	g ashed wt	-	-	-	50.5	-
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	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
alpha-BHC	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
beta-BHC	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
delta-BHC	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
gamma-BHC (Lindane)	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
cis-Chlordane	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
trans-Chlordane	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
4,4'-DDD	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
2,4'-DDE	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015

Sample Type: Soil						
Sample Name:		HA02_0.1 10-Oct-2018 9:45 am	HA03_0.1 10-Oct-2018 10:30 am	HA04_0.1 10-Oct-2018 10:48 am	HA04_0.5 10-Oct-2018 10:55 am	HA05_0.1 [11:15-11:20] 10-Oct-2018
Lab Number:		2063571.11	2063571.13	2063571.15	2063571.16	2063571.17
Organochlorine Pesticides Screening in Soil						
4,4'-DDE	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
2,4'-DDT	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
4,4'-DDT	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Total DDT Isomers	mg/kg dry wt	< 0.09	< 0.10	< 0.09	-	< 0.09
Dieldrin	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endosulfan I	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endosulfan II	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endosulfan sulphate	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endrin	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endrin aldehyde	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Endrin ketone	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Heptachlor	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Heptachlor epoxide	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Hexachlorobenzene	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Methoxychlor	mg/kg dry wt	< 0.015	< 0.017	< 0.015	-	< 0.015
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
2-Methylnaphthalene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
Perylene	mg/kg dry wt	0.038	< 0.017	< 0.015	< 0.013	< 0.015
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	0.09	< 0.04	0.04	0.06	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	0.09	< 0.05	0.04	0.06	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
Acenaphthene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
Anthracene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
Benzo[a]anthracene	mg/kg dry wt	0.050	< 0.017	0.026	0.022	0.027
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.054	< 0.017	0.029	0.051	< 0.015
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.074	< 0.017	0.035	0.041	0.030
Benzo[e]pyrene	mg/kg dry wt	0.045	< 0.017	0.025	0.024	< 0.015
Benzo[g,h,i]perylene	mg/kg dry wt	0.057	< 0.017	0.027	0.024	0.016
Benzo[k]fluoranthene	mg/kg dry wt	0.027	< 0.017	< 0.015	0.017	< 0.015
Chrysene	mg/kg dry wt	0.060	< 0.017	0.026	0.026	0.028
Dibenzo[a,h]anthracene	mg/kg dry wt	0.016	< 0.017	< 0.015	< 0.013	< 0.015
Fluoranthene	mg/kg dry wt	0.127	0.046	0.048	0.046	0.064
Fluorene	mg/kg dry wt	< 0.016	< 0.017	< 0.015	< 0.013	< 0.015
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.053	< 0.017	0.028	0.022	0.015
Naphthalene	mg/kg dry wt	< 0.08	< 0.09	< 0.08	< 0.07	< 0.08
Phenanthrene	mg/kg dry wt	0.035	< 0.017	0.014	< 0.013	< 0.015
Pyrene	mg/kg dry wt	0.114	0.020	0.054	0.055	0.038
Total of Reported PAHs in Soil*	mg/kg	0.8	< 0.4	0.4	0.3	< 0.4

Sample Name:		HA06_0.1 10-Oct-2018 11:30 am	HA06_0.4 10-Oct-2018 12:00 pm	HA07_0.1 10-Oct-2018 1:45 pm	HA08_0.1 10-Oct-2018 2:10 pm	HA09_0.1 10-Oct-2018 2:30 pm
Lab Number:		2063571.19	2063571.20	2063571.21	2063571.23	2063571.25
Individual Tests						
Dry Matter	g/100g as rcvd	58	78	61	60	70
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	3	4	3	3	5
Total Recoverable Cadmium	mg/kg dry wt	0.30	< 0.10	0.22	0.26	0.18
Total Recoverable Chromium	mg/kg dry wt	28	15	21	28	21
Total Recoverable Copper	mg/kg dry wt	21	20	19	20	17
Total Recoverable Lead	mg/kg dry wt	16.7	10.2	13.2	16.1	14.4
Total Recoverable Nickel	mg/kg dry wt	34	7	28	31	27

Sample Type: Soil						
Sample Name:		HA06_0.1 10-Oct-2018 11:30 am	HA06_0.4 10-Oct-2018 12:00 pm	HA07_0.1 10-Oct-2018 1:45 pm	HA08_0.1 10-Oct-2018 2:10 pm	HA09_0.1 10-Oct-2018 2:30 pm
Lab Number:		2063571.19	2063571.20	2063571.21	2063571.23	2063571.25
Heavy Metals, Screen Level						
Total Recoverable Zinc	mg/kg dry wt	69	20	62	64	52
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	605.1	679.2	399.5	828.5	467.9
Dry Weight	g	364.9	551.3	250.8	543.8	315.5
Ashed Weight	g	308.4	543.5	232.6	514.8	296.9
Moisture	%	40	19	37	34	33
Dry Sample Fraction >10mm	g ashed wt	< 0.1	211.4	< 0.1	14.5	< 0.1
Sample Fraction <10mm to >2mm	g ashed wt	1.3	189.2	8.9	74.0	8.3
Sample Fraction <2mm	g ashed wt	306.4	142.5	223.0	424.9	287.8
<2mm Subsample Weight	g ashed wt	54.2	51.6	56.7	56.9	52.8
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Weight of Asbestos as Asbestos Fines (Friable)*	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
alpha-BHC	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
beta-BHC	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
delta-BHC	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
gamma-BHC (Lindane)	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
cis-Chlordane	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
trans-Chlordane	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	< 0.04	< 0.04	< 0.04
2,4'-DDD	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
4,4'-DDD	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
2,4'-DDE	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
4,4'-DDE	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
2,4'-DDT	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
4,4'-DDT	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Total DDT Isomers	mg/kg dry wt	< 0.11	-	< 0.10	< 0.10	< 0.09
Dieldrin	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endosulfan I	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endosulfan II	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endosulfan sulphate	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endrin	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endrin aldehyde	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Endrin ketone	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Heptachlor	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Heptachlor epoxide	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Hexachlorobenzene	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014
Methoxychlor	mg/kg dry wt	< 0.017	-	< 0.016	< 0.017	< 0.014

Sample Type: Soil						
Sample Name:		HA06_0.1 10-Oct-2018 11:30 am	HA06_0.4 10-Oct-2018 12:00 pm	HA07_0.1 10-Oct-2018 1:45 pm	HA08_0.1 10-Oct-2018 2:10 pm	HA09_0.1 10-Oct-2018 2:30 pm
Lab Number:		2063571.19	2063571.20	2063571.21	2063571.23	2063571.25
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
2-Methylnaphthalene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Perylene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.05	< 0.04	< 0.04	< 0.04	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.05	< 0.04	< 0.04	< 0.05	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Acenaphthene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Anthracene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Benzo[a]anthracene	mg/kg dry wt	< 0.017	< 0.013	0.025	< 0.017	< 0.014
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.024	< 0.013	0.022	< 0.017	< 0.014
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.033	< 0.013	0.037	< 0.017	< 0.014
Benzo[e]pyrene	mg/kg dry wt	< 0.017	< 0.013	0.021	< 0.017	< 0.014
Benzo[g,h,i]perylene	mg/kg dry wt	0.027	< 0.013	0.021	< 0.017	< 0.014
Benzo[k]fluoranthene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Chrysene	mg/kg dry wt	< 0.017	< 0.013	0.019	< 0.017	< 0.014
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Fluoranthene	mg/kg dry wt	0.029	< 0.013	0.038	< 0.017	< 0.014
Fluorene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.027	< 0.013	0.022	< 0.017	< 0.014
Naphthalene	mg/kg dry wt	< 0.09	< 0.07	< 0.08	< 0.09	< 0.07
Phenanthrene	mg/kg dry wt	< 0.017	< 0.013	< 0.016	< 0.017	< 0.014
Pyrene	mg/kg dry wt	0.027	< 0.013	0.040	< 0.017	< 0.014
Total of Reported PAHs in Soil*	mg/kg	< 0.5	< 0.4	< 0.4	< 0.4	< 0.4

Sample Name:		HA09_0.4 10-Oct-2018 2:40 pm	HA10_0.1 10-Oct-2018 3:00 pm	HA11_0.1 10-Oct-2018 3:30 pm	HA12_0.1 10-Oct-2018 3:50 pm	HA12_0.4 [16:00-16:10] 10-Oct-2018
Lab Number:		2063571.26	2063571.27	2063571.29	2063571.31	2063571.32
Individual Tests						
Dry Matter	g/100g as rcvd	90	61	57	63	78
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	11	4	3	3	3
Total Recoverable Cadmium	mg/kg dry wt	0.12	0.29	0.23	0.28	< 0.10
Total Recoverable Chromium	mg/kg dry wt	6	32	19	28	12
Total Recoverable Copper	mg/kg dry wt	6	23	16	22	11
Total Recoverable Lead	mg/kg dry wt	3.6	14.8	16.0	14.9	6.2
Total Recoverable Nickel	mg/kg dry wt	8	44	17	36	2
Total Recoverable Zinc	mg/kg dry wt	34	79	45	68	7
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	636.9	800.7	500.3	635.3	597.9
Dry Weight	g	543.3	479.7	302.6	405.9	463.4
Ashed Weight	g	529.7	444.4	281.1	381.1	454.3
Moisture	%	15	40	40	36	22
Dry Sample Fraction >10mm	g ashed wt	55.4	< 0.1	< 0.1	1.8	6.2
Sample Fraction <10mm to >2mm	g ashed wt	103.4	73.8	25.6	26.8	68.8
Sample Fraction <2mm	g ashed wt	370.2	369.3	254.4	351.7	378.5
<2mm Subsample Weight	g ashed wt	57.5	56.7	55.5	54.9	54.7
Asbestos Presence / Absence		Chrysotile (White Asbestos) detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		Loose Fibres	-	-	-	-
Weight of Asbestos in ACM (Non-Friable)	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

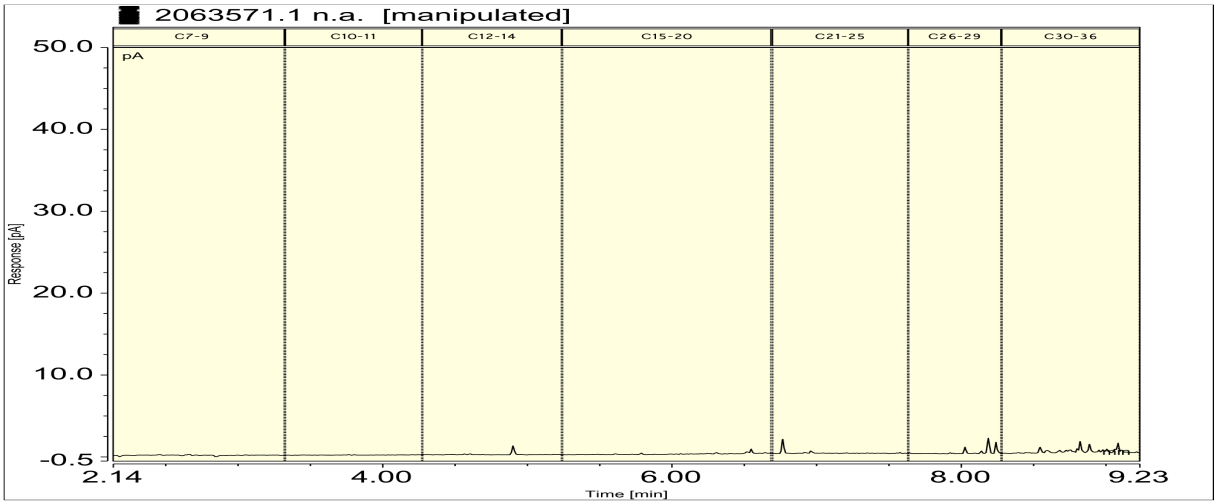
Sample Type: Soil						
Sample Name:		HA09_0.4 10-Oct-2018 2:40 pm	HA10_0.1 10-Oct-2018 3:00 pm	HA11_0.1 10-Oct-2018 3:30 pm	HA12_0.1 10-Oct-2018 3:50 pm	HA12_0.4 [16:00-16:10] 10-Oct-2018
Lab Number:		2063571.26	2063571.27	2063571.29	2063571.31	2063571.32
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Weight of Asbestos as Asbestos Fines (Friable)*	g ashed wt	0.00588	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	0.001	< 0.001	< 0.001	< 0.001	< 0.001
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
alpha-BHC	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
beta-BHC	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
delta-BHC	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
cis-Chlordane	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
trans-Chlordane	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	< 0.04	< 0.04	< 0.04	-
2,4'-DDD	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
4,4'-DDD	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
2,4'-DDE	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
4,4'-DDE	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
2,4'-DDT	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
4,4'-DDT	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Total DDT Isomers	mg/kg dry wt	-	< 0.10	< 0.11	< 0.10	-
Dieldrin	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endosulfan I	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endosulfan II	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endosulfan sulphate	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endrin	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endrin aldehyde	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Endrin ketone	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Heptachlor	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Heptachlor epoxide	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Hexachlorobenzene	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Methoxychlor	mg/kg dry wt	-	< 0.016	< 0.017	< 0.016	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
2-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Perylene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.03	< 0.04	< 0.05	< 0.04	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.03	< 0.04	< 0.05	< 0.04	< 0.04
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Acenaphthene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Anthracene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[a]anthracene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[e]pyrene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013

Sample Type: Soil						
Sample Name:		HA09_0.4 10-Oct-2018 2:40 pm	HA10_0.1 10-Oct-2018 3:00 pm	HA11_0.1 10-Oct-2018 3:30 pm	HA12_0.1 10-Oct-2018 3:50 pm	HA12_0.4 [16:00-16:10] 10-Oct-2018
Lab Number:		2063571.26	2063571.27	2063571.29	2063571.31	2063571.32
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Chrysene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Fluoranthene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Fluorene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Naphthalene	mg/kg dry wt	< 0.06	< 0.08	< 0.09	< 0.08	< 0.07
Phenanthrene	mg/kg dry wt	< 0.011	< 0.016	< 0.017	< 0.016	< 0.013
Pyrene	mg/kg dry wt	< 0.011	< 0.016	0.020	< 0.016	< 0.013
Total of Reported PAHs in Soil*	mg/kg	< 0.3	< 0.4	< 0.5	< 0.4	< 0.4

Sample Name:		BH02_0.1 10-Oct-2018 12:00 pm	BH02_1.0 10-Oct-2018 4:30 pm			
Lab Number:		2063571.33	2063571.35			
Individual Tests						
Dry Matter	g/100g as rcvd	70	74	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	< 2	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.16	< 0.10	-	-	-
Total Recoverable Chromium	mg/kg dry wt	35	6	-	-	-
Total Recoverable Copper	mg/kg dry wt	40	11	-	-	-
Total Recoverable Lead	mg/kg dry wt	47	6.3	-	-	-
Total Recoverable Nickel	mg/kg dry wt	61	3	-	-	-
Total Recoverable Zinc	mg/kg dry wt	70	7	-	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.015	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.015	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.015	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.015	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.015	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.015	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.015	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.015	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.015	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.015	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.015	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.015	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.015	-	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.09	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.015	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.015	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.015	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.015	-	-	-	-
Endrin	mg/kg dry wt	< 0.015	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.015	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.015	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.015	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.015	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.015	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.015	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	-	-	-

Sample Type: Soil							
Sample Name:		BH02_0.1 10-Oct-2018 12:00 pm	BH02_1.0 10-Oct-2018 4:30 pm			
Lab Number:		2063571.33	2063571.35			
Polycyclic Aromatic Hydrocarbons Screening in Soil						
2-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.013	-	-	-
Perylene	mg/kg dry wt	0.080	< 0.013	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	0.48	< 0.04	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	0.48	< 0.04	-	-	-
Acenaphthylene	mg/kg dry wt	0.046	< 0.013	-	-	-
Acenaphthene	mg/kg dry wt	< 0.015	< 0.013	-	-	-
Anthracene	mg/kg dry wt	0.038	< 0.013	-	-	-
Benzo[a]anthracene	mg/kg dry wt	0.27	< 0.013	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.32	< 0.013	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.35	< 0.013	-	-	-
Benzo[e]pyrene	mg/kg dry wt	0.193	< 0.013	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.196	< 0.013	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	0.146	< 0.013	-	-	-
Chrysene	mg/kg dry wt	0.28	< 0.013	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	0.051	< 0.013	-	-	-
Fluoranthene	mg/kg dry wt	0.43	< 0.013	-	-	-
Fluorene	mg/kg dry wt	< 0.015	< 0.013	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.20	< 0.013	-	-	-
Naphthalene	mg/kg dry wt	< 0.08	< 0.07	-	-	-
Phenanthrene	mg/kg dry wt	0.113	< 0.013	-	-	-
Pyrene	mg/kg dry wt	0.47	< 0.013	-	-	-
Total of Reported PAHs in Soil*	mg/kg	3.2	< 0.4	-	-	-

2063571.1
EHA01_0.1 08-Oct-2018 10:30 am
Client Chromatogram for TPH by FID



Analyst's Comments

Amended Report: This certificate of analysis replaces an earlier certificate issued on 17 Oct 2018 at 12:28 pm
Reason for amendment: Additional testing added.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively 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**

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
Total of Reported PAHs in Soil*	Sonication extraction, SPE cleanup, GC-MS SIM analysis.	0.3 mg/kg	1, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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]	-	1
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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	3, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33
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]	-	3, 5, 9-11, 13, 15-17, 19-21, 23, 25-27, 29, 31-33, 35
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	9-10, 16, 19-21, 23, 25-27, 29, 31-32
Ashed Weight	Sample ashed at 400°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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 %	9-10, 16, 19-21, 23, 25-27, 29, 31-32

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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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.	-	9-10, 16, 19-21, 23, 25-27, 29, 31-32
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32
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	9-10, 16, 19-21, 23, 25-27, 29, 31-32

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

Appendix D: Framework Site Management Plan

Tonkin+Taylor

Job No: 30314.V1
25 October 2019

Ryman Healthcare Ltd
c/- Mitchell Partnerships Ltd
Via email to Richard.Turner@mitchelldaysh.co.nz

Attention: Richard Turner

Dear Richard

Framework Site Management Plan for Ground Contamination. Ryman Village, Kohimarama Road, Auckland

Introduction

Ryman Healthcare Ltd (Ryman) is applying for resource consents to develop a comprehensive care retirement village (Proposed Village) at Kohimarama Road, in Auckland (the Site). Tonkin & Taylor Ltd (T+T) has prepared a Ground Contamination Investigation Report[1] to support the consent applications.

This report sets out the basis for, and framework of, ground contamination-related procedures and controls to be implemented during construction earthworks at the site. It is intended that a Site Management Plan (SMP) for ground contamination will be prepared in accordance with CLMG#1[2] prior to the commencement of earthworks. The procedures and controls set out within the SMP will be based on this framework plan, but will supersede them.

Basis for ground contamination management procedures

The T+T Ground Contamination Investigation identified that:

- The Site comprises two properties: 7 Rymer Place and 223 Kohimarama Road;
- The 7 Rymer Road property has been undeveloped since the earliest records available (1940);
- The 223 Kohimarama Road property was used for pastoral purposes until the early 1960s. Aerial photographs from the late 1960s show the establishment of a levelled playing field in the centre of the property and at this time the property is understood to have been leased by Selwyn College, which is located immediately north of the property. Historic aerial imagery suggests ongoing maintenance of the playing field and grassed areas of the property occurred up until circa 2015. That date corresponds to the approximate changeover of leasehold from the School to Rainbow Holdings NZ Limited;

[1] Tonkin + Taylor, October 2019. Ground Contamination Assessment of Effects, Ryman Village, Kohimarama Road, Auckland. Prepared for Ryman Healthcare Ltd, T+T job number 30314.001.V2
[2] Contaminated Land Management Guidelines No.1: Reporting on Contaminated Sites in New Zealand. Ministry for the Environment. April 2001 (revised 2011).

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- Soil sampling completed by T+T (2018) and Aurecon (2016)[3] indicate that surface soils are likely to contain low levels of metals and polyaromatic hydrocarbon (PAHs). The levels detected are below NES[4] SCS[5] criteria but in some cases above background concentrations. Subsurface soils contain lower concentrations of metals (below published background), and in most samples, non-detectable levels of PAHs. Pesticide and total petroleum hydrocarbons were not detected;
- Asbestos has been detected below the 'all site uses' soil guideline value of 0.001% w/w in three areas at the Site. One area corresponds to fill material in the former sports field, a second area is associated with fly tipped material in the north of the Site, and the third area is associated with reworked natural material, also in the north of the Site;
- The asbestos-contaminated material is considered to be localised and can be distinguished either on the basis of visual observations or soil sampling data;
- The presence of asbestos is the principal reason for the procedures outlined below and recommended management approach for the site. It is considered that the procedures implemented for asbestos contamination will be sufficient to mitigate risks from low levels of other contaminants (metals and PAHs) that may be present;
- The presence of asbestos in soils means that specific health and safety controls and soil management procedures will be required to protect construction workers and the general public from exposure to asbestos during earthworks, and so that asbestos-contaminated soil is appropriately disposed or managed on Site. The concentrations of chemical contaminants (e.g. metals) detected to date do not require specific health and safety controls, though procedures are required so that they are appropriately disposed or managed on site.

Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011

- The NES Soil regulations will apply to earthworks undertaken during construction of the Proposed Village. NES Soil consent will be required due to the volume of soil disturbance. As contaminants (asbestos) have been detected at a level equal to the applicable land use standard during the completion of Detailed Site Investigation (i.e. the ground contamination investigation), an NES Soil consent application for earthworks as a controlled activity shall be required;
- The NES Soil regulations require an SMP be provided to show how contamination will be managed during and possibly after earthworks. A framework for the SMP is provided within this letter. It is proposed that a full SMP is prepared (and provided to Auckland Council) as a condition of consent following confirmation of the earthworks methodology, and prior to soil disturbance works commencing at the Site;
- Although asbestos has been detected below the soil guideline value, it is best practice to limit exposure to asbestos as far as practicable and this would normally be achieved by removing and/or encapsulating the asbestos contaminated material. At this stage, the approach to managing asbestos contaminated soils has not been confirmed.

[3] AECOM 2015, Site Investigation (Contamination) – 223 Kohimarama Road Residential Development and Subdivision. Prepared for Rainbow Holdings NZ Limited by AECOM New Zealand Limited, dated 14 September 2015 (Reference 60430368).
[4] Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.
[5] NES Soil Contaminant Standards.

The following provides a summary of the primary ground contamination controls that the Applicant intends to put in place during the works, including asbestos and contingency procedures, these are based on industry good practice including CLMG#1 and New Zealand Asbestos Guidelines[6].

Asbestos controls

Soil analysis completed to date has detected a maximum concentration of bonded asbestos in soil of 0.001 % w/w, on which basis the proposed earthworks within the three defined asbestos contaminated areas will be carried out as *Unlicensed Asbestos Works*.

- Segregation of and restricted access to the *Unlicensed Asbestos Works* from other Site activities and use of signage to indicate that *Unlicensed Asbestos Works* are being undertaken;
- Water and/or asbestos-encapsulating polymer emulsion product will need to be applied for dust control before starting work and during as required;
- Spoil for disposal will need to be wrapped with 200 µm heavy-gauge polythene and trucks covered;
- Appropriate facilities for decontamination of personnel and equipment (basic disposable units will suffice) will be required; and
- Visual inspection of plant by an independent competent person before demobilisation from Site.

Asbestos has not been detected outside of the three defined areas and therefore the *Unlicensed Asbestos Works* controls only apply to earthworks undertaken within those areas. Standard earthworks controls apply to earthworks within all other material.

General earthworks procedures

Management of soil contamination related health effects

The potential for the exposure of workers and the public to contaminants in soil will be managed principally by controlling dust emissions, avoiding direct contact with soils and ensuring good personal hygiene practices during the works. Where the potential for direct contact (including accidental contact) with soils exists, e.g. during manual handling/excavation activities, then in principle full-length clothing and gloves shall be worn. As discussed above, different/additional PPE will be required for handling asbestos contaminated soils.

Dust controls

The control of dust emissions is important for any earthworks project, though particularly where contaminants are present which could become airborne (for example asbestos). Dust controls will include maintaining damp conditions using water sprays in excavation areas, minimising the size and duration of stockpiles, covering or stabilising stockpiles and regular visual monitoring. Dust controls shall comply with the applicable Council guidelines, regulations and other applicable legislation.

Water discharges

Separation and diversion of clean stormwater away from areas of ground disturbance is standard practice for any earthworks activity but becomes far more important where contaminants are present. Any contact between clean stormwater and contaminated soils/spoil etc. means the water can no longer be discharged to a stormwater system without treatment.

[6] New Zealand Guidelines for Assessing and Managing Asbestos in Soil – BRANZ – November 2017

The earthworks plan typically requires the excavation and segregation/stockpiling of contaminated materials so there will be little time for contact between stormwater and exposed, in situ contaminated soils. Any stockpiles of contaminated material shall be covered to avoid the generation of contaminated runoff from stockpiles. If not covered, the runoff shall be managed such that it discharges to ground from where the stockpiled material was excavated.

Confirmatory testing prior to discharge will be undertaken as required.

Sediment and erosion controls:

Erosion and sediment control shall be managed in accordance with AC guidelines, in particular the AC guideline document 2016/005 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GDO5, 2016):

- Avoiding work in heavy rain;
- Avoiding stockpiles where possible, however where they are required they shall be covered, stabilised other otherwise kept damp if left overnight. Stockpiles will not be placed in an area where runoff cannot be controlled;
- Contractor to take reasonable steps to avoid sediment being tracked on and off the site by vehicle movements;
- The installation of silt fences and runoff diversion bunds where appropriate to capture sediment in surface water runoff;
- Cleaning of entry/exit points to remove sediment and prevent tracking onto roads; and
- Regular checking and maintenance of erosion and sediment controls to maintain good working condition.

Spoil management

The stockpiling of spoil shall be minimised with the preference to load spoil directly onto trucks. Stockpiling of contaminated material may be necessary for these works. Stockpiled material shall be placed on suitable material and covered to minimise dust generation.

Soil reuse and disposal

Contaminated soil and fill, including that containing asbestos can remain on Site if it is encapsulated beneath a soil cap (0.5 m thick), hardstanding or buildings and will be subject to ongoing management controls. Underlying natural in situ soils can be reused onsite. If soils are removed from the Site, all materials shall be disposed at an appropriately licensed facility.

Authority to dispose of material off-site will be obtained from the receiving facility prior to the works commencing. The details of each load (e.g. truck registration number) shall be recorded on Site to allow reconciliation against the disposal site weighbridge documentation.

Unexpected contamination and contingency procedures

Contingency measures will be prepared for implementation in the event of the unexpected discovery of contamination, or spills of potential contaminants.

The procedures will include:

- Indications of contamination;
- First response procedures;
- Notification procedures;

- Complaints procedures; and
- Actions following exposure to contaminated material.

Monitoring procedures

Monitoring will be undertaken to confirm that the controls being implemented are effective. Monitoring will include:

- Visual dust monitoring; and
- Monitoring of erosion and sediment controls.

Validation reporting:

A site validation report (SVR) will be prepared on completion of works. This will outline the works undertaken, any variation to the finalised SMP, and document soils removed from Site. The SVR will also specify requirements for ongoing monitoring and management (and associated consents), if required.

Applicability

This report has been prepared for the exclusive use of our client Ryman Healthcare Ltd, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report in support of an application for resource consent and that Auckland Council as the consenting authority will use this report for the purpose of assessing that application.

Recommendations and opinions contained in this report are based on our visual inspection and sampling of material within the site. The nature and continuity of the subsoil away from the test and sample locations is inferred and it must be appreciated that actual conditions may vary from the assumed model.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared and certified by a suitably qualified and experienced practitioner as prescribed under the NES Soil Users Guide (April 2012):

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Paul Walker

Technical Director – Contaminated Land

Authorised for Tonkin & Taylor Ltd by:

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Pierre Malan

Project Director

25-Oct-19
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