2 Johnston St, Waitara

Preliminary Site Investigation

For Hareb Investments Ltd

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QUALITY INFORMATION

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Date: 21 November 2018

Prepared by: Tim Muller

Reviewed by: Kathryn Hooper

Client Review: **Scott Grieve (RMY Legal)**

Version Number: **FINAL**

SUMMARY

2 Johnston St is a former agricultural and horticultural site owned by Hareb Investments Ltd, which proposes to rezone it as residential through a private plan change. Landpro Ltd has completed this preliminary site investigation to identify historical hazardous activities with the potential to cause soil contamination, and to confirm the suitability of the site for residential use.

Pesticide use associated with horticulture was the only hazardous activity considered "more likely than not" to have occurred at the site. A small risk was also identified that contaminants associated with building materials (primarily lead, zinc and asbestos) may be present at elevated concentrations in localised areas around the buildings at the site.

As part of this preliminary site investigation, 12 soil samples were collected for laboratory analysis, with 7 samples collected in the central yard area at the site, near a cluster of present and former buildings, and the rest spread out across the rest of the site. All samples were analysed for organochlorine pesticides and toxic trace elements (AKA heavy metals), with 5 samples from near buildings also analysed for asbestos. The laboratory results showed:

- No detectable asbestos in any of the samples analysed.
- No detectable organochlorine pesticides in most samples, apart from 2 in which DDT and related compounds were detected at slightly above the detection limit.
- Above-background concentrations of some lead, arsenic, zinc and/or cadmium in a group of 5 samples from the central yard area. Generally the concentrations detected were not of concern from a human health perspective, but 2 samples contained arsenic and lead at concentrations equal to or exceeding the human health standard for residential land use (though generally only slightly greater than the standard).

Further soil sampling and testing are recommended before subdivision, soil disturbance, or construction of any houses proceeds. However, in our opinion, the preliminary results presented in this report are sufficient to confirm that the site is suitable for residential use, subject to appropriate management during the redevelopment.

The results also indicate that much of the soil at the site, while suitable for use on residential sites, would not be classified as cleanfill if removed from the site. Care should be taken when designing any future earthworks to ensure that as much of the topsoil as possible can be retained on site, to avoid unnecessary disposal costs.

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LIST OF ATTACHMENTS

1. INTRODUCTION

1.1 Background

Landpro Ltd was engaged by Hareb Investments Ltd (Hareb) to carry out a preliminary site investigation (PSI) of 2 Johnston St, Waitara. The site is owned by Hareb and is a former agricultural and horticultural site (though currently largely vacant). Hareb propose to rezone the site for future residential use via a private plan change.

1.2 Scope and sources of information

The brief was to carry out a PSI in accordance with the Ministry for the Environment's *Contaminated Land Management Guidelines* (2003-2011) and prepare this PSI report. The scope was as agreed with the client and was limited to the following sources of information:

- Review of New Plymouth District Council (NPDC) and Taranaki Regional Council (TRC) records relating to the site.
- Review of publicly available historical aerial photographs.
- Review of site development plans and geotechnical information.
- Requesting Fire and Emergency New Zealand (FENZ, formerly NZ Fire Service) records relating to any spills or other incidents at the site.
- Carrying out a site walkover.
- Collecting a small number of surface soil samples and submitting these for laboratory analysis.

Sources referred to, but not included in/attached to, this report can be provided on request.

1.3 Regulatory context

The Ministry for the Environment's *Hazardous Activities and Industries List* (HAIL, 2011) defines a number of activities with the potential to cause soil contamination, including persistent pesticide use on horticultural sites. The *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health* (NES, 2011) applies to land on which it is "more likely than not" that one or more of these activities has occurred or is occurring (see clause 5(7)).

On land covered by the NES, there are restrictions on changes of land use, subdivision, soil disturbance, soil sampling, and removing/replacing fuel storage systems. The proposed plan change does not involve any of these activities, except perhaps land use change. Under the NES, 'land use' is defined in terms of the actual activities occurring on the site, and is not necessarily

related to zoning (see clause 5(6) of the NES and Section 2.1.2, point 5 of the Ministry for the Environment's 2012 *User's Guide* to the NES). Perhaps for this reason, neither the *User's Guide* nor the NES itself explicitly state whether private plan changes are covered by the NES when there is no associated subdivision etc.

Regardless of the above issues of interpretation, this PSI has been prepared to give NPDC confidence that the land is generally suitable for the proposed residential land use. Further investigation and assessment under the NES will be needed when an application is lodged for subdivision consent (and the associated change of land use and probable soil disturbance).

In Waitara, the NES is primarily administered by NPDC. The following organisations also have a role in regulating (potentially) contaminated sites in the area:

- Worksafe, which administers the *Health and Safety at Work (Asbestos) Regulations 2016* (*Asbestos Regulations*). These Regulations are relevant to land on which there is "reasonable cause… to suspect that asbestos-contaminated soil is present" (see clause 10(4)).
- Taranaki Regional Council (TRC) also has responsibilities under the RMA to manage contaminated sites within the region. However, there are no rules in the relevant plans (*Freshwater Plan* and *Soil Plan*, both issued 2001 and revised 2018) which specifically relate to contaminated sites, unless the site is a closed landfill or an industrial or trade premise.

1.4 Project team

Under clause 3 of the NES, all PSIs and detailed site investigations (DSIs) must be completed by a "suitably qualified and experienced practitioner". The following Landpro staff have been involved in this PSI:

- **Kathryn Hooper**. Kathryn carried out the site inspection and soil sampling, and also reviewed this report. Kathryn has a Masters in Applied Science in Natural Resource Management from Massey University and the University of London, and a Graduate Certificate in Environmental Management from Central Queensland University. She is a founding director of Landpro and has over 20 years of experience in environmental management and planning in New Zealand, including 17 years working with the petroleum sector. She has also worked in consenting, pollution response and enforcement for Wellington and Taranaki Regional Councils.
- **Tim Muller**. I was primarily responsible for the desktop elements of this investigation (review of documents, etc) and wrote this report. I have a B.Sc. (Hons), 1st Class in chemistry and a B.A. in history, both from the University of Otago. Since then, I have spent 8 years working in environmental chemistry, primarily on contaminated land projects. I am also a Certified Environmental Practitioner (CEnvP) and a member of the Australasian Land

and Groundwater Association (ALGA) and the Environmental Institute of Australia and New Zealand (EIANZ).

- **Maddy Albertson**. Maddy assisted with the review of aerial photography and NPDC property file documents, under Tim's supervision. Maddy is a graduate planner with a Bachelor in Environment and Society from Lincoln University.

We consider ourselves to be suitably qualified and experienced to fulfil our respective roles on this project. Detailed CVs can be provided on request.

2. PROPOSED ACTIVITY

Figure 1 – Concept Plan – Bluemarble Ltd

Pursuant to Section 73(2) of the Resource Management Act 1991, the applicant is requesting that the New Plymouth District Plan be changed to re-zone Lot 3 DP 446773 from Rural Environment Area with a Future Development Overlay (Figure 1) to Residential A Environment Area.

Based on the proposed future use of the site, the residential (10 % home-grown produce) scenario is considered the most appropriate land-use category under the NES.

3. THE SITE

3.1 Location and land use

2 Johnston St is an approximately triangular, 11.3 ha site located on the western fringes of the town of Waitara. It is legally described as Lot 3 DP 446773.

The surrounding land use is primarily agricultural or rural residential. Land occupied by low-density urban housing (part of the town of Waitara) is located to the east. The site itself has been used for both agriculture and, more recently, horticulture. Currently, the site is largely vacant.

Figure 2 – Site boundaries overlaid on recent (post-2013) aerial photograph. Source: NPDC GIS viewer.

3.2 Topography and surface water

According to contour data available from the NPDC GIS viewer, the site slopes gently from approx. 40 metres above sea level (masl) near the southern corner to approx. 27 masl near the northern corner. This elevation change occurs over an approx. 640 m distance, meaning the typical slope across the site is approx. 1:50 (vertical:horizontal). This ignores local high and low points, most notably a ~3 m high pile of tree stumps and similar material near the northern corner, and a gully

which runs from approx. north-south through the centre of the site (the lowest point in the gully within the site is approx. 24 masl).

The site is divided into paddocks by shelterbelts, primarily pine trees.

A stream flows through the gully. According to NZ Topo Map and the NPDC GIS viewer, this flows into a small pond near Mayne St (approx. 300 m north of the site). The pond discharges into the Waitara stormwater system. The NPDC GIS viewer contours suggest that the catchment of the stream is limited to the site and a very small amount of surrounding land.

Figure 3 – A typical view of the site, looking north from the location of sample S7 (see Figure 12 for sample locations)

Figure 4 – Sample location S5, showing stream in background.

3.3 Geology and groundwater

Information on the soil profile at the site is available from both public sources, and logs from a site-specific geotechnical investigation carried out by Opus. In summary:

- The GNS Science/Te Pū Ao New Zealand Geology Webmap (2018, 1:250,000 scale) shows that the site is underlain by late Pleistocene sediments of the Okawa formation described as *'laharic breccia of andesite cobbles and boulders in a muddy matrix' ;*
- The site is not covered by SMap. The soil is identified as '*67a New Plymouth Black Loam'* from the North Island Four Mile Survey (source Taranaki Maps, 2018). This is typical Taranaki Volcanic Ash soil;
- There are no boreholes near the site listed in the New Zealand Geotechnical Database;
- The Opus hand auger logs (see **Attachment B**) indicate that the near-surface soil profile generally comprises topsoil underlain by clayey silts or silty clays. The exception was hand auger 3, in which the topsoil was underlain by peat to the base of the auger at

2 mbgl. This location is in the eastern part of the site, near the intersection of Raleigh and Borthwick Streets (see Figure 5). No fill was identified; and

- Groundwater was encountered at between 2.6 and 3.5 mbgl in every hand auger except no. 3 (which terminated at 2.0 mbgl). The relatively small variation in groundwater depths compared to surface elevation suggests that groundwater flow is likely to be generally towards the north, consistent with the surface contours, and probably controlled by the stream.

Figure 5 – Extract from draft hand auger location plan by Civil Infrastructure Consultants Ltd (drawing attached in Attachment A). Note that the reference to "test pits" is erroneous – we understand that all investigation locations were hand augers.

Based on *Maps of total soil concentrations (background levels) of chromium, copper, lead, nickel, vanadium and zinc in the Taranaki Region* (Landcare Research, 2001), and the fact that allophanic/volcanic soils are present at the site, the following approximate background concentrations are expected in near surface soils:

- Chromium: 10-45 mg/kg (dry weight);
- Copper: 50-120 mg/kg;
- Lead: 2-25 mg/kg;
- Nickel: 2-15 mg/kg;
- Vanadium: 150-300 mg/kg; and
- Zinc: 70-140 mg/kg.

Vanadium was not considered as part of this investigation as no evidence was found to suggest it might be elevated above background levels, and it is not included in the standard "heavy metals" laboratory suite used.

In the absence of Taranaki-specific data for arsenic and cadmium soil concentrations, the following approximate background concentrations for yellow brown loams were used:

- Arsenic: 3-10 mg/kg
- Cadmium: 0.4-0.9 mg/kg

These values are taken from Figures 2 and 3 of "Concentrations of arsenic, cadmium, copper, lead, and zinc in New Zealand pastoral topsoils and herbage" (Longhurst et al., 2004).

3.4 Other site observations

A historic milking shed is in the process of being demolished on the site, with roofing iron and materials removed and stockpiled nearby. There is also an old shed that has been used for stock housing in the past.

Pine trees are also in the process of being removed and at the time of sampling, were piled on site in places. These piles have largely been burnt at the time of writing.

4. HISTORY

4.1 Summary

The site was a dairy farm or a similar agricultural operation until between 1975 and 2001 (probably before 1984), after which it was redeveloped as a market garden or similar. There may have been two tunnel houses constructed in the mid-1980s, although, if so, these were removed before the time of the next available aerial photograph (2001). Horticultural activity at the site ceased in approx. 2011.

4.2 Detailed information by source

4.2.1 Aerial photographs

We have reviewed aerial photographs from the following sources:

- The National Library's Timeframes archive (dated 1947, 1958, 1965 and 1975);
- NPDC's GIS viewer (2001, 2005, 2007, 2010 and 2013).

No photos showing the site are available from Retrolens. Selected photos are presented and discussed below.

Figure 6 – 1947 aerial photo, showing part of the site near the top left corner. (Timeframes ref: WA-05583-F)

Although the site is near the edge of the 1947 photo and partially obscured, it appears that at least the visible part of the site was used for pastoral farming at that time.

Figure 7 - 1958 aerial photo showing site in left foreground (Timeframes ref: WA-477331-G)

The 1958 aerial photo shows the site much more clearly, and confirms that the site was pastoral farmland or similar at that time. At least two buildings are visible near the centre of the site. It is not clear whether these are the same as the two large sheds near the centre of the site at the time of the 2001 photograph. There is no evidence of a stock yard area around either building.

In the 1965 and 1975 aerial photographs (not pictured, Timeframes refs: WA-63609-F and WA-72894-F), the site is in the background and specific site features cannot be clearly seen. However, the photos do indicate that the site was still being used for pastoral farming during this period.

Figure 8 – 2001 aerial photograph, showing present property boundaries (source: NPDC GIS viewer)

By 2001, the site had been redeveloped for market gardening or a similar horticultural activity. At least 7 sheds or other small buildings were present in a yard area near the centre of the site. Some materials (probably pellets and timber beams) were being stored outside in the same area.

Figure 9 - 2005 aerial photo (NPDC GIS viewer)

The land use in 2005 had not changed significantly since 2001, but 2 of the small sheds had been removed from the southern part of the yard area.

Figure 10 – 2007 aerial photo (NPDC GIS viewer)

By 2007, an additional rectangular feature was present near the centre of the yard area. This was no longer present in the 2010 aerial photograph (not pictured), and may have been a house bus or tent. The market gardening activity also covers less of the site in 2007 than in previous photographs, although this may be due to the season in which the photo was taken. The 2010 aerial photo (not pictured) shows a similar area in horticulture to previous photographs.

Figure 11 - 2013 aerial photograph (NPDC GIS viewer)

The 2013 photograph shows that horticultural activity at the site had finished by that time. Many of the shelterbelt trees had been removed. Approx. 10 piles (presumably of tree stumps) had been formed in the eastern and northern parts of the site. Most of the smaller sheds had been removed, and the remaining buildings were falling into disrepair. Large areas of the yard were being used to store wrapped hay bales.

The two residential sections in the western part of the site were subdivided before 2013, and one house had been built.

4.2.2 NPDC records

The NPDC's property file for the site was reviewed and contained the following relevant documents:

- A 1984 building consent application for two 15.6 x 7 m tunnel houses. None of the buildings visible in the next aerial photograph (2001) are consistent with this description, suggesting that the tunnel houses were either removed/demolished before then, or were never actually built. The location of the proposed tunnel houses is not stated.
- 2011 documents relating to the subdivision that formed 44 Johnston St (the neighouring site to the west). We could find no evidence that soil contamination was considered as part of that application.
- An engineering report prepared by BAC Services in support of the above subdivision consent application states that "Our inspection of the site and surrounding terrain on 16th August 2011 indicates that the land has been used for horticultural purposes in recent years and is in the process of having shelter belts removed." Soil conditions at what is now 44 Johnston St were described as "300 mm on average of black topsoil over clean, firm, friable orangey/brown volcanic ash." This summary was based on 6 holes hand augered to 1.2-1.5 m, with no hard pan surface or groundwater encountered.

4.2.3 TRC records

TRC was asked whether it held any records related to potential contamination at the site. Its response (pers. comm. Callum MacKenzie 25/9/2018) stated that:

> *"The horticultural operator had a water abstraction consent at this site with no issues noted in our records. There are also five logged complaints regarding smoke from burning vegetation around the property, none of which were serious incidents."*

Fire Service records

FENZ was contacted to find out whether they have any record of fires, spills or other incidents at the site. It's response records 25 incidents in the general vicinity of the site since their records began (c. 1998). However, none of these were within the site boundaries. The 3 closest incidents occurred on Raleigh St near the site (based on the co-ordinates provided by FENZ). These were described as:

- A "mobile property fire" in 2010 (FENZ have confirmed that a mobile property fire is a vehicle fire),

- A second “mobile property fire” in 2012,
- An “outside rubbish bin, skip fire” in 2017.

Based on these brief descriptions and the fact that the incidents did not occur within the site boundary, they are considered to pose a very low risk of having caused contamination at the site.

A vegetation fire (October 2018) is also recorded within the site boundary. As a rural fire, only water was used to extinguish the fire and this too is considered to pose a very low risk of having caused contamination at the site.

However, as a precautionary measure incident reports will be requested from FENZ, and (if available) considered as part of the DSI.

5. SUMMARY OF DESKTOP INFORMATION

5.1 Hazardous activities

The only hazardous activity identified as “more likely than not” to have occurred at the site is horticulture, including market gardening across most of the site, and potentially two tunnel houses at an unknown location. Persistent pesticide use on horticultural sites is classified as HAIL code A10.

The current and former buildings at the site also represent a low-risk source of contaminants associated with building materials (primarily lead, zinc and asbestos).

5.2 Preliminary conceptual site model

A conceptual site model (CSM) is a description or depiction of the **sources** of contamination actually or potentially present at a site, the **receptors** who could be exposed to the contamination, and the **pathways** by which they might be exposed. The preliminary CSM for this site (to be refined as more information becomes available) is summarised below.

- The primary **source** of contamination at the site is **pesticides from horticulture**, with toxic trace elements such as copper, lead and arsenic or organochlorine pesticides (OCPs) like DDT being the primary contaminants of concern. These pesticides are persistent and are generally expected to have low mobility in the soils at the site. The pesticides would generally have been applied in a broad-acre fashion. For these reasons, pesticide residues are likely to be present in shallow soil only, and at consistent

concentrations across the site (except for potential hotspots such as the former tunnel houses and any mixing areas).

- The **buildings on the site are an additional potential source** of contamination. However, any such contamination is likely to be very localized. The primary contaminants of concern in these areas are lead, zinc and asbestos (although the buildings are generally of timber and steel construction/cladding, and the risk of asbestos being present in soil is very low).
- The **receptors** of primary concern are the future residents of the site, particularly children, who tend to have higher exposure to contaminants in soil due to outdoor play and hand-to-mouth activity. Children are also more vulnerable to the toxic effects of many contaminants.
- Given the proposed residential use, most of the **pathways** typically considered in contaminated site investigations (soil ingestion, dust inhalation, skin absorption, produce consumption etc) are at least potentially relevant. However:
    - Due to the availability of reticulated drinking water in the area, it is considered unlikely that groundwater or surface water at the site would be used for household/drinking water, either now or in the future.
    - There is no evidence of activities that may lead to volatile contaminants in soil or groundwater, and therefore vapour intrusion is not a relevant pathway.

6. SOIL SAMPLING

6.1 Methodology

To provide initial evidence to test the CSM, 12 soil samples were collected at the site. Samples S1-S7 were collected in the yard area near the current and former buildings on the site, while samples S8-S12 were collected in the paddocks around the remainder of the site.

Samples were collected at the locations identified in Figure 12 below.

Figure 12 - Approximate sample locations over 2016 aerial photo from NPDC GIS viewer. Left: samples in yard area; right: samples in rest of site.

All samples were sent to Hill Laboratories for analysis for "heavy metals" (a standard suite of 7 toxic trace elements) and OCPs. In addition, 5 samples were analysed for asbestos in soil.

6.2 Results

The results are included in full in **Attachment C**, and can be summarised as follows:

- No asbestos was detected in the 5 samples tested (S1 and S4-S7).
- DDT and breakdown products were detected in samples S3 and S9 only, at concentrations slightly greater than the detection limit (max. ΣDDT ignoring non-detects: 0.051 mg/kg in sample S9). No other OCPs were detected.
- Toxic trace elements were generally within the expected background range, with the following exceptions:
    - **Lead** concentrations exceeded background levels in samples S1 and S3-S6. Three of these samples contained lead at significantly less than the relevant human health guideline for residential use (10% produce consumption) of 210 mg/kg. The remaining 2 lead concentrations were 210 mg/kg (S5) and 300 mg/kg (S3).
    - **Arsenic** concentrations were above the expected background concentrations in samples S3 (42 mg/kg) and S4 (20 mg/kg) only. These concentrations also exceed/equal the human health standard for residential use (20 mg/kg).
    - **Zinc** concentrations exceeded the expected background levels in samples S1 and S3-S6 (the same group in which elevated lead was detected). The maximum concentration was 1,530 mg/kg in S3, with all other concentrations measured below 350 mg/kg. Zinc has a low level of toxicity, and is not a priority contaminant under the NES. The United States Environmental Protection

Agency's (2018) Regional Screening Level for zinc and compounds in residential soil is 23,000 mg/kg, an order of magnitude greater than the highest concentration detected at the site.

- **Cadmium** was detected at 0.97 mg/kg in sample S3, slightly outside the estimated background range (0.4-0.9 mg/kg). In practice, this result is considered indistinguishable from background levels, given the margin of error of the laboratory results and the estimated background range. Regardless, this concentration is below the human health standard for cadmium (3 mg/kg).

The samples with elevated lead, zinc and arsenic concentrations were all within the yard area near former/present buildings, and may be due to building materials (lead paint, galvanised steel sheets, and treated timber) rather than pesticides. Fenceposts and some building materials were being stored around these buildings at the time of our site visit. That said, the two samples with above-background arsenic concentrations did not have noticeably elevated concentrations of copper or chromium, as might be expected if the source was treated timber.

In summary, the results indicate that soil contaminant concentrations at the site are generally suitable for residential use, as well as being consistent with the CSM. However, 3 of the 12 samples (S3-S5, all within the central yard area) contained arsenic and/or lead at a concentration that either exceeded or equalled the relevant human health guideline. Further soil samples around these locations should be included in the DSI, along with sub-surface samples to confirm elevated contaminant concentrations are present below the topsoil layer.

7. CONCLUSION AND RECOMMENDATIONS

The site has been used for agricultural and horticultural activities. Limited soil sampling carried out as part of this PSI identified above-background concentrations of DDT and breakdown products, as well as toxic trace elements (primarily arsenic, lead and zinc). Of the 12 samples analysed, S3, S4 and S5 contained lead and or arsenic at or slightly above (approx. double or less) the relevant human health standard for residential land use (with 10 % produce consumption). The concentrations of all contaminants tested for complied with the relevant standards in the remaining 9 samples, and no asbestos was detected in the 5 samples tested for it. All of the samples complied with the human health standards for recreational use, meaning that even soil from the potential hotspots identified may be safe for use in parks as part of the proposed development.

In our opinion, these results show that from a soil contamination perspective the site is suitable for the proposed residential rezoning. This is subject to further investigation, and implementation of appropriate remediation/management measures before any change of land use, subdivision,

or soil disturbance in excess of that permitted under the NES. The level of additional investigation required will depend on the specific development proposal, but as a minimum the investigation should include:

- obtaining and reviewing at least one additional aerial photo from between 1984 and 2001 (ideally early 1990s, if available) to confirm whether the tunnel houses referred to in the property file were ever built, and if so where.
- comment on any relevant additional information provided by FENZ.
- **at least** one soil sample per proposed residential lot.
- further investigation to delineate (horizontally and vertically) the potential hot spots identified at locations S3-S5.

The preliminary investigation results presented in this report indicate a low level of risk, but nonetheless some remediation or management will be required for soil near the existing/former buildings in the yard area.

Based on the results of this investigation, we consider that:

- It is highly unlikely that a risk to the health of future residents at the site will exist at the site due to contaminants in soil, provided that the future land use is generally consistent with that assumed in this report, and that further investigation and remediation/management are carried out before residential use or soil disturbance commences (probably during the subdivision consent application process).
- At this stage, there is no reasonable cause to suspect that asbestos-contaminated soil is present at the site, and therefore clause 10(1) of the *Asbestos Regulations* does not apply to soil at the site. It would still be prudent to consider the possibility of asbestos contamination during future investigations, including (at a minimum) a detailed walkover inspection of the areas near present and former buildings.
- Nonetheless, some of the topsoil at the site contains contaminants at least slightly above background levels. While the preliminary sampling results indicate that most soil is suitable for residential use, soil with above-background contaminant concentrations can not be treated as cleanfill, if removed from the site. Any future earthworks should be designed to maximise the amount of topsoil that can be retained on site. If this is not possible, options for cost-effective off-site disposal as managed fill should be considered well in advance to avoid unnecessary additional costs.

Attachment A: Site plan, showing hand auger locations

File Name: D:\OneDrive - Civil Infrastructure Consulting_Jobs\1819 - 2 Johnston St Subdivision\Dwg\1819-02 Test Location Plan.dwg - TESTING PLAN Plot Date: 24/09/2018 Plot Time: 16:30

civil infrastructure consulting

Civil Infrastructure Consulting Ltd
13 French St
NEW PLYMOUTH 4310
Ph: (06) 215 4783
Mob: (021) 617 331
Email: mike@cic.nz
www.cic.nz

NO	DATE	BY	CHKD	APPR	DESCRIPTION
?	??/??/??	???	???	???	DESCRIPTION

REVISIONS

CLIENT: **HAREB INVESTMENTS LTD**

1. Coordinates in terms of : New Zealand Transverse Mercator Projection
2. Elevations in terms of : Mean Sea Level (Taranaki Datum 1970)
3. Contour interval is : N/A

LOCATION	LOCATION	
PROJECT No.	PROJECT NUMBER	
A3 SCALE	AS SHOWN	
SURVEYED	-	-
DRAWN	-	-
CHECKED	-	-

PROJECT: **2 Johnston Street, Waitara**

DRAWING DESCRIPTION: **Test Pit Location Plan**

ORIGINAL SIZE	
A3	
DRAWING No	
00000-00	
REVISION	SHEET
01	0

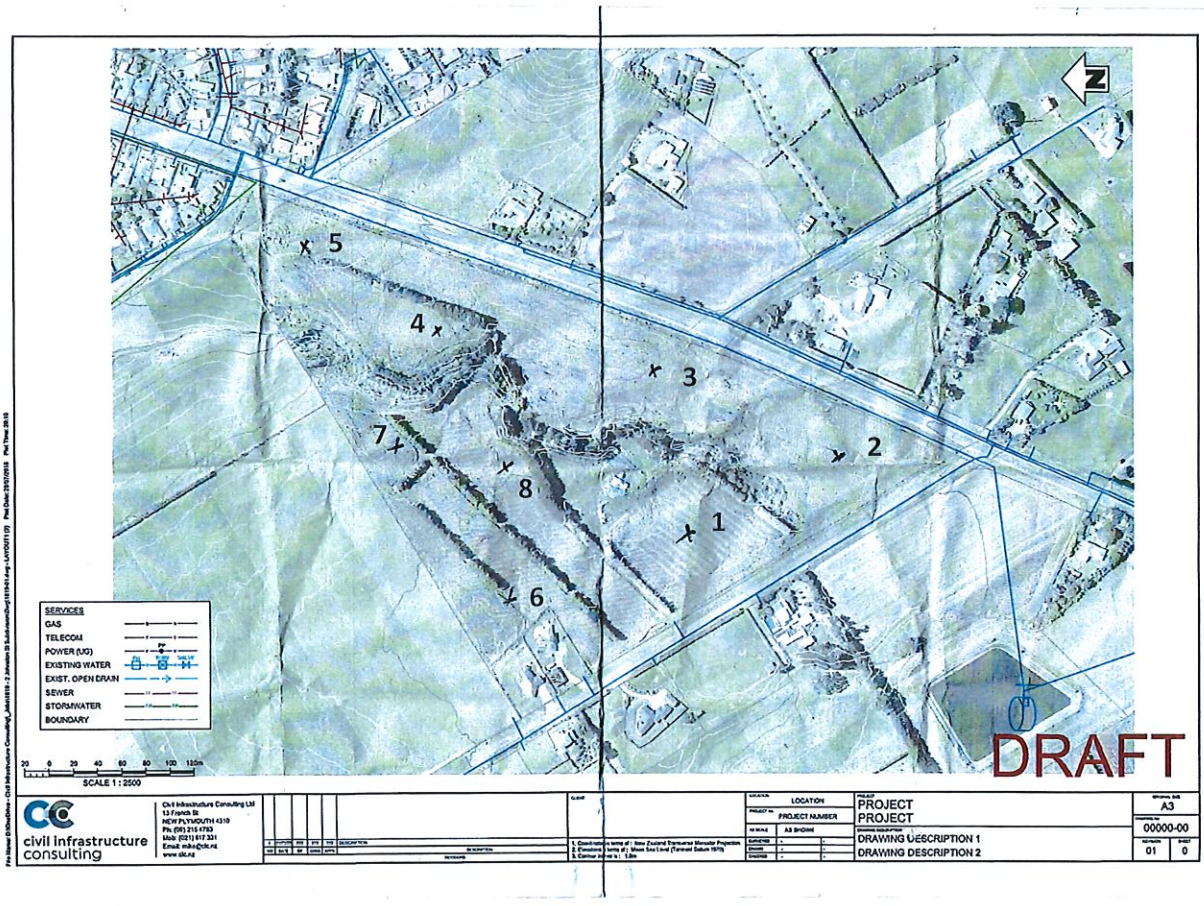
Attachment B: Hand auger logs

TEST REPORT

Project :	**Proposed Building Site Investigation**
Location :	**Johnston St, Waitara (see plan)**
Client :	**Civil Infrastructure Consulting**
Contractor :	**N/A**
Sampled by :	**Opus Laboratory, New Plymouth**
Date sampled :	**13-14 August 2018**
Sampling method :	**Scala & Hand Auger**
Sample description :	**Various**
Sample condition :	**In Situ Ground**

Project No :	**5-NPCIC.00**
Lab Ref No :	**NP784-1**
Client Ref No :	**Michael Matangi**

Test Results



Date tested : 13-14/08/18
Date reported : 14/08/18

Approved

Rowan Carlyle
Designation : *Laboratory Manager*
Date : 14/08/18

WSP Opus
New Plymouth Laboratory
Quality Management Systems Certified to ISO 9001

13 Constance Street
Private Bag 2037, New Plymouth 4342,
New Zealand

Telephone +64 6 759 8870
Website www.wsp-opus.co.nz

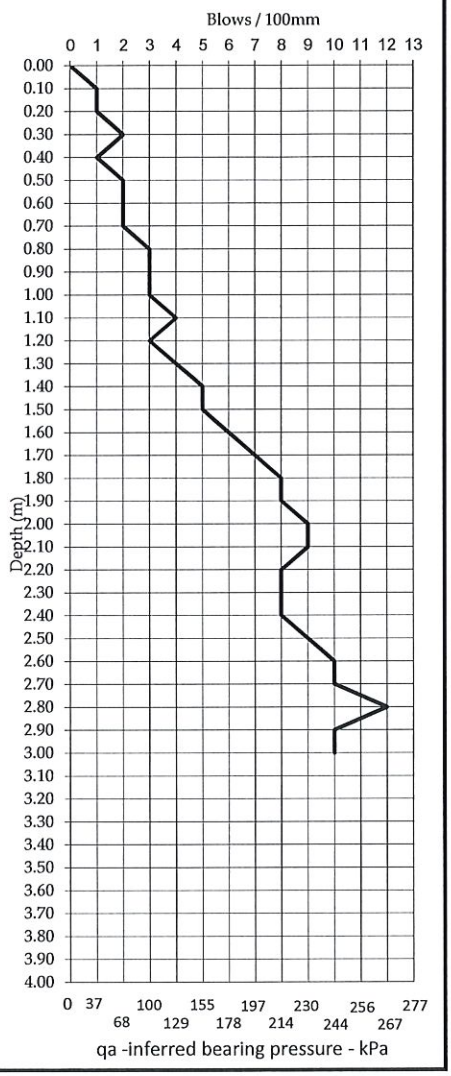
AUGER / SCALA PENETROMETER TEST REPORT

WSP | OPUS

Project :	**Proposed Building Site Investigation**
Location :	**Johnston St, Waitara (see plan)**
Client :	**Civil Infrastructure Consulting**
Contractor :	**N/A**
Test number :	**1**
Shear vane number :	**NPL851079**
Shear vane correction :	**7.718**
Water level (m):	**3.6**

Project No :	**5-NPCIC.00**
Lab Ref No :	**NP784-1**
Client Ref No :	**Michael Matangi**

Scala Penetrometer



Test Results

Depth (m)	Shear Strength (kPa)	Soil Description
0.00		
0.35		Topsoil
0.50	66	Slightly Clayey SILT, brown, stiff to very stiff, moist, slightly plastic
1.00	158	
1.20		
1.50	201+	Clay SILT, brown, very stiff to hard, moist, plastic
2.00	139	
2.50	201+	
3.00	201+	
3.60		Clay SILT w/ trace Sand, brown, hard, moist, plastic **Water Level 3.0m**
4.00		
		End of auger UTP denotes Unable To Penetrate

Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2	Field Descriptions of Soils and Rocks by
Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001	NZ Geotechnical Society Dec 2005, Scala over 1.5m
Note : Inferred bearing pressure values from NZ Engineering June 1977, MJ Stockwell	and Inferred bearing pressure values are not IANZ accredited

Date tested : 13-14/08/18
Date reported : 14/08/18

Approved

Rowan Carlyle
Designation : *Laboratory Manager*
Date : 14/08/18

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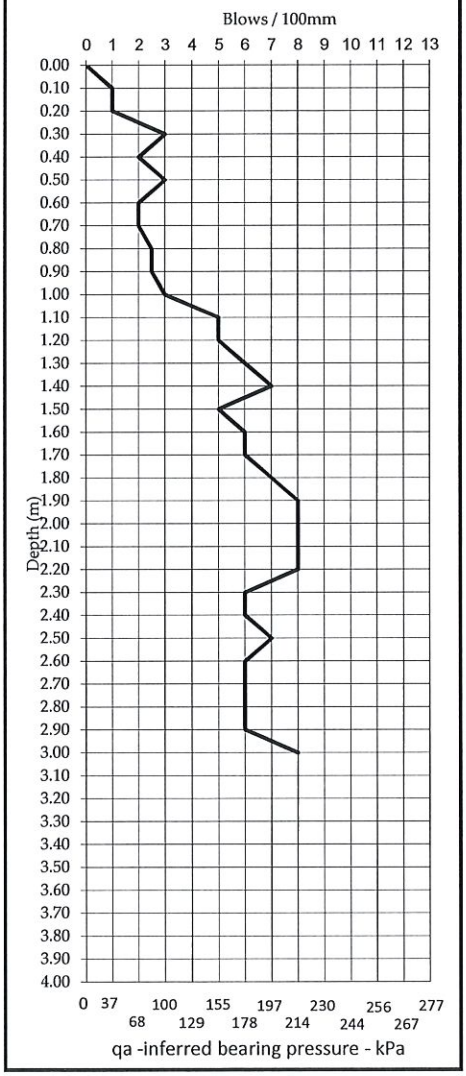
AUGER / SCALA PENETROMETER TEST REPORT

WSP | OPUS

Project :	**Proposed Building Site Investigation**
Location :	**Johnston St, Waitara (see plan)**
Client :	**Civil Infrastructure Consulting**
Contractor :	**N/A**
Test number :	**2**
Shear vane number :	**NPL851079**
Shear vane correction :	**7.718**
Water level (m):	**2.6**

Project No :	**5-NPCIC.00**
Lab Ref No :	**NP784-1**
Client Ref No :	**Michael Matangi**

Scala Penetrometer



Test Results

Depth (m)	Shear Strength (kPa)	Soil Description
0.00		
0.20		Topsoil
0.50	170	Slightly Clayey SILT, brown, very stiff, moist, slightly plastic
1.00	100	
1.40		Clay SILT, brown, very stiff, moist, plastic
1.50	201+	
2.00	201+	
2.50	201+	Clay SILT w/ trace Sand, brown, hard to very stiff, moist, plastic
2.60		**Water Level 2.6m**
3.00	151	
3.50		
		Clay SILT w/ Sand, Pumice & Small Gravels, light brown, hard, moist, plastic
4.00		
		End of auger
		UTP denotes Unable To Penetrate

Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2	Field Descriptions of Soils and Rocks by
Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001	NZ Geotechnical Society Dec 2005, Scala over 1.5m
Note : Inferred bearing pressure values from NZ Engineering June 1977, MJ Stockwell	and Inferred bearing pressure values are not IANZ accredited

Date tested : 13-14/08/18
Date reported : 14/08/18

Approved

Rowan Carlyle
Designation : *Laboratory Manager*
Date : 14/08/18

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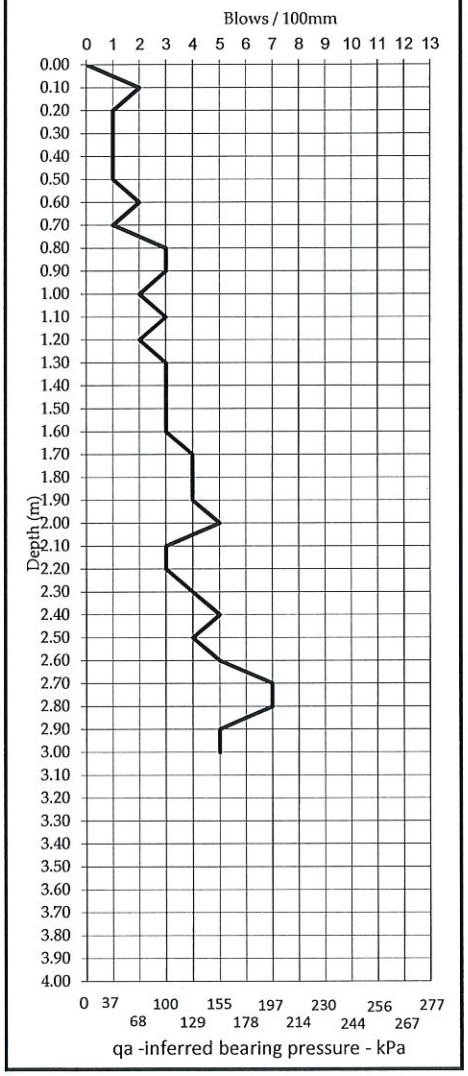
AUGER / SCALA PENETROMETER TEST REPORT

WSP | OPUS

Project :	**Proposed Building Site Investigation**
Location :	**Johnston St, Waitara (see plan)**
Client :	**Civil Infrastructure Consulting**
Contractor :	**N/A**
Test number :	**3**
Shear vane number :	**NPL851079**
Shear vane correction :	**7.718**
Water level (m):	**Not found**

Project No :	**5-NPCIC.00**
Lab Ref No :	**NP784-1**
Client Ref No :	**Michael Matangi**

Scala Penetrometer



Test Results

Depth (m)	Shear Strength (kPa)	Soil Description
0.00 0.20		Topsoil
0.50	54	
1.00	50	Peat
1.50	54	
2.00	UTP	
		End of auger - unable to dig (hit wood) (3rd attempt)
		UTP denotes Unable To Penetrate

Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2	Field Descriptions of Soils and Rocks by
Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001	NZ Geotechnical Society Dec 2005, Scala over 1.5m
Note : Inferred bearing pressure values from NZ Engineering June 1977, MJ Stockwell	and Inferred bearing pressure values are not IANZ accredited

Date tested : 13-14/08/18
Date reported : 14/08/18

Approved

Rowan Carlyle
Designation : *Laboratory Manager*
Date : 14/08/18

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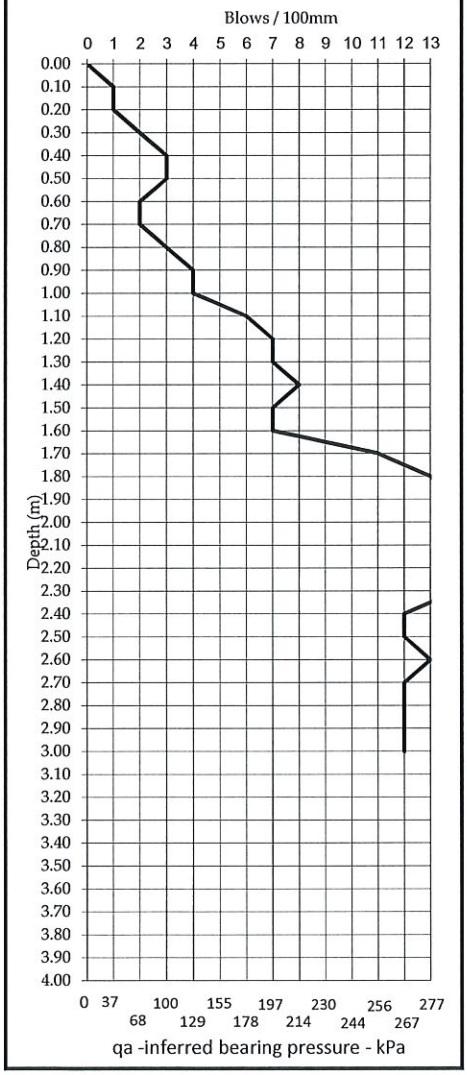
AUGER / SCALA PENETROMETER TEST REPORT

WSP | OPUS

Project :	**Proposed Building Site Investigation**
Location :	**Johnston St, Waitara (see plan)**
Client :	**Civil Infrastructure Consulting**
Contractor :	**N/A**
Test number :	**4**
Shear vane number :	**NPL851079**
Shear vane correction :	**7.718**
Water level (m):	**3.4**

Project No :	**5-NPCIC.00**
Lab Ref No :	**NP784-1**
Client Ref No :	**Michael Matangi**

Scala Penetrometer



Test Results

Depth (m)	Shear Strength (kPa)	Soil Description
0.00 0.20		Topsoil
0.50 1.00 1.20	189 201+	Slightly Clayey SILT, brown, very stiff to hard, moist, slightly plastic
1.50 1.70	201+	Clay SILT w/ trace Sand, brown, hard, moist, plastic
2.00 2.50 2.60	201+ 201+	Clay SILT, brown, hard, moist, plastic
  3.00 3.10	 178	Clay SILT w/ trace Sand, brown, hard to very stiff, moist, plastic
3.40 4.00		**Water Level 3.40m** Clay SILT w/ Sand, Pumice & Small Gravels, light brown, hard, moist, plastic
		End of auger UTP denotes Unable To Penetrate

Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2 Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001 Note : Inferred bearing pressure values from NZ Engineering June 1977, MJ Stockwell	Field Descriptions of Soils and Rocks by NZ Geotechnical Society Dec 2005, Scala over 1.5m and Inferred bearing pressure values are not IANZ accredited

Date tested : 13-14/08/18
Date reported : 14/08/18

Approved

Rowan Carlyle
Designation : *Laboratory Manager*
Date : 14/08/18

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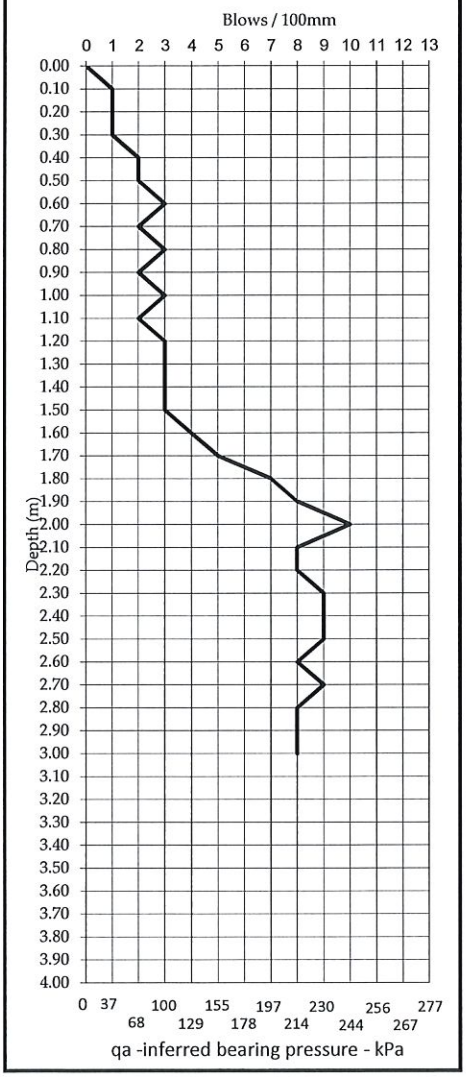
AUGER / SCALA PENETROMETER TEST REPORT

WSP | OPUS

Project :	**Proposed Building Site Investigation**
Location :	**Johnston St, Waitara (see plan)**
Client :	**Civil Infrastructure Consulting**
Contractor :	**N/A**
Test number :	**5**
Shear vane number :	**NPL851079**
Shear vane correction :	**7.718**
Water level (m):	**2.8**

Project No :	**5-NPCIC.00**
Lab Ref No :	**NP784-1**
Client Ref No :	**Michael Matangi**

Scala Penetrometer



Test Results

Depth (m)	Shear Strength (kPa)	Soil Description
0.00 0.25		Topsoil
0.50	189	Slightly Clayey SILT, brown, very stiff, moist, slightly plastic
1.00 1.20	185	
1.50	93	Clay SILT w/ trace Sand, brown, stiff to hard, moist, plastic
2.00	201+	
2.50	201+	
2.80		**Water Level 2.80m** Clay SILT w/ trace Sand, brown, hard, moist, plastic
3.00	201+	
3.20		
		End of auger - unable to dig further (hard gravels)
		UTP denotes Unable To Penetrate

Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2	Field Descriptions of Soils and Rocks by
Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001	NZ Geotechnical Society Dec 2005, Scala over 1.5m
Note : Inferred bearing pressure values from NZ Engineering June 1977, MJ Stockwell	and Inferred bearing pressure values are not IANZ accredited

Date tested : 13-14/08/18
Date reported : 14/08/18

Approved

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Designation : *Laboratory Manager*
Date : 14/08/18

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AUGER / SCALA PENETROMETER TEST REPORT

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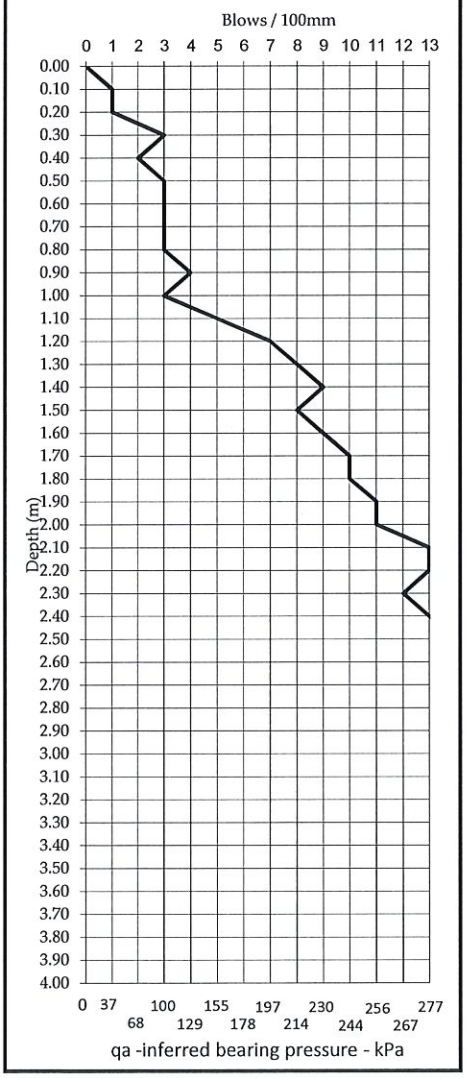
Project :	**Proposed Building Site Investigation**
Location :	**Johnston St, Waitara (see plan)**
Client :	**Civil Infrastructure Consulting**
Contractor :	**N/A**
Test number :	**6**
Shear vane number :	**NPL851079**
Shear vane correction :	**7.718**
Water level (m):	**2.7**

Project No :	**5-NPCIC.00**
Lab Ref No :	**NP784-1**
Client Ref No :	**Michael Matangi**

Scala Penetrometer



Test Results

Depth (m)	Shear Strength (kPa)	Soil Description
0.00 0.20		Topsoil
0.50	93	Slightly Clayey SILT, brown, stiff to very stiff, moist, slightly plastic
1.00 1.10	166	
1.50	201+	Clay SILT, brown, hard, moist, plastic
1.80		
2.00	170	
2.50	189	
2.70		**Water Level 2.7m**
3.00	201+	Clay SILT w/ trace Sand, brown, very stiff to hard, moist, plastic
3.90		
		End of auger - unable to dig further
		UTP denotes Unable To Penetrate

Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2	Field Descriptions of Soils and Rocks by
Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001	NZ Geotechnical Society Dec 2005, Scala over 1.5m
Note : Inferred bearing pressure values from NZ Engineering June 1977, MJ Stockwell	and Inferred bearing pressure values are not IANZ accredited

Date tested : 13-14/08/18
Date reported : 14/08/18

Approved

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Designation : *Laboratory Manager*
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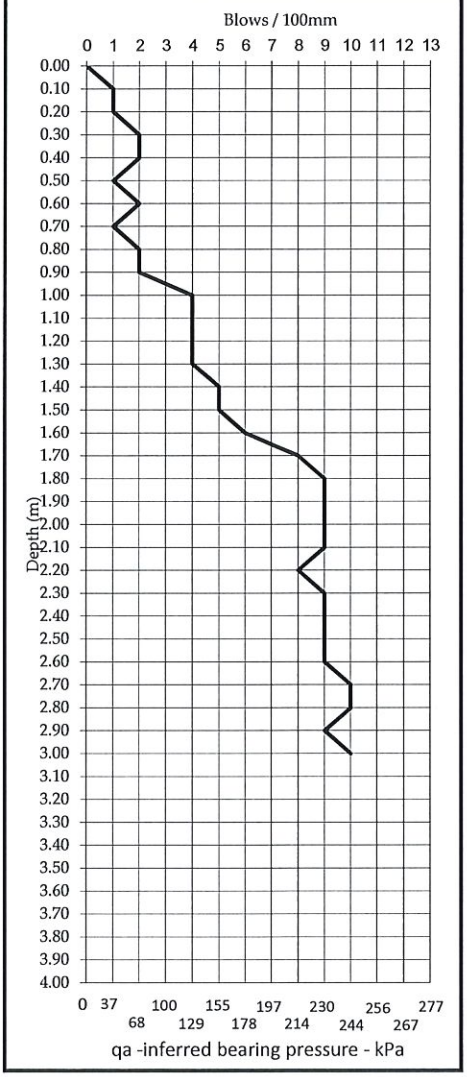
AUGER / SCALA PENETROMETER TEST REPORT

WSP | OPUS

Project :	**Proposed Building Site Investigation**
Location :	**Johnston St, Waitara (see plan)**
Client :	**Civil Infrastructure Consulting**
Contractor :	**N/A**
Test number :	**7**
Shear vane number :	**NPL851079**
Shear vane correction :	**7.718**
Water level (m):	**3.5**

Project No :	**5-NPCIC.00**
Lab Ref No :	**NP784-1**
Client Ref No :	**Michael Matangi**

Scala Penetrometer



Test Results

Depth (m)	Shear Strength (kPa)	Soil Description
0.00 0.10		Topsoil
0.50	174	Slightly Clayey SILT, brown, very stiff to hard, moist, slightly plastic
1.00 1.10	201+	
1.50	201+	Clay SILT, brown, hard, moist, plastic
2.00	201+	
2.50 2.60	201+	
3.00	201+	Clay SILT w/ trace Sand, brown, hard, moist, plastic
3.50		**Water Level 3.5m**
3.80		
4.00		Clay SILT w/ Sand, Pumice & Small Gravels, light brown, hard, moist, plastic
		End of auger UTP denotes Unable To Penetrate

Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2 Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001 Note : Inferred bearing pressure values from NZ Engineering June 1977, MJ Stockwell	Field Descriptions of Soils and Rocks by NZ Geotechnical Society Dec 2005, Scala over 1.5m and Inferred bearing pressure values are not IANZ accredited

Date tested : 13-14/08/18
Date reported : 14/08/18

Approved

Rowan Carlyle
Designation : *Laboratory Manager*
Date : 14/08/18

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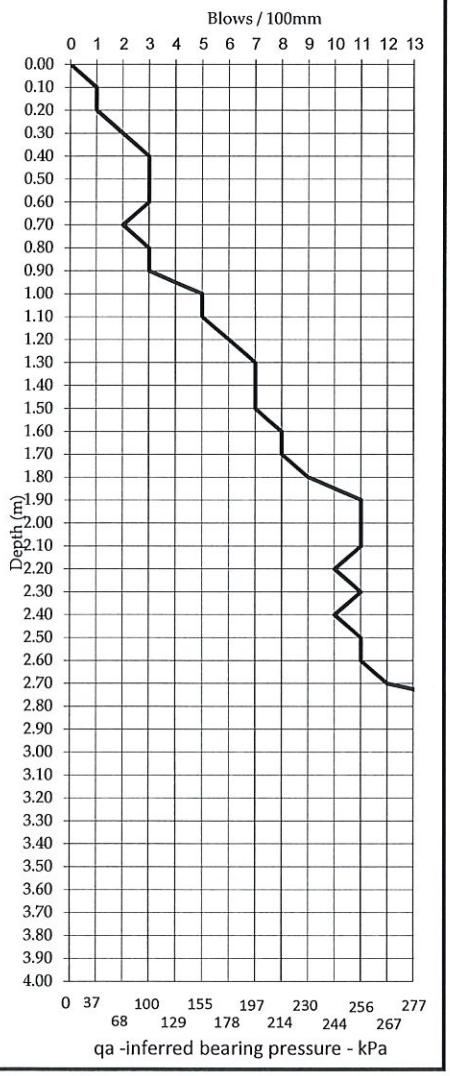
AUGER / SCALA PENETROMETER TEST REPORT

WSP | OPUS

Project :	**Proposed Building Site Investigation**
Location :	**Johnston St, Waitara (see plan)**
Client :	**Civil Infrastructure Consulting**
Contractor :	**N/A**
Test number :	**8**
Shear vane number :	**NPL851079**
Shear vane correction :	**7.718**
Water level (m):	**2.7**

Project No :	**5-NPCIC.00**
Lab Ref No :	**NP784-1**
Client Ref No :	**Michael Matangi**

Scala Penetrometer



Test Results

Depth (m)	Shear Strength (kPa)	Soil Description
0.00		
0.30		Topsoil
0.50	143	Slightly Clayey SILT, brown, very stiff, moist, slightly plastic
1.00	197	
1.20		
1.50	201+	
2.00	185	Clay SILT, brown, very stiff to hard, moist, plastic
2.50	174	
3.00	201+	**Water Level 3.0m**
3.50		Clay SILT w/ trace Sand, brown, moist, plastic
4.00		
		End of auger
		UTP denotes Unable To Penetrate

Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2	Field Descriptions of Soils and Rocks by
Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001	NZ Geotechnical Society Dec 2005, Scala over 1.5m
Note : Inferred bearing pressure values from NZ Engineering June 1977, MJ Stockwell	and Inferred bearing pressure values are not IANZ accredited

Date tested : 13-14/08/18
Date reported : 14/08/18

Approved

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Date : 14/08/18

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Attachment C: Laboratory results

Hill Laboratories
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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	Landpro Limited	**Lab No:**	2048918	SPv1
Contact:	Tim Muller	**Date Received:**	15-Sep-2018	
	C/- Landpro Limited	**Date Reported:**	21-Sep-2018	
	PO Box 302	**Quote No:**	94764	
	Cromwell 9342	**Order No:**		
		Client Reference:		
		Submitted By:	Tim Muller	

Sample Type: Soil

Sample Name:		S7 14-Sep-2018 11:42 am	S3 14-Sep-2018 11:49 am	S4 14-Sep-2018 11:55 am	S1 14-Sep-2018 12:02 pm	S2 14-Sep-2018 12:10 pm
Lab Number:		2048918.1	2048918.2	2048918.3	2048918.4	2048918.5
Individual Tests						
Dry Matter	g/100g as rcvd	66	58	63	53	59
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	10	42	20	9	3
Total Recoverable Cadmium	mg/kg dry wt	0.37	0.97	0.58	0.49	0.11
Total Recoverable Chromium	mg/kg dry wt	16	27	15	11	8
Total Recoverable Copper	mg/kg dry wt	89	112	83	79	66
Total Recoverable Lead	mg/kg dry wt	16.3	300	151	44	16.6
Total Recoverable Nickel	mg/kg dry wt	6	8	5	5	4
Total Recoverable Zinc	mg/kg dry wt	94	1,530	310	350	114
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	562.2	-	509.1	463.6	-
Dry Weight	g	394.6	-	327.7	256.7	-
Ashed Weight	g	343.2	-	277.1	210.3	-
Moisture	%	30	-	36	45	-
Dry Sample Fraction >10mm	g ashed wt	51.0	-	5.4	1.4	-
Sample Fraction <10mm to >2mm	g ashed wt	33.3	-	40.7	20.5	-
Sample Fraction <2mm	g ashed wt	257.8	-	230.1	187.9	-
<2mm Subsample Weight	g ashed wt	53.3	-	53.7	51.8	-
Asbestos Presence / Absence		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	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	-	< 0.001	< 0.001	-
Weight of Asbestos as Fibrous Asbestos (Friable)	g ashed wt	< 0.00001	-	< 0.00001	< 0.00001	-
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	-	< 0.001	< 0.001	-
Weight of Asbestos as Asbestos Fines (Friable)*	g ashed wt	< 0.00001	-	< 0.00001	< 0.00001	-
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	-	< 0.001	< 0.001	-
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	-	< 0.001	< 0.001	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
alpha-BHC	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
beta-BHC	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
delta-BHC	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017

Sample Type: Soil						
Sample Name:		S7 14-Sep-2018 11:42 am	S3 14-Sep-2018 11:49 am	S4 14-Sep-2018 11:55 am	S1 14-Sep-2018 12:02 pm	S2 14-Sep-2018 12:10 pm
Lab Number:		2048918.1	2048918.2	2048918.3	2048918.4	2048918.5
Organochlorine Pesticides Screening in Soil						
gamma-BHC (Lindane)	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
cis-Chlordane	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
trans-Chlordane	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
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	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
4,4'-DDD	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
2,4'-DDE	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
4,4'-DDE	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
2,4'-DDT	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
4,4'-DDT	mg/kg dry wt	< 0.015	0.027	< 0.016	< 0.019	< 0.017
Total DDT Isomers	mg/kg dry wt	< 0.09	< 0.11	< 0.10	< 0.12	< 0.10
Dieldrin	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
Endosulfan I	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
Endosulfan II	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
Endosulfan sulphate	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
Endrin	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
Endrin aldehyde	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
Endrin ketone	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
Heptachlor	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
Heptachlor epoxide	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
Hexachlorobenzene	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017
Methoxychlor	mg/kg dry wt	< 0.015	< 0.018	< 0.016	< 0.019	< 0.017

Sample Name:		S6 14-Sep-2018 12:18 pm	S5 14-Sep-2018 12:25 pm	S9 14-Sep-2018 12:31 pm	S11 14-Sep-2018 12:39 pm	S12 14-Sep-2018 12:42 pm
Lab Number:		2048918.6	2048918.7	2048918.8	2048918.9	2048918.10
Individual Tests						
Dry Matter	g/100g as rcvd	67	55	61	62	66
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	7	5	9	8	11
Total Recoverable Cadmium	mg/kg dry wt	0.34	0.29	0.30	0.32	0.50
Total Recoverable Chromium	mg/kg dry wt	10	9	13	14	18
Total Recoverable Copper	mg/kg dry wt	73	67	97	97	93
Total Recoverable Lead	mg/kg dry wt	118	210	10.5	10.2	11.5
Total Recoverable Nickel	mg/kg dry wt	5	5	5	6	6
Total Recoverable Zinc	mg/kg dry wt	153	230	75	82	88
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
As Received Weight	g	516.3	433.9	-	-	-
Dry Weight	g	309.9	245.0	-	-	-
Ashed Weight	g	263.0	200.8	-	-	-
Moisture	%	40	44	-	-	-
Dry Sample Fraction >10mm	g ashed wt	18.7	5.3	-	-	-
Sample Fraction <10mm to >2mm	g ashed wt	48.6	12.6	-	-	-
Sample Fraction <2mm	g ashed wt	195.1	182.4	-	-	-
<2mm Subsample Weight	g ashed wt	54.6	54.6	-	-	-
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	-	-	-

Sample Type: Soil						
Sample Name:		S6 14-Sep-2018 12:18 pm	S5 14-Sep-2018 12:25 pm	S9 14-Sep-2018 12:31 pm	S11 14-Sep-2018 12:39 pm	S12 14-Sep-2018 12:42 pm
Lab Number:		2048918.6	2048918.7	2048918.8	2048918.9	2048918.10
New Zealand Guidelines Semi Quantitative Asbestos in Soil						
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	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
alpha-BHC	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
beta-BHC	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
delta-BHC	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
gamma-BHC (Lindane)	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
cis-Chlordane	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
trans-Chlordane	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
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	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
4,4'-DDD	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
2,4'-DDE	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
4,4'-DDE	mg/kg dry wt	< 0.015	< 0.018	0.026	< 0.016	< 0.015
2,4'-DDT	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
4,4'-DDT	mg/kg dry wt	< 0.015	< 0.018	0.025	< 0.016	< 0.015
Total DDT Isomers	mg/kg dry wt	< 0.09	< 0.11	< 0.10	< 0.10	< 0.09
Dieldrin	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
Endosulfan I	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
Endosulfan II	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
Endosulfan sulphate	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
Endrin	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
Endrin aldehyde	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
Endrin ketone	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
Heptachlor	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
Heptachlor epoxide	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
Hexachlorobenzene	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015
Methoxychlor	mg/kg dry wt	< 0.015	< 0.018	< 0.017	< 0.016	< 0.015

Sample Name:		S10 14-Sep-2018 12:47 pm	S8 14-Sep-2018 12:50 pm			
Lab Number:		2048918.11	2048918.12			
Individual Tests						
Dry Matter	g/100g as rcvd	62	64	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	9	9	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.36	0.78	-	-	-
Total Recoverable Chromium	mg/kg dry wt	16	14	-	-	-
Total Recoverable Copper	mg/kg dry wt	69	74	-	-	-
Total Recoverable Lead	mg/kg dry wt	14.3	10.7	-	-	-
Total Recoverable Nickel	mg/kg dry wt	7	7	-	-	-
Total Recoverable Zinc	mg/kg dry wt	65	64	-	-	-
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.016	< 0.015	-	-	-
alpha-BHC	mg/kg dry wt	< 0.016	< 0.015	-	-	-
beta-BHC	mg/kg dry wt	< 0.016	< 0.015	-	-	-
delta-BHC	mg/kg dry wt	< 0.016	< 0.015	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.016	< 0.015	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.016	< 0.015	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.016	< 0.015	-	-	-

Sample Type: Soil						
Sample Name:		S10 14-Sep-2018 12:47 pm	S8 14-Sep-2018 12:50 pm			
Lab Number:		2048918.11	2048918.12			
Organochlorine Pesticides Screening in Soil						
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	< 0.04	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.016	< 0.015	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.016	< 0.015	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.016	< 0.015	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.016	< 0.015	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.016	< 0.015	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.10	< 0.09	-	-	-
Dieldrin	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Endosulfan I	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Endosulfan II	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Endrin	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Endrin ketone	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Heptachlor	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.016	< 0.015	-	-	-
Methoxychlor	mg/kg dry wt	< 0.016	< 0.015	-	-	-

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-12
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	1-12
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082). Tested on as recieved sample	0.010 - 0.06 mg/kg dry wt	1-12
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 3-4, 6-7
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 3-4, 6-7
Ashed Weight	Sample ashed at 400°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1, 3-4, 6-7
Moisture	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	1 %	1, 3-4, 6-7
Sample Fraction >10mm	Sample ashed at 400°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1, 3-4, 6-7
Sample Fraction <10mm and >2mm	Sample ashed at 400°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1, 3-4, 6-7
Sample Fraction <2mm	Sample ashed at 400°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g ashed wt	1, 3-4, 6-7

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1, 3-4, 6-7
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 3-4, 6-7
Weight of Asbestos in ACM (Non-Friable)	Measurement on analytical balance, from the >10mm Fraction. Weight of asbestos based on assessment of ACM form. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1, 3-4, 6-7
Asbestos in ACM as % of Total Sample*	Calculated from weight of asbestos in ACM and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3-4, 6-7
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1, 3-4, 6-7
Asbestos as Fibrous Asbestos as % of Total Sample*	Calculated from weight of fibrous asbestos and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3-4, 6-7
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g ashed wt	1, 3-4, 6-7
Asbestos as Asbestos Fines as % of Total Sample*	Calculated from weight of asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3-4, 6-7
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	Calculated from weight of fibrous asbestos plus asbestos fines and sample dry weight. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.001 % w/w	1, 3-4, 6-7

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

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental