



14 September 2016

John Duthie
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Waiuku
AUCKLAND 2341

Dear John,

PRELIMINARY SOIL SAMPLING INVESTIGATION AT KAHAWAI POINT, GLENBROOK BEACH, AUCKLAND

1.0 Introduction

Kahawai Point Developments Limited (KPD) has engaged Pattle Delamore Partners Limited (PDP) to undertake a Preliminary Soil Sampling Investigation (PSSI) at the proposed development site located at Kahawai Point, Glenbrook Beach, Auckland ('the site'). The site is comprised of four legal parcels described as Lots 1 and 2 DP 351480, Lot 1 DP 18680, and Lot 1 DP 21692 (refer Figure 1). The parcels cover approximately 68 ha of land area, where residential development is planned. Former Hazardous Activity and Industry List (HAIL) land-use was previously identified in the PDP Preliminary Site Investigation (PDP, 2015a) as:

- ✧ Persistent pesticide use and application to paddocks onsite – chiefly paraquat and diquat in the eastern area of the site;
- ✧ Fuel storage in two above ground storage tanks (AST); and,
- ✧ A barn on site containing asbestos products observed to be in a deteriorated condition.

Owing to the historical use of the site, the Auckland Council (AC) have requested an environmental assessment be carried out to determine if there are residual horticultural chemical impacts above human health and/or environmental criteria which might affect the proposed development works. The assessment criteria used to determine these effects include the Resource Management (National Environmental Standards ("the NES") for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES, 2011), the Proposed Auckland Unitary Plan (PAUP; Decision Version), and the Operative Auckland Council Regional Plan: Air, Land and Water (ACRP: ALW).

This PSSI has been undertaken in accordance with the Ministry for the Environment (MfE) Guideline No.1 – Reporting on Contaminated Sites in New Zealand (MfE, 2011a), and the principles contained in Guideline No. 2 – Hierarchy and Application in New Zealand of Environmental Guideline Values (MfE, 2011b) and Guideline No.5 – Site Investigation and Analysis of Soils (MfE, 2011c). This letter report provides the results of the investigation.

2.0 Objectives and Scope

The purpose of this preliminary soil sampling investigation is to determine:

- ✧ If the historical application of pesticides and herbicides (including paraquat and diquat) has resulted in contaminant residues remaining within the shallow soils of the site paddocks (refer Photograph 1); and,
- ✧ If asbestos or asbestos-containing materials (ACM) are present in the building materials of the barn on site (refer Photograph 2 and 3);
- ✧ If petroleum hydrocarbon residues are present in soils beneath the two AST's on site (refer Photographs 4 and 5);
- ✧ Whether the stripped soil material:
 - Is suitable to be reused on site;
 - Is suitable to be on-sold; or,
 - Requires disposal to a licensed disposal facility.

3.0 Investigation Methodology

A site investigation was undertaken to complete the scope of works on July 28th 2016.

All surface soil samples were collected using a foot corer and placed directly into laboratory supplied glass jars. A fresh pair of nitrile gloves was used for each sample, and the sampling equipment was decontaminated between sample locations. All of the soil samples were kept in a chilled container following collection. Samples were immediately despatched to the nominated IANZ laboratories (Analytica Laboratories/Hills Laboratories) under standard PDP chain of custody procedure, where analysis for heavy metals (including Arsenic (As), Lead (Pb), and Copper (Cu)), organochlorine pesticides (OCPs), paraquat/diquat and total petroleum hydrocarbons (TPH) was undertaken (refer Table 1 below).

Samples of building materials were selected from the barn on site for presence/absence analysis of ACM. Samples were double-bagged and sent to Analytica Laboratories for analysis under standard PDP chain of custody procedure.

Refer to Figure 1 for soil sample locations.

3.1 Site Conceptual Model and Sampling and Analysis Plan

To confirm the contamination linkages (source-pathway-receptor) which are expected to be 'complete' or 'potentially complete' within the proposed development area, based on the PSI findings (PDP, 2015a), a Conceptual Site Model (CSM) is presented below in Table 1. (Incomplete linkages are not discussed further after the CSM).

The CSM identifies all of the more-likely-than-not HAIL activities which are occurring, or have occurred, within the proposed development area. The CSM also outlines the applicable land-use scenarios, and the relevant guideline criteria for assessment of the proposed development area, both during the development works, and for the proposed end-use of the properties within the development area.

3.2 Soil Sampling and Laboratory Analysis

Soil sampling was undertaken in accordance with the principles in MfE 2011c. The number of samples and the sample locations were selected based on the following factors identified in the Preliminary Site Investigation, the Response to Section 92 Request (PDP, 2015b), the spray records kept, and information provided by the previous site occupant (Mr. Balle).

- ✧ The former occupation by market gardens was noted to be uniformly distributed across the entire site. The farm utilised a rotating crop system (PDP, 2015a), with the distribution of chemical pesticide and herbicide sprays evenly applied to the area;
- ✧ The use of agrichemicals paraquat and diquat (as active ingredients in the product *Preeglone*) on Lot 1 DP 21692 and a small portion of Lot 1 DP 351480 was identified to be applied once on 20 February 2014;
- ✧ Mixing and storage of agrichemicals is reported to have occurred offsite, therefore no requirement for 'targeted' sampling for agrichemical contamination was considered necessary; and,
- ✧ Based on observations during the PSI the following additional targeted sampling locations for ACM and hydrocarbons were identified as the barn and the AST's, respectively, located on Lot 1 DP 351480.

3.3 Site Observations

During the soil sampling investigation, no olfactory evidence of contamination or contaminating activities was observed.

Visual evidence of ACM was identified on the ground surface around the barn, and the barn cladding located on Lot 1 DP 351480.

No visual or olfactory evidence of petroleum hydrocarbon contamination surrounding the AST's was noted.

Table 1: Conceptual Site Model and Sampling and Analysis Plan

HAIL land use (contaminant source)	Bulk application of pesticides due to historic use of the site as market gardens	Bulk application of herbicides containing paraquat and diquat due to historic use of the site as market gardens	Bulk storage of fuels due to the presence of above ground storage tanks	Historic building materials; use of asbestos cladding
Identified contaminants of concern	Heavy metals (As, Cu, Pb) and organochlorine pesticides (OCPs).	Paraquat and diquat	Petroleum hydrocarbons (TPH) and heavy metals	Asbestos fibres and asbestos containing materials
Potential mechanism of soils contamination	Bulk application from ground spray units; leaching to ground	Bulk application from ground spray units; leaching to ground	Leaks or spills from the tanks during tank filling and refuelling operations; leaching to ground	Demolition of building, dust generated from weathering of asbestos cladding; ground impact of nearby surface soils
Identified receptors	<u>Short term</u> Workers during site development <u>Long term</u> Future maintenance/excavations at the site (if remaining onsite); Residential site users; Groundwater and surface water environments from site discharges.			<u>Short term</u> Workers during demolition and site development works. <u>Long term</u> Residential site users and future maintenance/excavations at the site if buried/remaining onsite
Potentially complete exposure pathways identified	Dermal contact from workers during soil disturbance and long term future site users – complete Soil ingestion from workers during soil disturbance and long term future site users – complete Produce consumption – direct uptake during the consumption of plants and food grown in site soils – complete Discharges to groundwater and/or surface water during soil disturbance – incomplete due to low permeability of soils and expectation to include sediment and erosion controls during redevelopment works			Inhalation of dust containing asbestos fibres when removing building materials and/or when potentially contaminated soils are exposed and disturbed – complete

Table 1: Conceptual Site Model and Sampling and Analysis Plan

Applicable land use scenarios	NES SCS for medium density residential land-use with 10% produce consumption MfE (2011d) Tier 1 Soil Acceptance criteria for residential land-use MfE (2011d) Route-specific criteria for maintenance and excavation workers US EPA (2016) Regional Screening Levels for soils.			WADOH (2009) Guidelines for the Assessment, Remediation and Management of Asbestos
Applicable discharge criteria	AC Permitted Activity Criteria and AC Air, Land and Water Regional Plan for discharges (PAUP; Decision Version, and ACRP:ALW (2013))			Nil
Sampling Method	Composite samples from individual paddocks where suspected application of pesticides may have occurred. (No target samples because no onsite mixing occurred, and uniform application across the areas).	Composite samples from individual paddocks where paraquat/diquat known to be used. (No target samples because no onsite mixing occurred and uniform, application across the areas).	Discrete samples from immediately beneath current ASTs. (Discrete samples required for volatile components of hydrocarbon contaminants).	Discrete samples from different types of building materials suspected to contain asbestos materials
Number of Samples	8 composite samples (32 sub samples)	4 composite samples (16 sub samples)	2 discrete samples	2 discrete samples
Required Chemical Analysis	As, Cu, Pb and OCPs	Paraquat and Diquat	TPH and heavy metals	ACM presence/absence

4.0 Investigation Results and Comparison to Relevant Criteria

With respect to the CSM presented above, for the complete and potentially complete source-pathway-receptor 'linkages', the following provides a comparison of results with relevant guidelines and standards as shown in Tables 2 and 3 (and appended laboratory reports).

4.1 Proposed Auckland Unitary Plan (PAUP); Decision Version & Operative Auckland Council Regional Plan: Air Land and Water (ACRP:ALW)

Surface soil sample results were compared against the PAUP (Decision Version) and the ACRP:ALW requirements (Section E30 6.1.4 and Rule 5.5.41, respectively) for applicable discharge criteria for soils. There are no specific guideline values in the PAUP/ACRP:ALW for TPH, paraquat, or diquat.

In summary,

- Sample AST 1/1 had an arsenic concentration (126 mg/kg) value which exceeded the guideline discharge criteria (100 mg/kg).
- All other samples were below the guideline values provided in the PAUP and ACRP:ALW.

4.2 National Environmental Standards

Regulation 5(9) of the NES (2011) states that the NES does not apply to land where a detailed site investigation (DSI) indicates that the contaminant concentrations are at, or below, background concentrations. This report covers the requirements of a DSI. The concentrations reported for some contaminants of concern were reported above background concentrations, and therefore the NES applies to the site, or at least to certain parts of the site.

Based on the proposed development of the site to medium-density residential land use, the site soils have been compared to the NES SCS for residential 10% produce. (The SCS are found in the Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (MfE, 2011e)).

In summary,

- Sample AST 1/1 exceeded the NES SCS guideline value for arsenic – residential land-use with 10% produce consumption.
- All other samples (and remaining parameters in sample AST1/1) reported heavy metal and organochlorine pesticide concentrations below the NES SCS guideline values – residential land-use with 10% produce consumption.

The discrete soil samples obtained from beneath the current ASTs on site were also compared to the MfE (2011d) Tier 1 Soil Acceptance criteria for residential land use due to TPH identified as a potential contaminant of concern. The CSM also identifies the potential for short- and long- term exposure of maintenance and excavation (M&E) workers to soils onsite. To provide an assessment for these M&E workers, the Route Specific criteria for M&E workers (from MfE, 2011d) has been reviewed, and the adopted Tier 1 Soil Acceptance criteria for residential land-use are lower than those for protection of M&E workers. Therefore, the specific values for the M&E pathways have not been included in Table 3. (The NES SCS for commercial/industrial site use have not been included because they do not provide an applicable risk assessment scenario for M&E workers).

There are no specific guideline values in the NES SCS for paraquat or diquat. Using the MfE (2011b) CLMG No. 2 hierarchy, the US Environmental Protection Agency regional screening levels (US EPA, 2016) have been selected as the most appropriate guideline criteria to assess the risk of the paraquat and diquat concentrations that remain in the shallow soils of the site.

In summary,

- ∴ All samples analysed for TPH were below the MfE (2011d) Tier 1 Soil Acceptance criteria values – Residential All Pathways (and Route Specific Maintenance and Excavation workers).
- ∴ All samples analysed for paraquat and diquat reported concentrations below the US EPA Regional Screening Levels. No concentrations of paraquat were detected in any of the composite samples.

4.3 Asbestos Containing Materials

Both samples collected from the building materials from the barn (ACM1 and ACM2) were positively identified as asbestos-containing (laboratory results are appended). As samples were analysed for the presence/absence of asbestos only, the results were not compared to any risk-based guideline criteria.

As of April 2016, regulations for the management of asbestos in New Zealand were updated. The Health and Safety at Work (Asbestos) Regulations 2016 (HSW, 2016) outline a number of duties and responsibilities relevant to the Person Conducting a Business or Undertaking (PCBU). These include, but are not limited to appropriate removal and disposal of ACM to be undertaken by a licensed removalist (when the total area of ACM is greater than 10 m²), after a demolition survey has been completed for the structure, and under the management of an Asbestos Removal Control Plan (ARCP). It is expected that given the area of ACM cladding on the barn represented by samples ACM1 and 2, that the HSW (2016) Regulations apply to any barn demolition works. At the close of any removal works, a clearance inspection and a clearance certificate would be required to confirm the acceptable removal of the ACM.

5.0 Suitability of Soil for Reuse

The soil investigation results indicate that the majority of the surface soil material onsite does not meet the definition of 'cleanfill' material due to the detectable concentrations of organics reported within the samples (such as DDT isomers, and diquat).

- ∴ Excluding material represented by samples AST 1/1, the material is suitable to be reused on site as representative samples indicate concentrations of contaminants in the soil are below the AC discharge criteria (PAUP & ACRP:ALW) and the NES SCS for residential 10% produce;
- ∴ Surface soil material on site is able to be removed offsite, providing the material is either; 'cleanfill' (i.e. has non-detectable concentrations of organic contaminants, and concentrations of inorganic contaminants that meet background ranges), or the receiving site or facility is consented to accept the materials represented by the sampling results in this report.
- ∴ Surface soil material represented by sample AST1/1 (and the ACM building materials from the barn) will require removal and disposal to a facility licensed to accept materials with concentrations of contaminants reported (e.g. elevated arsenic, and asbestos), such as a special wastes landfill. (The source of arsenic in AST1/1 is not known (although possibly related to the tank and its former contents). Despite this, results from the wider site area indicate that it is likely to be localised around the tank area. The extent of arsenic residues in this area will require delineation prior to removal).

6.0 Conclusions

A Preliminary Soil Sampling Investigation (PSSI) has been undertaken on the site at Kahawai Point, Glenbrook Beach, to assess the potential for residual soil contamination to be present as a result of the former use of the site. The former uses which contributed to residual surface soil impacts comprised the application of pesticides and herbicides on market garden areas and the storage of fuels in onsite AST's. There is also confirmed evidence of asbestos building products attached to an existing building onsite.

Thirty two surface soil samples were collected from the site, in areas where soil disturbance and future exposure to soils was expected. Discrete samples were taken beneath the onsite ASTs, and from selected building materials onsite.

The key conclusions of the investigation are as follows:

- ✧ With respect to the PAUP (Decision Version) and the ACRP:ALW requirements (Section E30 6.1.4 and Rule 5.5.41, respectively), the reported results of the measured analytical parameters from collected samples, excluding sample AST 1/1, all meet the discharge criteria under the respective plans.
- ✧ All samples, excluding sample AST 1/1, reported heavy metal concentrations below the NES SCS guideline values – residential land-use with 10% produce consumption
- ✧ Analysis of soil samples within the area where paraquat and diquat was applied report very low concentrations of diquat remaining in the shallow soils. While detectable, the diquat concentrations do not exceed the adopted US EPA guideline values. No concentrations of paraquat were detected above the laboratory limits of reporting.
- ✧ Analysis of some composite samples for organochlorine pesticides reported non-detectable concentrations in all samples with the exception of trace DDE in two samples. The level of organochlorine residues is well below environmental and human health criteria, but the detection of residues precludes the material from being treated as cleanfill.
- ✧ Sample AST 1/1 exceeds the adopted discharge criteria for arsenic and human health NES SCS for residential land-use 10%. It is recommended that impacted soil in this area is delineated and removed during the development works. As the elevated concentration of arsenic is expected to be localised, it is expected that the arsenic residues will be removed along with the soils during these recommended works.
- ✧ Total Petroleum Hydrocarbon residues were present in the shallow soils beneath the ASTs. The level of TPH detected does not exceed the MfE (2011d) Tier 1 Soil Acceptance Criteria for All Pathways (residential), and in turn does not exceed the Route Specific criteria for Maintenance and Excavation workers.
- ✧ ACM is present in cladding attached to the barn. Removal of this material is recommended to be undertaken by a licensed removalist (as the total area of ACM is greater than 10 m²), after a demolition survey has been completed for the structure, and under the management of an Asbestos Removal Control Plan (ARCP) – as required by the Health and Safety at Work (Asbestos) Regulations (HSW, 2016).
- ✧ Excluding surface soil material surrounding the AST 1, surface soil material is suitable to be reused on site, based on the results of this PSSI. Surface soil material on site is able to be removed offsite, providing the material is either; 'cleanfill' (i.e. has non-detectable concentrations of organic contaminants, and concentrations of inorganic contaminants that meet background ranges), or the receiving site or facility is consented to accept the materials represented by the sampling results in this report.

7.0 References

- AC, 2016. *The Proposed Auckland Unitary Plan Decisions Version, (notified 19 August 2016)*. Auckland Council.
- AC, 2013. *Auckland Council Regional Plan: Air, Land and Water*. Operative 2013.
- HSW, 2016. *Health and Safety at Work (Asbestos) Regulations*. 4 April 2016.
- MfE, 2011a. *Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand*. Ministry for the Environment.
- MfE, 2011b. *Contaminated Land Management Guideline No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values*. Ministry for the Environment.
- MfE, 2011c. *Contaminated Land Management Guideline No. 5: Investigation and Analysis of Soils*. Ministry for the Environment.
- MfE, 2011d. *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand*. Ministry for the Environment (Revised 2011).
- MfE, 2011e. *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health*. Ministry for the Environment.
- NES, 2011. *Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations*.
- PDP, 2015a. *Preliminary Site Investigation – Kahawai Point, Glenbrook Beach, Auckland*. Pattle Delamore Partners Ltd, Auckland.
- PDP, 2015b. *Response to Section 92 Request and Recommendations for Further Works – Kahawai Point, Glenbrook Beach, Auckland*. Pattle Delamore Partners Ltd, Auckland.
- US EPA, 2016. *Regional Screening Levels – Generic Tables*. Updated May 2016.
- WADOH, 2009. *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*.

8.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Kahawai Point Developments Limited (KPD) and others not independently contracted for the works including Mr. Eamon Balle (former farm manager/site owner). PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This letter-report has been prepared based on: analysis of 8 composite soil samples collected from thirty two surface soil samples, two discrete surface samples beneath two AST's, and two building material samples. The site conditions as described in this report have been interpreted from, and are subject to, this information and its limitations.

This report has been prepared by PDP on the specific instructions of KPD for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED

Prepared by



Erin Gasston

Environmental Geologist

Reviewed by



Rod Lidgard

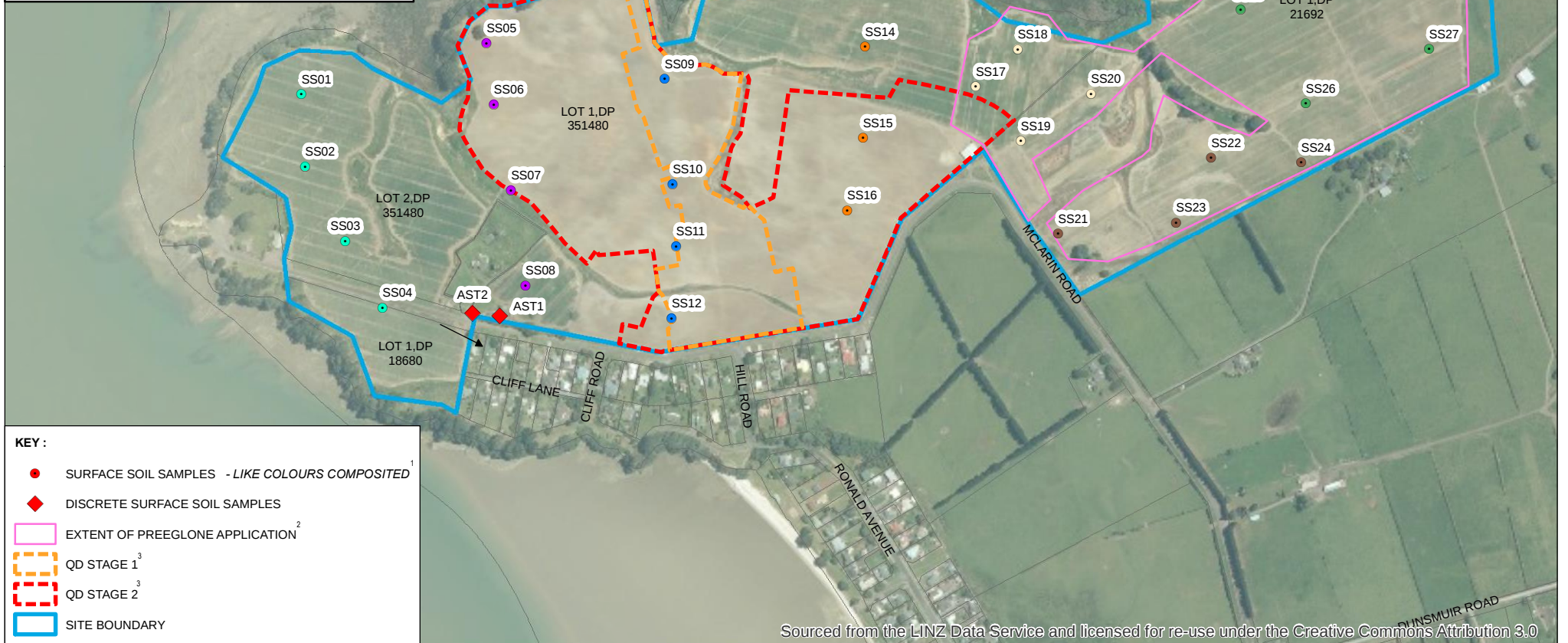
Senior Environmental Geologist

Approved by



Hamish Wilson

Technical Director Environmental Engineering



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NOTES:

1. REFER TO ANALYTICAL TABLES FOR SAMPLE RESULTS.
2. EXTENT OF PREEGLONE APPLICATION AS PROVIDED BY MR EAMON BALLE ON 13 OCTOBER 2015.
3. QD STAGE 1 AND 2 DERIVED FROM DRAWING T3002 REVISION C4, PROVIDED BY KAHAWAI POINT DEVELOPMENT LTD 13 AUGUST 2015.
4. AERIAL IMAGERY (FLOWN 2010) SOURCED FROM THE LINZ DATA SERVICE.
5. CADASTRAL INFORMATION AND INSET DERIVED FROM LINZ DATA.

FIGURE 1 : SAMPLE LOCATION PLAN

SCALE : 1:7,500 (A4)

0 50 100 200

Meters

Table 2. Composite Soil Samples - Heavy Metals, Organochlorine Pesticides and selected Acid Herbicides ¹

Sample Name	Composite SS1-SS4	Composite SS5-SS8	Composite SS9-SS12	Composite SS13-SS16	Composite SS17-SS20	Composite SS21-SS24	Composite SS25-SS28	Composite SS29-SS32	Background Ranges of Trace Elements in Auckland Soils ³	Auckland Council Permitted Activity Criteria		NES SCS Residential 10% produce ⁶	US EPA Regional Screening Levels ⁷
Laboratory Reference ²	16-10088 #1-4	16-10088 #6-9	16-10088 #11-14	16-10088 #16-19	16-10088 #21-24	16-10088 #26-29	16-10088 #31-34	16-10088 #36-39		ACRP:ALW ⁴	PAUP ⁵		
Sample Depth	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Non-Volcanic				
Heavy Metals (HM)													
Arsenic	6.31	6.94	6.80	6.65	6.84	6.32	7.55	5.86	0.4 - 12	100	20	-	
Copper	12.4	14.2	13.7	12.9	16.4	16.7	17.6	13.2	1 - 45	325	> 10,000	-	
Lead	17.1	17.4	18.7	16.3	17.2	16.2	19.5	17.8	< 1.5 - 65	250	210 ^{6a}	-	
Organochlorine Pesticides (OCP)													
Total DDT ⁸	ND	ND	ND	0.045	0.053	ND	ND	ND	-	0.7 / 12 ⁹	12 ⁹	70	-
Aldrin	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	2.6 ¹⁰	-	-
Deildrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-		-	-
All other OCP's	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
Laboratory Reference ¹¹	-	-	-	-	1623858.17	1623859.18	1623860.19	1623861.20					
Acid Herbicides (AH)													
Paraquat	-	-	-	-	<0.1	<0.1	<0.1	<0.1	-	-	-	280	
Diquat	-	-	-	-	0.7	0.98	0.99	0.93	-	-	-	140	

ND	Non-Detect: compound concetration reported below the laboratory detection level
-	No Data Available

- Notes.
1. All results in mg/kg.
 2. Selected heavy metals and organochlorine pesticides analysis completed at Analytica Laboratories.
 3. Table 2 Section 4.5 of the Proposed Auckland Unitary Plan (from TP153: Background Concentrations of Inorganic Elements in Soils from the Auckland Region (ARC, 2001)).
 4. AC Permitted Activity Soil Criteria - discharge based on the requirements of Rule 5.5.41 of the ACRP:ALW (AC, 2013).
 5. Permitted Activity Soil Criteria based on Section E30 6.1.4 of the Proposed Auckland Unitary Plan (Decisions Version) - notified 19 August 2016 (AC, 2016).
 6. NES Soil Contaminant Standards from "Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health" (MfE, 2011e) - Residential 10% produce and commercial/industrial outdoor worker.
6a. SCS value is for inorganic lead.
 7. US Environmental Protection Agency Regional Screening Levels (Updated may, 2016). Target Hazard Quotient (THQ) of 1.0 used.
 8. Calculated value. For each DDD, DDE and DDT constituent recorded below detection limits, half of the detection limit (0.005mg/kg) has been added to the DDD, DDE and DDT totals to provide a conservative estimate of the likely total DDT concentration.
 9. A value of 0.7mg/kg applies only during the redevelopment works. At the end of the development works, the value of 12mg/kg applies.
 10. The SCS is applicable to either dieldrin or aldrin separately, or to the sum of aldrin and dieldrin if both are involved.
 11. Selected acid herbicides analysis completed at RJ Hill Laboratories.

Table 3. Target Soil Samples - Heavy Metals Suite and Total Petroleum Hydrocarbons¹

Sample Name	AST 1/1	AST 2/1	Background Ranges of Trace Elements in Auckland Soils ²	Auckland Council Permitted Activity Criteria		NES SCS
Laboratory Reference	AST 1/1 0-0.1	AST 2/1 0-0.1				
Sample Location	Beneath AST 1	Beneath AST 2				
Soil Type - MfE (2011)	SILTY CLAY	SILTY CLAY	Non-Volcanic	ACRP:ALW ³	PAUP ⁴	Residential 10% Produce ⁵
Sample Depth (m bgl)	0-0.1	0-0.1				
Heavy Metals (HM)						
Arsenic	126	20	0.4 - 12	100		20
Beryllium	0.29	1	-	-		-
Boron	4.61	6	2 - 45	-		>10,000
Cadmium	0.35	0.33	< 0.1 - 0.65	7.5		3
Chromium	34.7	31.3	2 - 55	400		460 ^{5a}
Copper	36.5	31	1 - 45	325		> 10,000
Lead	87.7	134	< 1.5 - 65	250		210 ^{5a}
Mercury	0.14	0.14	<0.03 - 0.45	0.75		310 ^{5a}
Nickel	13.4	15.1	0.9 - 35	105		400 ⁶
Zinc	117	244	9 - 180	400		7,400 ⁶
						Tier 1 Soil Acceptance Criteria ALL PATHWAYS ^{7,8}
Total Petroleum Hydrocarbons						
C ₇ - C ₉	<10	<10	-	-	-	(2,700) ^{10,9v}
C ₁₀ - C ₁₄	<15	<15	-	-	-	(560) ^{10,9x}
C ₁₅ - C ₃₆	370	292	-	-	-	NA ¹¹
Total hydrocarbons (C ₇ - C ₃₆)	370	292	-	-	-	-

86	Concentration exceeds Auckland Council Background Ranges of Trace Elements in non-volcanic soils
86	Concentration exceeds Permitted Activity criteria under the PAUP (2016) (Section E30 6.1.4), and exceeds Rule 2.1.3 Discharge Criteria of the ACRP:ALW.
86	Concentration exceeds NES SCS criteria for Residential Land Use 10% produce
-	No guideline criteria available

Notes.

- All results in mg/kg.
- Table 2 Section 4.5 of the Proposed Auckland Unitary Plan (from TP153: Background Concentrations of Inorganic Elements in Soils from the Auckland Region (ARC, 2001)).
- AC Permitted Activity Soil Criteria - discharge based on the requirements of Rule 5.5.41 of the ACRP:ALW (AC, 2013).
- Permitted Activity Soil Criteria based on Section E30 6.1.4 of the Proposed Auckland Unitary Plan (Decisions Version) - notified 19 August 2016 (AC, 2016).
- NES Soil Contaminant Standards from "Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health" (MfE, 2011e) - Residential 10% produce.
 - SCS values are for chromium IV, inorganic lead and inorganic mercury.
- Criteria Guideline values from "Schedule B(1) Guideline on Investigation Levels for Soils and Groundwater National Environment Protection Measure (NEPM), updated May, 2013. Table 1A (1) Health Investigation Levels for soil contaminants (mg/kg); HIL A - Residential with garden/accessible soil.
- Criteria from Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Revised 2011 (MfE 2011d).
- Criteria assume residential land use, 'silty clay' soil types and contamination depths of <1 m below ground level.
- The following notes indicate the limiting pathway for each criterion: v - volatilisation, x - PAH surrogate.
- Brackets denote values exceed threshold likely to correspond to formation of residual separate phase hydrocarbons.
- NA indicates contaminant is not limiting as health based criterion is significantly higher than may be encountered on site (i.e. 20,000 mg/kg for TPH, 10,000 mg/kg for other contaminants).



Photograph 1: Typical onsite paddock where pesticides and herbicides were applied.



Photograph 2: Barn located on site showing ACM in deteriorated condition.



Photograph 3: Fibre cement board cladding in deteriorated condition from the barn, identified as ACM.



Photograph 4: Above-ground storage tank 1 (AST 1).



Photograph 5: Above-ground storage tank 2 (AST 2).



Certificate of Analysis

Pattle Delamore Partners Ltd
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Email: erin.gasston@pdp.co.nz

Lab Reference: 16-10088
Submitted by: James/Erin
Date Received: 2/08/2016
Date Completed: 5/08/2016
Order Number:
Reference: AO2935102

Heavy Metals in Soil

Client Sample ID			4 sample composite SS1-SS4 (16-10088 #1-4)	4 sample composite SS5-SS8 (16-10088 #6-9)	4 sample composite SS9-SS12 (16-10088 #11-14)	4 sample composite SS13-SS16 (16-10088 #16-19)	4 sample composite SS17-SS20 (16-10088 #21-24)
Date Sampled			28/07/2016	28/07/2016	28/07/2016	28/07/2016	28/07/2016
Analyte	Unit	Reporting Limit	16-10088-5	16-10088-10	16-10088-15	16-10088-20	16-10088-25
Arsenic	mg/kg dry wt	0.125	6.31	6.94	6.80	6.65	6.84
Copper	mg/kg dry wt	0.075	12.4	14.2	13.7	12.9	16.4
Lead	mg/kg dry wt	0.05	17.1	17.4	18.7	16.3	17.2

Heavy Metals in Soil

Client Sample ID			4 sample composite SS21-SS24 (16-10088 #26-29)	4 sample composite SS25-SS28 (16-10088 #31-34)	4 sample composite SS29-SS32 (16-10088 #36-39)
Date Sampled			28/07/2016	28/07/2016	28/07/2016
Analyte	Unit	Reporting Limit	16-10088-30	16-10088-35	16-10088-40
Arsenic	mg/kg dry wt	0.125	6.32	7.55	5.86
Copper	mg/kg dry wt	0.075	16.7	17.6	13.2
Lead	mg/kg dry wt	0.05	16.2	19.5	17.8

Heavy Metals in Soil

Client Sample ID			AST1/1 Depth 0-0.1	AST2/1 Depth 0-0.1
Date Sampled			28/07/2016	28/07/2016
Analyte	Unit	Reporting Limit	16-10088-41	16-10088-42
Arsenic	mg/kg dry wt	0.125	126	19.6
Beryllium	mg/kg dry wt	0.013	0.29	0.56
Boron	mg/kg dry wt	1.25	4.61	6.11
Cadmium	mg/kg dry wt	0.005	0.35	0.33
Chromium	mg/kg dry wt	0.125	34.7	31.3
Copper	mg/kg dry wt	0.075	36.5	30.6
Lead	mg/kg dry wt	0.05	87.7	134



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation, with the exception of tests marked *, which are not accredited.

Heavy Metals in Soil

Client Sample ID			AST1/1 Depth 0-0.1	AST2/1 Depth 0-0.1
Date Sampled			28/07/2016	28/07/2016
Analyte	Unit	Reporting Limit	16-10088-41	16-10088-42
Mercury	mg/kg dry wt	0.025	0.14	0.14
Nickel	mg/kg dry wt	0.05	13.4	15.1
Zinc	mg/kg dry wt	0.05	117	244

Total Petroleum Hydrocarbons - Soil

Client Sample ID			AST1/1 Depth 0-0.1	AST2/1 Depth 0-0.1
Date Sampled			28/07/2016	28/07/2016
Analyte	Unit	Reporting Limit	16-10088-41	16-10088-42
C7-C9	mg/kg dry wt	10	<10	<10
C10-C14	mg/kg dry wt	15	<15	<15
C15-C36	mg/kg dry wt	25	370	292
C7-C36 (Total)	mg/kg dry wt	50	370	292

Organochlorine Pesticides - Soil

Client Sample ID			4 sample composite SS1-SS4 (16-10088 #1-4)	4 sample composite SS5-SS8 (16-10088 #6-9)	4 sample composite SS9-SS12 (16-10088 #11-14)	4 sample composite SS13-SS16 (16-10088 #16-19)	4 sample composite SS17-SS20 (16-10088 #21-24)
Date Sampled			28/07/2016	28/07/2016	28/07/2016	28/07/2016	28/07/2016
Analyte	Unit	Reporting Limit	16-10088-5	16-10088-10	16-10088-15	16-10088-20	16-10088-25
2,4'-DDD	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2,4'-DDE	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2,4'-DDT	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,4',DDD	mg/kg dry wt	0.003	<0.005	<0.005	<0.005	<0.005	<0.005
4,4'-DDE	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	0.033	0.041
4,4'-DDT	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
alpha-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Aldrin	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
beta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-Chlordane	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-Nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
delta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dieldrin	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan I	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan II	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan Sulphate	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endrin	mg/kg dry wt	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin Aldehyde	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin Ketone	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
gamma-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	mg/kg dry wt	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methoxychlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-Chlordane	mg/kg dry wt	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TCMX (Surrogate)	%	1	135.3	134.6	134.2	156.1	146.4

Organochlorine Pesticides - Soil

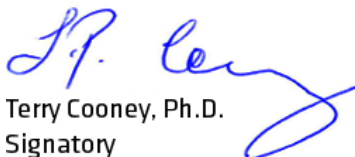
Client Sample ID			4 sample composite SS21-SS24 (16-10088 #26-29)	4 sample composite SS25-SS28 (16-10088 #31-34)	4 sample composite SS29-SS32 (16-10088 #36-39)
Date Sampled			28/07/2016	28/07/2016	28/07/2016
Analyte	Unit	Reporting Limit	16-10088-30	16-10088-35	16-10088-40
2,4'-DDD	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
2,4-DDE	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
2,4-DDT	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
4,4,DDD	mg/kg dry wt	0.003	<0.005	<0.005	<0.005
4,4'-DDE	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
4,4'-DDT	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
alpha-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
Aldrin	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
beta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
cis-Chlordane	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
cis-Nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01
delta-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
Dieldrin	mg/kg dry wt	0.01	<0.01	<0.01	<0.01
Endosulfan I	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
Endosulfan II	mg/kg dry wt	0.01	<0.01	<0.01	<0.01
Endosulfan Sulphate	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
Endrin	mg/kg dry wt	0.05	<0.05	<0.05	<0.05
Endrin Aldehyde	mg/kg dry wt	0.01	<0.01	<0.01	<0.01
Endrin Ketone	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
gamma-BHC	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
Heptachlor	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	mg/kg dry wt	0.005	<0.005	<0.005	<0.005
Methoxychlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01
trans-nonachlor	mg/kg dry wt	0.01	<0.01	<0.01	<0.01
trans-Chlordane	mg/kg dry wt	0.01	<0.01	<0.01	<0.01
TCMX (Surrogate)	%	1	145.0	133.7	117.2

Method Summary

Elements in Soil	Acid digestion followed by ICP-MS analysis.
TPH in Soil	Solvent extraction, silica cleanup, followed by GC-FID analysis. (C7-C36)
PCB/OCP in Soil	Solvent extraction, florisil cleanup followed by GC-MSMS analysis.

Report Comments

Samples were received by Analytica Laboratories in acceptable condition unless otherwise noted on this report.



Terry Cooney, Ph.D.
Signatory

DATE: 3rd August 2016

JOB NUMBER: J115870 (1)



Analytica Laboratories (Hamilton)

Ruakura Research Centre
10 Bisley Road
Private Bag 3123,
3214

Client Reference: Project Id AO2935102

Dear Analytica Laboratories,

Re: Asbestos Identification Analysis – Kahawai Pt

Two (2) samples received on 3rd August 2016 by Irene Suresh.

The results of fibre analysis were performed by Irene Suresh of Precise Consulting and Laboratory Ltd on 3rd August 2016.

The sample(s) were stated to be from Kahawai Pt .

Sample analysis was performed using polarised light microscopy with dispersion staining in accordance with the guidelines of *AS4964-2004 Method for the qualitative identification of asbestos in bulk samples*.

The results of the fibre analysis are presented in the appended table.

Should you require further information please contact Irene Suresh.

Yours sincerely

A handwritten signature in black ink that reads "Irene Suresh". The signature is fluid and cursive, with a long horizontal line extending from the end of the name.

Irene Suresh
PRECISE LABORATORY IDENTIFIER

Sample Analysis Results

Job No: J115870

3 August 2016

Note 1: The reporting limit for this analysis is 0.1g/kg (0.01%) by application of polarised light microscopy, dispersion staining and trace analysis techniques.

Note 2: If mineral fibres of unknown type are detected (UMF), by PLM and dispersion staining, these may or may not be asbestos fibres. To confirm the identity of this fibre, another independent analytical technique such as XRD analysis is advised.

Note 3: The samples in this report are "As Received" the laboratory does not take responsibility for the sampling procedure or accuracy of sample location description.

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Identified by:



Irene Suresh
Approved Identifier

Reviewed by:



Irene Suresh
Key Technical Person

Site Address: Kahawai Pt			
Sample ID	Client Sample Number	Sample Location/Description/Dimensions	Analysis Results
BS056279	1	ACM 1 Cement sheet 70x 40x 12mm	Amosite + Chrysotile + Crocidolite (Brown, White & Blue Asbestos)
BS056280	2	ACM 2 Cement sheet 50x 35x 2mm	Amosite + Chrysotile + Crocidolite (Brown, White & Blue Asbestos)