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Project Number 13451.000.001

Site Management Plan

Drury Development Stage 2,
64-120 Flanagan Road, Drury

Submitted to:
Kiwi Property Holdings No. 2 Ltd
Level 7, Vero Centre
48 Shortland Street
Auckland 1010

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Client	Kiwi Property Holdings No. 2 Ltd	**Client Contact**	Elizabeth Davidson
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Date	Revision Details / Status	Author	Reviewer	WP
20/02/2024	Issued to Client	LN	EM	DF
02/04/2024	Revised Management Areas	LN	EM	HO
03/04/2024	Issued to Client	LN	EM	JT

SQEP Certifying Statement

I certify that the site has been assessed in accordance with current New Zealand Regulations and guidance documents and that this report has been prepared in general accordance with the Ministry for the Environment's Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand, 2021.

I am considered by ENGEO Limited to be a suitably qualified and experienced practitioner (SQEP) able to certify reports pursuant to the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011, based on the company's definition of a SQEP as given below.

Erika McDonald

3 April 2024

ENGEO Limited requires that a SQEP has the following Qualifications / Experience:

- *Tertiary science or engineering qualification relevant to environmental assessment.*
- *A minimum of 10 years of relevant experience.*
- *Registration with a professional body that assess and certifies environmental professionals in the competency criteria of training, experience, professional conduct, and ethical behaviour.*

1 Introduction

ENGEO Ltd was requested by Kiwi Property Holdings No. 2 Ltd (KPH) to develop a Site Management Plan (SMP) for soil disturbance activities related to land development works at Drury Development Stage 2, 64–120 Flanagan Road, Drury (herein referred to as 'the site'; shown on Figure 1). This work has been carried out in accordance with our signed agreement, dated 5 October 2023.

The site is former pastoral land that is being developed for mixed commercial and residential use. The majority of the development area will be sealed below buildings or paving (e.g., parking, accessways) with some greenspace / landscaped areas including Hingaia Reserve North on the western side of the development area and in a park in the north-eastern quadrant. Development works will require soil disturbance to prepare the ground surface, install foundation elements / subsurface utilities, and achieve the final design contours. No cut / fill plans have been provided to ENGEO at the time of writing this report.

We understand that KPH intends to retain all soils on-site, where practicable, but some surplus soils may be removed from site.

Based on the results of soil testing undertaken by ENGEO and others (refer Section 3), surface soils (< 0.2 m below ground level [bgl]) in localised areas around the site contain contaminant concentrations at levels exceeding the published background range in the Auckland Unitary Plan (AUP) (Auckland Council, February 2024), Auckland permitted activity soil acceptance criteria (relevant to protection of the environment; ibid) or human health-based criteria for commercial and high-density residential land use (MfE, 2011). This Site Management Plan (SMP) outlines the handling and management procedures that should be implemented during the disturbance of potentially contaminated soils to mitigate risks to human health and the environment.

Key findings of soil testing are summarised in Table 1.

Table 1: Site Summary

Contaminants Identified On-Site	• 64 Flanagan Road: Surface soil samples contained detectable polycyclic aromatic hydrocarbons (PAH) and concentrations of heavy metals (i.e., arsenic, cadmium, lead, zinc) at levels exceeding the range of background concentrations; however, all concentrations were below the relevant AUP permitted activity (environmental) and human health-based criteria. • 108 Flanagan Road: Surface soil samples contained detectable PAH and concentrations of heavy metals (i.e., arsenic, lead) at levels exceeding the range of background concentrations; however, all concentrations were below the relevant AUP permitted activity (environmental) and human health-based criteria. • 114 Flanagan Road: Surface soil samples collected from around the former residential structure contained detectable PAH and concentrations of heavy metals (i.e., arsenic, cadmium, lead) at levels exceeding the range of background concentrations. Additionally, lead concentrations exceeded the AUP permitted activity (environmental) criterion and the human health-based criterion for high-density residential land use. • 120 Flanagan Road: Surface soil samples collected from around the former residential structure contained detectable asbestos and PAH, and concentrations of heavy metals (i.e., arsenic, lead) at levels exceeding the range of background concentrations. Additionally, lead and zinc concentrations at one location exceeded the AUP permitted activity (environmental) criteria and the human health-based criteria for high-density residential land use and commercial land use.

This SMP contains:

- A summary of previous investigations completed at the site.
- Management procedures to assist in:
    - achieving a safe working environment for relevant personnel; and
    - protecting the environment from contaminants in site discharges during the redevelopment works.

2 Objectives and Relevance of the SMP

2.1 Objective

The objectives of the SMP are to:

- Support an application for a resource consent;
- Outline monitoring and management procedures to be implemented during earthworks to mitigate risks to human health and the environment; and
- Outline actions to be undertaken if unidentified contamination is encountered.

2.2 Relevance

This document has been prepared in general accordance with the Ministry for the Environment's (MfE's) Contaminated Land Management Guidelines No.1 – Reporting on Contaminated Sites in New Zealand (MfE, 2021a).

The information and recommendations provided herein are to augment the processes on-site and are not intended to relieve any contractor or the controller of the place of work of their responsibility for the health and safety of their workers and contractors. Nor is it intended to relieve contractors undertaking work on the site of their responsibilities under the Health and Safety at Work Act 2015 and subsequent amendments.

The provisions of the SMP are mandatory for all persons entering the site and all contractor and sub-contractor employees who will be involved in implementing the procedures identified in this document.

The contractor shall develop a site-specific health and safety plan to complement this SMP and to address other health and safety requirements that may be applicable to their site works.

This SMP is considered suitable to provide controls based on the contamination identified during the previous investigation works. If contamination is found that varies from what has been assumed in preparing this SMP, the SMP will need to be updated to account for the changed site understanding. If a revised SMP is prepared, it will be re-distributed to Council and the project team (Table 2) prior to earthworks commencing.

Table 2: Assigned Responsibilities for Site Work

Role	Responsibility
Site Owner KPL	To distribute this SMP to the Site Contractor(s) and Auckland Council, and ensure that the site works are undertaken in accordance with this document and any revisions to this document.
Site Contractor (Main Contractor / General Earthworks) – TBD	To distribute the SMP to employees and subcontractors, including updated versions, and to ensure that the correct copy of the SMP is on-site at all times. To provide control and oversee the redevelopment works. It is recommended that a designated, suitably trained Site Supervisor is present to oversee the works. The Site Supervisor shall address changes to site procedures, as necessary, should unanticipated conditions arise. The Site Supervisor shall also ensure that all site staff and subcontractors are aware of and comply with the procedures and health and safety requirements contained within this document. It is anticipated that this Site Supervisor will represent the Site Contractor. Should an incident occur on-site that may result in discharges, the Site Supervisor shall notify the Site Owner and coordinate the efforts to minimise the impact. Worker and public Health and Safety concerns will take precedence over environmental discharges, if it is unsafe to employ controls or emergency measures immediately. As a minimum, the Site Supervisor should have received non-certified training in asbestos identification, safe handling and suitable controls, to ensure that, if asbestos / asbestos containing materials (ACMs) are encountered, they are identified and appropriately managed. A copy of the training shall be kept on record.

Contaminated Land Specialist ENGEO	Suitably Qualified and Experienced Practitioners (SQEPs) in contaminated land management shall be appointed to liaise with the Site Owner / Site Contractor during the course of the works. The SQEP shall provide contamination-related support during site works (if required) and prepare a report at the completion of works.

3 Ground Contamination Investigation Findings

3.1.1 Geotechnical and Environmental Due Diligence Investigation – 64 – 66 Flanagan Road (ENGEO, 2017)

A due diligence investigation was undertaken to inform potential development considerations at the property. Four hand auger boreholes were advanced to a maximum depth of 4.4 m bgl. Suspected fill was observed beneath the topsoil to depths ranging from 0.4 m bgl to 1.5 m bgl. No man-made materials (e.g., refuse, building materials) or indications of soil contamination (e.g., staining, odours) were noted in the boreholes. No soil samples were collected for laboratory analysis.

3.1.2 Geotechnical and Environmental Due Diligence Investigation – 120 Flanagan Road (ENGEO, 2017)

A due diligence investigation was undertaken to inform potential development considerations at 120 Flanagan Road and a portion of 114 Flanagan Road. Eleven hand auger boreholes were advanced to a maximum depth of 5 m bgl. Suspected fill was observed at two locations in the northern half of 120 Flanagan Road from the ground surface to depths of 0.7 m bgl and 1.0 m bgl. No man-made materials (e.g., refuse, building materials) or indications of soil contamination (e.g., staining, odours) were noted in the boreholes. No soil samples were collected for laboratory analysis.

3.1.3 Drury Centre Project – Preliminary Site Investigation (Aurecon Limited, 2020)

Aurecon Limited undertook a Preliminary Site Investigation (PSI) of the greater Drury Development area to identify current or historical activities / land uses with the potential to cause ground contamination.

The PSI identified several activities that are included on the MfE Hazardous Activities and Industries List (HAIL) (MfE, Revised 2021) including fertiliser storage (Activity A6; 64 Flanagan Road), uncontrolled filling (Activity G5; 64 Flanagan Road and potentially 108 Flanagan Road), and the potential use of asbestos building materials (Activity E1; site wide) in residential dwellings and farm buildings that were built prior to 2000.

3.1.4 Drury Centre Project – Detailed Site Investigation (Aurecon Limited, 2021)

Aurecon Limited undertook a Detailed Site Investigation (DSI) of the greater Drury Development area to better quantify the contamination hazard associated with the potentially contaminating activities identified in the PSI. The intrusive investigation comprised one test pit to a depth of 2.0 m bgl (120 Flanagan Road) and 30 surface (< 0.2 m bgl) soil sample locations across the site.

The soil sampling analytical results showed that:

- An arsenic concentration exceeding the human health-based criteria (high-density residential) was detected in one location near a farm building on the eastern extent of 120 Flanagan Road. These soils were removed during the Stage 1 development works;

- Lead concentrations exceeding the human health-based criteria (recreational and / or high-density residential) were detected in the surficial soils in the vicinity of the residential dwellings located at 114 Flanagan Road and 120 Flanagan Road;
- A lead concentration exceeding the human health-based criterion (commercial) was detected in the surficial soils in one location on the eastern side of the residential dwellings located at 120 Flanagan Road; and
- Asbestos fines (AF) and / or fibrous asbestos (FA) were detected in two soil samples; however, the concentrations did not exceed the laboratory reporting limit or BRANZ guidelines.

This report should be read it its entirety for details of the investigation methodology and findings. A summary of relevant laboratory analytical results (extracted from the DSI) is included in Appendix 1 (Table A1.1); the sample location plan from this investigation is provided in Appendix 1 (Figure A1).

3.1.5 Supplementary Soil Sampling

ENGEO undertook supplementary soil sampling on 31 October 2023. The purpose of the sampling was to assess the lateral extent of the contamination identified by Aurecon at 114 Flanagan Road and 120 Flanagan Road, and characterize the suspected fill observed by ENGEO at 120 Flanagan Road.

Samples were collected from 14 locations around the site including around the former residence located at 114 Flanagan Road (HA01–HA07), on the eastern side of the residence located at 120 Flanagan Road (120 Flanagan Road), and in the vicinity of the two suspected fill locations at 120 Flanagan Road (HA08–HA11; refer Section 3.1.2). The sample location plan is provided in Appendix 2 (Figure A2.1).

Fieldwork and sampling were undertaken in general accordance with the procedures for the appropriate handling of potentially contaminated soils as described in the MfE Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils (CLMG5; MfE, 2021b). In summary:

- Shallow soils around the former residences were field screened with a hand-held x-ray fluorescence spectrometer (XRF) to inform sampling locations in a general grid pattern.
- Prior to the collection of each sample, the equipment was decontaminated using a triple wash procedure with potable water, Decon 90 solution and distilled water.
- Soil samples were logged for general soil type and indicators of potential contamination (e.g., man-made materials, staining, odours)
- Samples were given a unique sample ID to identify the depth and location from where they were collected on-site.
- Samples were placed into laboratory supplied containers using a new pair of nitrile gloves for each sample. The containers were capped, labelled with a unique identifier, and placed into an insulated container and kept on ice for transport to IANZ-accredited Hill Laboratories under a standard chain of custody.
- The soil samples collected from locations HA01–HA07 and HA12–HA14 were analysed for lead; the soil samples collected from locations HA08–HA11 were analysed for heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc), PAH, and semi-quantitative (wt/wt%) asbestos.

Soil analytical results were assessed relative to the published range of background concentrations, Envirowaste (Hampton Downs) Waste Acceptance Criteria (WAC), AUP permitted activity (environmental) criteria, and the human health-based criteria for commercial and high-density residential land use. Based on the findings of this investigation:

- None of the samples collected contained detectable asbestos.
- One soil sample collected from a suspected fill area (HA11) contained low detections of PAH compounds. No background / ambient concentration has been established for PAH; however, the concentrations were approximately three orders of magnitude below the AUP permitted activity (environmental) or human health-based criteria, indicating no significant risk due to PAH concentrations in soil at this location. None of the remaining soil samples collected from the fill areas contained detectable PAH.
- One soil sample collected from a suspected fill area (HA08) contained a concentration of cadmium (0.7 mg/kg) that was slightly above the background concentration (0.65 mg/kg) but below the AUP permitted activity (environmental) criterion (7.5 mg/kg) and at least three orders of magnitude below the relevant human health-based criteria, indicating no significant risk due to the cadmium concentration in soil at this location. None of the remaining soil samples collected from the fill areas contained a heavy metal / metalloid at a level exceeding the adopted assessment criteria.
- Lead concentrations from around the former residences generally exceeded the range of background concentrations (< 65 mg/kg). Two shallow (<0 .15 m bgl) samples collected at 114 Flanagan Road (HA04 and HA06) and three shallow (< 0.15 m bgl) samples collected at 120 Flanagan Road (HA12, HA13, and HA14) contained lead concentrations that exceeded the AUP permitted activity (environmental) criterion (250 mg/kg) and / or the Envirowaste WAC (200 mg/kg). Additionally, the shallow soil sample collected at HA13 contained a concentration of lead that exceeded the human health-based criterion for high-density residential land use (500 mg/kg) and recreational land use (880 mg/kg) but was below the criterion for commercial land use (3,300 mg/kg). Deeper samples collected at HA04, HA06, HA12, HA13, and HA14 did not contain lead at concentrations exceeding either the Envirowaste WAC, AUP permitted activity (environmental), or the human health-based criteria, indicating that these impacts likely do not extend below shallow soil.
- Samples that contained concentrations of lead that exceeded the Envirowaste WAC were analysed for leachable lead using the Toxicity Characteristic Leaching Procedure (TCLP). None of the samples contained TCLP concentrations exceeding the Envirowaste WAC (10 mg/L).

Results are summarised in Appendix 2 (Table A2.1); laboratory documentation is provided in Appendix 3.

3.1.6 Background Concentration Delineation Sampling

Following the supplementary sampling investigation (refer Section 3.1.5) ENGEO undertook additional soil sampling on 15 December 2023 to assess for the extent of lead concentrations exceeding the background range around the former residences at 114 Flanagan Road and 120 Flanagan Road. The purpose of the sampling was to assess the lateral extent of material that does not meet the definition of cleanfill.

XRF readings and lead analytical results from the supplementary sampling investigation were used to develop a general calibration curve for the XRF. The curve was used to calculate a target XRF reading (47 ppm) that would more likely correspond to a lead concentration within the background range. As shown in the attached XRF data (Appendix 2), field results were quite variable and did not always follow the expected pattern of decreasing concentrations with increased distance from site buildings. XRF readings can be highly variable due to site-specific conditions (e.g., soil moisture, soil type) and the presence of other heavy metals in soil. This uncertainty was addressed by only relying on XRF data when assessing areas of cleanfill versus not cleanfill (as opposed to defining management areas) and by incorporating a buffer around the furthest samples exceeding background criteria with the XRF.

Eight samples were collected around each of the former residences (S09-S16, 114 Flanagan Road; S01-S08, 120 Flanagan Road). The sample location plan is provided in Appendix 2 (Figure A2.1).

Fieldwork and sampling were undertaken in general accordance with the procedures in CLMG5. In summary:

- Shallow soils around the former residences were field screened with a hand-held XRF moving away from the previous (Section 3.1.5) sampling locations in a general radial pattern. Readings were collected at progressive distances until the readings were below 47 ppm. A surface soil sample was collected at this location for laboratory analysis. The coordinates of each sample location were recorded with a hand-held GPS unit.
- Prior to the collection of each sample, the equipment was decontaminated using a triple wash procedure with potable water, Decon 90 solution and distilled water.
- Samples were placed into laboratory supplied containers using a new pair of nitrile gloves for each sample. The containers were capped, labelled with a unique identifier, and placed into an insulated container and kept on ice for transport to IANZ-accredited Hill Laboratories under a standard chain of custody for analysis for lead.

Soil analytical results were assessed relative to the range of background concentrations (< 65 mg/kg). Based on the findings of this investigation:

- Soil analytical results for lead were generally within the range of background concentrations with the following exceptions:
    - Two locations (S02 and S08) around the former residence at 120 Flanagan Road; and
    - Four locations (S10, S13, S15, and S16) around the former residence at 114 Flanagan Road.
- There was no obvious spatial relationship between the exceedances (e.g., adjacent locations) or correlation with the XRF readings, possibly due to natural heterogeneity, differing ground conditions, and / or instrument sensitivity at low concentrations.
- Exceedances were only marginally above the range of background concentrations, with values from 73 mg/kg (S13) to 90 mg/kg (S08). The 95% upper confidence level (UCL) value for the dataset was 68 mg/kg, indicating that the blended concentration of the material could potentially be accepted as cleanfill. These results should be provided to a cleanfill operator if disposal of surplus material is required.

Laboratory results are summarised in Appendix 2 (Table A2.2); coordinates and XRF lead readings are included in Appendix 2 (Table A2.3). Laboratory reports are included in Appendix 3.

3.2 Summary of Ground Contamination Investigations

Based on the investigations undertaken at the site by ENGEO and others, shallow soils around the former residences at 114 Flanagan Road and 120 Flanagan Road contain concentrations of lead at levels exceeding the range of AUP permitted activity (environmental) criterion and / or the range of background concentrations. Laboratory analytical results (ENGEO and Aurecon) and XRF readings were used to assess for the approximate extent of elevated lead concentrations in soils. Figures are included in Appendix A (Figure A2.4 and Figure A2.5).

Additionally, shallow soils in the vicinity of the former residence / outbuilding at 114 Flanagan Road may contain lead concentrations exceeding the human health-based criteria (recreational and / or high-density residential) and shallow soils on the eastern side of the former residence at 120 Flanagan Road may contain lead concentrations exceeding the human health-based criterion (recreational, high-density residential, and commercial).

We note that the soil beneath the footprints of the former residences has not been assessed. It is inferred that the elevated concentrations of lead detected in investigations to date are the result of lead migration from painted surfaces (e.g., lead based paint) and / or landscaping activities (e.g. fertilisers, pesticides). However, following building demolition, a contaminated land specialist should walkover the building footprint to assess the area for evidence of contamination (e.g. building material, fill, staining) and collect samples if deemed appropriate by the specialist.

Due to the low frequency and limited distribution of concentrations of lead exceeding the human health-based criterion for commercial land use, the risks due to these lead concentrations in soil during earthworks or future commercial land use are not considered to be significant. However, soils exceeding the human health-based criteria for recreational and high-density residential land use will require suitable management (e.g., relocation, encapsulation) to manage the risk of exposure to future users (recreational users of planned park areas and future residents, respectively). For example, soils shall not be relocated to future recreational areas unless buried at depth (> 0.5 m or 0.2 m with a geotextile cloth placed on top of material). Alternatively, this material shall be placed in areas not used for high-density residential land use or recreational land use (e.g., in landscaped areas along road reserves or adjacent to commercial buildings).

Soil containing lead above the AUP permitted activity (environmental) criterion are localised in shallow soil around the former residences. Based on the low leachability of lead in samples analysed via TCLP, the risks to the environment associated with this material are not considered to be significant. As a conservative measure, if this material is retained on-site, it should be placed above the high groundwater table and away from areas planned for surface water channels / flows. The location of the placed material should also be documented for future reference and inclusion in the Works Completion Report (refer to Section 9).

4 Summary of Development Activities Relevant to this SMP

We have not been provided with details of the proposed earthworks but envisage that works will comprise:

- Preparing the ground surface by removing topsoil and any remaining structures (e.g., fences, building foundations;
- Recontouring the site to achieve the design levels;
- Undertaking excavations to install subsurface features (e.g., underground services, foundation elements; and
- Importing engineered fill (e.g., GAP65) to create a sub-base, where needed.

Based on the findings of previous investigations (refer Section 3) concentrations of lead exceeding the human health-based criteria may be present around the former structures located at 114 Flanagan Road and 120 Flanagan Road; however, exceedances were restricted to samples collected in from the surface soils (< 0.2 m bgl). We understand that these materials may be relocated during earthworks to prepare the ground surface and KPH intends to retain them on-site. It is not anticipated that groundwater will be encountered during the disturbance of these materials.

The Site Contractor shall adhere to the management practices outlined in this SMP during the disturbance of surface soils (< 0.2 m bgl) with lead concentrations exceeding AUP permitted activity (environmental) criterion (herein, “management areas”). The extent of the management areas are presented on Figure 2 and Figure 3. Based on the current dataset, the inferred volume of soil containing lead above the AUP permitted activity (environmental) criterion is estimated to be approximately 1,000 m^3 – 2,500 m^3, which is the estimated range of volumes that will be removed from the site.

Following disturbance of this material, this SMP shall be referenced for appropriate procedures in the event of an unanticipated discharge or discovery of suspected contaminated material.

5 Site Management Practices and Controls

The contamination-related management practices in Table 3 shall be implemented during earthworks unless advised otherwise by the Contaminated Land Specialist. Many of the required control measures are standard construction site procedures; however, the relevance and effectiveness of these protocols shall be reviewed by the Site Supervisor on a daily basis during work at the site.

Table 3: Site Management Practices

General Site Procedures	Contractor staff, subcontractors and visitors shall be inducted before entering the management areas or commencing work to ensure they are aware of the potential hazards relating to contaminated soil at the site. The following general safety procedures shall be followed by all staff entering or working in the immediate area of the earthworks: • Site workers shall avoid unnecessary contact with site soils. • Hands are to be washed in a dedicated area prior to eating, drinking or smoking. All incidents shall be reported to the Contractor's health and safety advisor, or equivalent responsible person on-site.
Personal Protective Equipment (PPE)	To minimise the effects of potential contamination exposure via incidental ingestion of soil, skin contact with soil or inhalation of dust, the following should be considered over-and-above standard PPE requirements for construction sites (e.g. safety boots): • P2 Dust mask (if visible dust is present) or Half-face P3 respirator with particulate filter • Work gloves / Coveralls (if contact with soil unavoidable)
Boundary Controls	Security fencing and appropriate warning signs erected around the management areas to prevent unauthorised access. Appropriate sediment control measures shall be implemented to minimise sediment runoff from the management areas. Minimum controls shall include: • A stabilised entrance to minimise the movement of soil off-site or in uncontaminated areas of the site. • Suitable sediment controls (e.g. silt fencing) shall be placed around the perimeter of the management areas where there is a potential for runoff. Set up of clean and dirty areas to minimise tracking potentially impacted soils around the site and off-site. • Any machinery used in the management areas shall be cleaned of loose soil in a designated part of the management area prior to tracking across other areas of the site. • Once loose soil has been removed, the cleaned item can be moved to the clean area. Any wastewater generated should not be discharged off-site and should be allowed to drain back into the management area.
Stockpiling	Stockpiling of contaminated material shall be avoided. If temporary stockpiling of material is necessary, dust shall be controlled through wetting during the workday. If left overnight, the material shall be covered (e.g., with plastic) and protected by erosion / sediment controls (e.g., bunded). Stockpiles shall be located on an impermeable surface. If this is not possible, the underlying material should be considered potentially contaminated, and shall be managed appropriately.

Groundwater	A groundwater assessment was not completed as part of the previous investigation; however, observations during the intrusive investigation indicates that groundwater is likely present at a depth of 11 m bgl (Aurecon, 2021). Based on these depths, it is highly unlikely that dewatering will be required during the disturbance of the contaminated or potentially contaminated materials; however, it is possible that unanticipated contamination is encountered at depth and dewatering is needed.
	Groundwater may be discharged to land on-site (either directly or after interim storage on-site), provided it complies with the permitted activity standards outlined in Section E4.6.1 and E4.6.2.5 of the Auckland Unitary Plan (AUP, 2016). These controls include restrictions on any changes to colour or visual clarity, odour emissions or effects on aquatic life.
Stormwater	Uncontrolled discharge of stormwater from the management areas shall not be permitted; therefore, mitigation measures for any unexpected discharges shall be implemented immediately. If the on-site erosion and sediment control measures fail, a vacuum truck shall be called to contain the stormwater discharges. It may be necessary to test water removed off-site to identify an appropriate disposal site.
Dust	Dust shall be managed in accordance with consent requirements and relevant regulations. The Contractor shall implement the following (as appropriate): • Limit vehicle access onto the management areas as far as possible. • Dampen surface soil using a water truck or portable water sprays. Ensure that the volume of water used does not induce soil erosion, or cause surface ponding or runoff, that could discharge into natural water bodies or stormwater drains. • Use wind screens or avoid work during windy conditions. • Consider use of surfactants or polymers where a reliable source of water is not available. In the unlikely event that unsatisfactory dust emissions emanate from the management areas on a sustained basis or complaints are received in relation to the works, mitigation of the adverse effects shall be applied in accordance with the hierarchy of control described in the Health and Safety at Work Act 2015 (MBIE, 2015) -eliminate the risk, so far as is reasonably practicable; and if it is not reasonably practicable to eliminate a risk, to minimise those risks so far as is reasonably practicable. If the emission or discharges persist, professional advice shall be sought in order to define appropriate control measures. It is recommended that consultation with appropriate council representatives also be undertaken prior to recommencing works.
Odour	It is not anticipated that the material in the management areas will contain odorous or putrescible matter; however, if excavated material is odorous, odour control measures shall be implemented. This could include covering the material with cleanfill, a polythene cover or instituting a deodoriser system.

Soil Disposal and Management	If surface soils in the management areas require off-site relocation, trucks shall be loaded within the management area where runoff and possible spills during loading will be controlled and contained. Loads must be securely covered during off-site transport. Soil must be taken to an appropriate soil disposal facility authorised to accept the contaminants present. Prior to acceptance, the results of the soil testing and TCLP analysis may be requested by the receiving facility. Requirements for additional testing and truck lining / soil wrapping should be confirmed with the receiving facility. All soils at the site are suitable to remain on-site; however, surface soils in the management areas shall be appropriately sited / encapsulated (e.g., in landscaped areas under a 200 mm cover of cleanfill) to prevent exposure to future high-density residential users. Deeper (> 0.2 m bgl) soils in the management areas and soils outside the management areas are suitable for unrestricted use onsite. If disposal is required, materials outside the management areas may comply with the Auckland Council definition of cleanfill material; however; this shall be confirmed with the cleanfill operator. Also note, a contaminated land specialist shall observe soils beneath buildings following demolition. If evidence of contamination is observed (e.g. building material, fill, staining), the material shall be tested for potential contaminants of concern or removed from site with the demolition debris and soil beneath validated for relevant contaminants of concern.
Importing Materials	Any materials imported to the site shall be quarry-sourced or the Contaminated Land Specialist shall be provided with material details (e.g., source location, results of laboratory testing) to assess the suitability of the material as cleanfill.

6 Asbestos Controls

Based on the findings of the previous investigations it is currently not anticipated that soil impacted by asbestos is present at the site, however care must be taken to identify any potential asbestos containing material (ACM) during earthworks activities. The earthworks contractor shall contact the Contaminated Land Specialist if areas of potential contamination are discovered during works.

If asbestos is identified as part of additional investigation works or during the redevelopment works (e.g. if asbestos cement pipes are encountered), the controls for the relevant asbestos works classification in Appendix 4 shall be implemented. As asbestos is considered primarily a human health contaminant, the objective of these asbestos controls is to eliminate personal exposure to airborne asbestos on and off-site, so far as reasonably practicable. In accordance with the WorkSafe Approved Code of Practice (herein referred to as 'the ACOP'; WorkSafe, 2016), if it is not reasonably practicable to eliminate personal exposure to airborne asbestos, exposure must be minimised, so far as is reasonably practicable. The Contaminated Land Specialist shall assess the appropriate level of asbestos controls to be implemented.

The control measures in Appendix 4 have been designed to meet the Safe Work Practices specified in the ACOP (WorkSafe, 2016), and the NZGAMAS (BRANZ, 2017); an asbestos removal plan will need to be prepared if asbestos pipes are identified. As the NZGAMAS (BRANZ, 2017) is referenced in the WorkSafe ACOP, the NZGAMAS (BRANZ, 2017) or higher level of controls are required.

7 Unanticipated Ground Conditions

As discussed above, a contaminated land specialist shall observe soils beneath buildings following demolition. If evidence of contamination is observed (e.g. building material, fill, staining), the material shall be tested for potential contaminants of concern or removed from site with the demolition debris and soil beneath validated for relevant contaminants of concern.

Should any unanticipated contaminated material be uncovered during earthworks, works shall stop in that area and a SQEP from the Contaminated Land Specialist company shall be called out to assess the potential risk and advise on what measures should be taken to manage the soil in that area.

Typical indicators of contamination include but are not limited to:

- Buried waste (for example drums or tanks with unknown liquid).
- Odour (petroleum hydrocarbons, oil).
- Discoloured soil (black, purple, or green staining most common).
- Asbestos containing materials (ACM) as fragments are visible with the naked eye.
- Uncontrolled fill material.

Examples of typical indicators of contamination have been provided in Table 4.

Table 4: Typical Indicators of Contamination

Uncontrolled Filling Building debris may contain asbestos or other contaminants	
Asbestos Containing Material Intact sheets or broken into smaller pieces, may be mixed with other material	
Separate-Phase Hydrocarbons Black liquid, odours, sheen	

8 Documentation

In order to demonstrate adherence to the requirements of this SMP, the documents listed in Table 5 shall be provided to the Contaminated Land Specialist company in the timeframes stipulated below. These documents will be included in a completion report for the site (discussed further in Section 9).

Table 5: Contractor Documentation

Prior to Earthworks Commencing	• Written confirmation from the proposed disposal site(s) confirming that they will accept excess material from the site. • For any material that is to be imported to the site as cleanfill on the basis of direct testing, a copy of the analytical laboratory test report shall be provided prior to transport.

Within Two Weeks of Earthworks Being Completed (or on an ongoing basis during works)	• Daily site photographs showing the entrance, stockpiles, and sediment control measures in the management areas.
	• A site plan showing any areas where surface soils originating at the management areas have been relocated.
	• Disposal dockets for each load of material that is removed from the management areas. The dockets should contain the following information:
	  ○ Date and time dispatched.
	  ○ Material description.
	  ○ The volume of material in the load.
	  ○ Haulage contractor details (name, address, contact person, contact telephone number).
	  ○ Truck and trailer registration number.
	  ○ The destination of material.
	• Documentation for all imported fill which shall include:
	  ○ Date and time dispatched.
	  ○ Address of source site.
	  ○ Type and proposed use of material.
	  ○ Weight and / or volume of material carried.
	  ○ Basis for treating the material as cleanfill (e.g., directly tested and confirmed to be cleanfill or directly sourced from a licensed quarry).
	• Information relating to any incidents or complaints and how these were managed.

9 Completion Reporting

A Works Completion Report will likely be required following site development activities. The report shall be prepared in accordance with MfE Contaminated Land Management Guideline No. 1 (MfE, 2021a) by a Contaminated Land Specialist SQEP who has monitored the earthworks on-site. The report shall, as a minimum, include the following information:

- Summary of soil disturbance works on-site and information relating to discovery of additional contamination, or site observations.
- Documentation relating to the disposal of contaminated soil / fill and used PPE.
- Documentation relating to the importation of cleanfill (if relevant).
- Summary of site observation visits and additional testing works, if any.

10 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Kiwi Property Holdings No. 2 Ltd, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by

Lyn Nugent, CEnvP

Environmental Scientist

Report reviewed by

Erika McDonald, CMEngNZ

Principal Environmental Engineer

11 References

Auckland Council, 2016. The Auckland Unitary Plan Operative in part - 15 November 2016, Auckland Council.

Aurecon Limited, 2020. Drury Centre Project – Preliminary Site Investigation.

Aurecon Limited, 2021. Drury Centre Project – Detailed Site Investigation (ref 510511). Prepared for Kiwi Property Holdings Ltd.

BRANZ, 2017. New Zealand Guidelines for Assessing and Managing Asbestos in Soil. The Building Research Association New Zealand.

ENGEO Limited, 2017. Geotechnical and Environmental Due Diligence Investigation – 64-66 Flanagan Road. (ref 13451.000.001_10) Prepared for Kiwi Property Group Ltd.

ENGEO Limited, 2017. Geotechnical and Environmental Due Diligence Investigation – 120 Flanagan Road. (ref 13451.000.001_06) Prepared for Kiwi Property Group Ltd.

MfE, 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health.

MfE, 2021a. Ministry for the Environment. (2021). Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils.

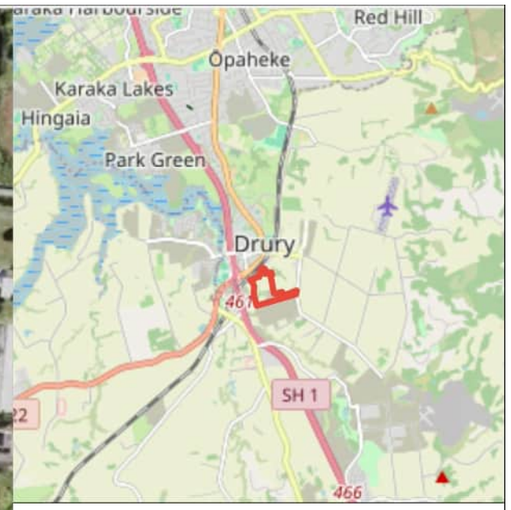
MfE, 2021b. Contaminated Land Management Guidelines No.1: Reporting on Contaminated Sites in New Zealand, Ministry for the Environment (revised 2021).

MfE,rev 2021. Hazardous Activities and Industries List (HAIL). Ministry for the Environment.

MBIE, 2015. Health and Safety at Work Act, 2015.

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

FIGURES



Legend

Stage 2 Boundary

0 50 m 100 m

ENGEO

Produced by **Datanest.earth**

Title: Site Location Plan		
Client: Kiwi Property Holdings Ltd (KPH)		Size: A3
Project: Drury Development Stage 2	Drawn: OB	Figure No.: 1
Date: 08-01-2024	Checked: LN	
Proj No: 13451.000.001	Scale: 1:2826	Version: 1.0

Legend

Approximate Pb > AUP PA

0 2.5 m 5 m

ENGEO

Produced by **Datanest.earth**

Title: Management Area (120 Flanagan)		
Client: Kiwi Property Holdings Ltd (KPH)		Size: A4
Project: Drury Development Stage 2	Drawn: OB	Figure No.: 2
Date: 19-02-2024	Checked: LN	
Proj No: 13451.000.001	Scale: 1:259	Version: 1.0

Legend

Approximate Pb > AUP PA

0 2.5 m 5 m

ENGEO

Produced by **Datanest.earth**

Title: Management Area (114 Flanagan)		
Client: Kiwi Property Holdings Ltd (KPH)		Size: A4
Project: Drury Development Stage 2	Drawn: OB	Figure No.: 3
Date: 19-02-2024	Checked: LN	
Proj No: 13451.000.001	Scale: 1:227	Version: 1.0

APPENDIX 1:

Aurecon Investigation Summary

Legend

- Aurecon (2021) Location
- Stage 2 Boundary

0 25 m 50 m

ENGEO

Produced by **Datanest.earth**

Title: Aurecon DSI (2021) Sample Locations		
Client: Kiwi Property Holdings Ltd (KPH)		Size: A4
Project: Drury Development Stage 2	Drawn: OB	Figure: A1.1
Date: 19-02-2024	Checked: LN	
Proj No: 13451.000.001	Scale: 1:2773	Version: 1.0

Table A1.1: Summary of Relevent Aurecon DSI Analytical Results

Sampled Date	Location	Depth (m)	Heavy Metals		Asbestos	
			Arsenic	Lead	ACM	AF/FA
15/01/21	SS001	0 - 0.2	**16**	14.4	< 0.001	< 0.001
	SS003	0 - 0.2	**17**	**86**	< 0.001	< 0.001
	SS005	0 - 0.2	6	29	< 0.001	< 0.001
	SS008	0 - 0.2	**47**	29	< 0.001	< 0.001
	SS009	0 - 0.2	9	27	< 0.001	< 0.001
20/01/21	SS025	0 - 0.2	8	19.3	< 0.001	< 0.001
15/01/21	SS028	0 - 0.2	**16**	48	< 0.001	< 0.001
	SS030	0 - 0.2	**33**	250	< 0.001	< 0.001
	SS035	0 - 0.2	10	***850***	< 0.001	< 0.001
	SS037	0 - 0.2	**19**	**1,410**	< 0.001	< 0.001
	SS040	0 - 0.2	12	24	< 0.001	< 0.001
	TP040	0.1 - 0.2	7	49	< 0.001	< 0.001
	TP040	1.9 - 2.0	5	5.5	< 0.001	< 0.001
18/01/21	SS043	0 - 0.2	11	**4,200**	< 0.001	< 0.001
	SS045	0 - 0.2	**36**	**118**	< 0.001	< 0.001
	SS046	0 - 0.2	10	**68**	< 0.001	< 0.001
Assessment Criteria						
Background: Auckland, Volcanic[1]			**0.4 - 12**	**5 - 65**	-	-
AUP Permitted Activity (environmental)[2]			100	250	-	-
Human Health[3] High Density Residential			*45*	*500*	*0.04%*	*0.001%*
Human Health[3] Recreational			80	880	0.02%	0.001%
Human Health[3] Commercial / Industrial			70	3,300	0.05%	0.001%

Scenarios:

Bold	Indicates result exceeds Background: Auckland, Volcanic
Shaded	Indicates result exceeds Environmental Discharge Criteria (AUP)
Italics	Indicates result exceeds for Human Health, High Density Residential
Shaded	Indicates result exceeds for Human Health, Recreational

Criteria adopted from the following guidelines:

[1]Auckland Unitary Plan, Table E30.6.1.4.2: Background Ranges of Trace Elements in Auckland Soils, Volcanic Range (Auckland Regional Council, rev 2024)

[2]Auckland Unitary Plan, Table E30.6.1.4.1: Permitted Activity Soil Acceptance Criteria (Auckland Regional Council, rev 2024)

[3]Methodology for Deriving Contaminants in Soil to Protect Human Health, Table 54: Summary of Contaminant Standards (MfE, 2011)

Notes:

This table does not represent the full analytical results, please refer to the laboratory results for full details.

APPENDIX 2:

ENGEO Investigation Summary

Legend

- ENGEO Laboratory Sample Locations
- Stage 2 Boundary

0 25 m 50 m

ENGEO

Produced by **Datanest.earth**

Title: ENGEO Soil Sampling Locations		
Client: Kiwi Property Holdings Ltd (KPH)		Size: A4
Project: Drury Development Stage 2	Drawn: OB	Figure: A2.1
Date: 19-02-2024	Checked: LN	
Proj No: 13451.000.001	Scale: 1:1684	Version: 1.0

Table A2.1: Summary of Supplementary Soil Sampling Analytical Results

Sampled Date	Location	Depth (m)	Heavy Metals							PAHs	Asbestos (%)		TCLP
			Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	BaP(eq)[1]	ACM	AF/FA	Lead
31-10-2023	HA01	0 - 0.15	-	-	-	-	170	-	-	-	< 0.001	< 0.001	-
	HA02	0 - 0.15	-	-	-	-	104	-	-	-	< 0.001	< 0.001	-
	HA03	0 - 0.15	-	-	-	-	113	-	-	-	< 0.001	< 0.001	-
	HA04	0 - 0.15	-	-	-	-	830	-	-	-	< 0.001	< 0.001	0.62
	HA04	0.15 - 0.3	-	-	-	-	161	-	-	-	-	-	-
	HA05	0 - 0.15	-	-	-	-	162	-	-	-	< 0.001	< 0.001	-
	HA06	0 - 0.15	-	-	-	-	270	-	-	-	< 0.001	< 0.001	0.116
	HA06	0.3 - 0.6	-	-	-	-	48	-	-	-	-	-	-
	HA07	0 - 0.1	-	-	-	-	78	-	-	-	< 0.001	< 0.001	-
	HA08	0 - 0.2	9	0.7	22	25	38	10	54	< 0.035	< 0.001	< 0.001	-
	HA09	0 - 0.2	8	0.62	18	22	31	8	60	< 0.035	< 0.001	< 0.001	-
	HA10	0 - 0.15	2	0.35	10	6	12.7	3	18	< 0.032	< 0.001	< 0.001	-
	HA11	0 - 0.2	3	0.25	11	27	22	4	30	< 0.036	< 0.001	< 0.001	-
	HA12	0 - 0.15	-	-	-	-	230	-	-	-	< 0.001	< 0.001	0.053
	HA12	0.15 - 0.3	-	-	-	-	131	-	-	-	-	-	-
	HA13	0 - 0.15	-	-	-	-	*1,240*	-	-	-	< 0.001	< 0.001	0.30
	HA13	0.4 - 0.55	-	-	-	-	154	-	-	-	-	-	-
	HA14	0 - 0.15	-	-	-	-	320	-	-	-	< 0.001	< 0.001	0.065
	HA14	0.15 - 0.4	-	-	-	-	122	-	-	-	-	-	-
Assessment Criteria													
Background: Auckland, Volcanic[2]			0.4 - 12	0.1 - 0.65	3 - 125	20 - 90	5 - 65	4 - 320	54 - 1,160	-	-	-	-
AUP Permitted Activity (environmental)[3]			100	7.5	400	325	250	105	400	20	-	-	-
Human Health[4,5,6] High Density Residential			*45*	*230*	*1,500*	*10,000*	*500*	*1,200*	*60,000*	*24*	*0.04%*	*0.001%*	-
Human Health[4,5,6] Recreational			80	400	2,700	10,000	880	1,200	30,000	40	0.02%	0.001%	-
Human Health[4,5,6] Commercial / Industrial			70	1,300	6,300	10,000	3,300	6,000	400,00	35	0.05%	0.001%	-
Hampton Downs Waste Acceptance Criteria (mg/L) [7]							200						10

Scenarios:

Bold	Indicates result exceeds Background: Auckland, Volcanic
Shaded	Indicates result exceeds Environmental Discharge Criteria (AUP)
Italics	Indicates result exceeds for Human Health, High Density Residential
Shaded	Indicates result exceeds for Human Health, Recreational
Bordered	Indicates result exceeds Envirowaste acceptance criteria for Hampton Downs

Criteria adopted from the following guidelines:

[1]Calculated as the sum of nine carcinogenic PAH compounds multiplied by their respective potency equivalency factor (refer Table 40, MfE, 2011b)

[2]Auckland Unitary Plan, Table E30.6.1.4.2: Background Ranges of Trace Elements in Auckland Soils, Volcanic Range (Auckland Regional Council, rev 2024)

[3]Auckland Unitary Plan, Table E30.6.1.4.1: Permitted Activity Soil Acceptance Criteria (Auckland Regional Council, rev 2024)

[4]Methodology for Deriving Contaminants in Soil to Protect Human Health, Table 54: Summary of Contaminant Standards (MfE, 2011)

[5]National Environmental Protection (Assessment of Site Contamination) Measure 1999. Table 1A(1): Health Investigation Levels (nickel and zinc) (NEPC, 2013)

[6]New Zealand Guidelines for Assessing and Managing Asbestos in Soil, Table 5: Soil Guideline Values for Asbestos (BRANZ, 2017)

Notes:

All results provided in mg/kg unless otherwise indicated

This table does not represent the full analytical results, please refer to the laboratory results for full details.

Assumes soil pH of 5 for Cadmium.

Legend

XRF Locations

0 5 m 10 m

ENGEO

Produced by **Datanest.earth**

Title: XRF Reading Locations (120 Flanagan Rd)		
Client: Kiwi Property Holdings Ltd (KPH)		Size: A4
Project: Drury Development Stage 2	Drawn: OB	Figure: A2.2
Date: 19-02-2024	Checked: LN	
Proj No: 13451.000.001	Scale: 1:468	Version: 1.0

Table A2.2: Summary Background Deliniation Analytical Results

Sampled Date	Location	Depth (m)	Heavy Metals
			Lead
15-12-2023	S01	0 - 0.15	39
	S02	0 - 0.15	**82**
	S03	0 - 0.15	48
	S04	0 - 0.15	37
	S05	0 - 0.15	35
	S06	0 - 0.15	48
	S07	0 - 0.15	63
	S08	0 - 0.15	**90**
	S09	0 - 0.15	58
	S10	0 - 0.15	**77**
	S11	0 - 0.15	58
	S12	0 - 0.15	60
	S13	0 - 0.15	**73**
	S14	0 - 0.15	43
	S15	0 - 0.15	**80**
	S16	0 - 0.15	**74**
Assessment Criteria			
Background: Auckland, Volcanic[2]			**5 - 65**
AUP Permitted Activity (environmental)[3]			250
Human Health[4] High Density Residential			*500*
Human Health[4] Recreational			880
Human Health[4] Commercial / Industrial			3,300

Scenarios:

Bold	Indicates result exceeds Background: Auckland, Volcanic
Shaded	Indicates result exceeds Environmental Discharge Criteria (AUP)
Italics	Indicates result exceeds for Human Health, High Density Residential
Shaded	Indicates result exceeds for Human Health, Recreational

Criteria adopted from the following guidelines:

[1]Calculated as the sum of nine carcinogenic PAH compounds multiplied by their respective potency equivalency factor (refer Table 40, MfE, 2011b)

[2]Auckland Unitary Plan, Table E30.6.1.4.2: Background Ranges of Trace Elements in Auckland Soils, Volcanic Range (Auckland Regional Council, rev 2024)

[3]Auckland Unitary Plan, Table E30.6.1.4.1: Permitted Activity Soil Acceptance Criteria (Auckland Regional Council, rev 2024)

Legend

XRF Locations

0 5 m 10 m

ENGEO

Produced by **Datanest.earth**

Title: XRF Reading Locations (114 Flanagan Rd)		
Client: Kiwi Property Holdings Ltd (KPH)		Size: A4
Project: Drury Development Stage 2	Drawn: OB	Figure: A2.3
Date: 19-02-2024	Checked: LN	
Proj No: 13451.000.001	Scale: 1:377	Version: 1.0

Table A2.3: Summary of XRF Readings and Location Coordinates

XRF ID	Sample ID	Latitude	Longitude	Lead (ppm)
1-A		-37.110196	174.9518067	120
1-B	S01	-37.1101596	174.9519661	10
1-C	S02	-37.1100412	174.9519444	20
1-D		-37.1099272	174.9516631	280
1-E		-37.1098927	174.9517148	620
1-F		-37.1098497	174.9517535	220
1-G		-37.1098167	174.9517764	125
1-H	S03	-37.1097823	174.9517736	40
1-I	S04	-37.1097751	174.9516717	24
1-J		-37.1098712	174.9514365	150
1-K	S05	-37.1097909	174.9514365	20
1-L	S06	-37.1098569	174.9513246	22
1-M		-37.1098956	174.9513418	50
1-N		-37.1099802	174.9512873	100
1-P		-37.1100778	174.9512816	170
1-Q	S07	-37.1100592	174.95103	35
1-R		-37.110207	174.9511075	90
1-S	S08	-37.1102629	174.9512065	15
1-T		-37.1102916	174.9514059	10
2-A	S09	-37.1083637	174.9502014	20
2-B		-37.1084839	174.9502219	25
2-C		-37.1086139	174.9502375	200
2-D		-37.1086081	174.9502747	190
2-E	S10	-37.1085944	174.9503294	20
2-F		-37.1086736	174.9503255	130
2-G		-37.1086921	174.9503656	130
2-H	S11	-37.1086814	174.9504027	25
2-I		-37.1087703	174.9500528	95
2-J	S12	-37.1087556	174.9499535	30
2-K		-37.1085818	174.9499247	260
2-L		-37.1085888	174.9498774	200

Table A2.3: Summary of XRF Readings and Location Coordinates

XRF ID	Sample ID	Latitude	Longitude	Lead (ppm)
2-M		-37.1085942	174.9498231	60
2-N		-37.1085942	174.9497641	400
2-O		-37.1085999	174.9497093	60
2-P		-37.1086048	174.9496619	70
2-Q		-37.1085549	174.9496533	200
2-R		-37.1086651	174.9496626	40
2-S	S13	-37.1086584	174.9497882	40
2-T		-37.1084969	174.9498033	40
2-U		-37.1083881	174.9499144	150
2-W		-37.1083875	174.9500197	90
2X	S14	-37.1083468	174.9500363	45
2-Y		-37.1084367	174.9498768	65
2Z	S15	-37.1084416	174.9498294	40
2-AA		-37.1087985	174.9500235	120
2-BB	S16	-37.108822	174.9500771	30

Legend

- ENGEO Laboratory Sample Locations
- Aurecon (2021) Location
- Approximate Pb > AUP PA
- Approximate Pb > Background

0 5 m 10 m

ENGEO

Produced by **Datanest.earth**

Title: Lead Concentrations in Soil (120 Flanagan Rd)		
Client: Kiwi Property Holdings Ltd (KPH)		Size: A4
Project: Drury Development Stage 2	Drawn: OB	Figure: A2.4
Date: 19-02-2024	Checked: LN	
Proj No: 13451.000.001	Scale: 1:475	Version: 1.0

Legend

- ENGEO Laboratory Sample Locations
- Aurecon (2021) Location
- Approximate Pb > AUP PA
- Approximate Pb > Background

0 5 m 10 m

ENGEO

Produced by **Datanest.earth**

Title: Lead Concentrations in Soil (114 Flanagan Rd)		
Client: Kiwi Property Holdings Ltd (KPH)		Size: A4
Project: Drury Development Stage 2	Drawn: OB	Figure: A2.5
Date: 19-02-2024	Checked: LN	
Proj No: 13451.000.001	Scale: 1:354	Version: 1.0

APPENDIX 3:

Laboratory Reports

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Engeo Limited	**Lab No:**	3396070	SPv4
Contact:	Lyn Nugent	**Date Received:**	31-Oct-2023	
	C/- Engeo Limited	**Date Reported:**	13-Mar-2024	**(Amended)**
	PO Box 373	**Quote No:**	82742	
	Christchurch 8140	**Order No:**		
		Client Reference:	13451.000.001	
		Submitted By:	Nandhini R	

Sample Type: Soil

Sample Name:		HA14 @ 0-0.15 31-Oct-2023	HA14 @ 0.15-0.4 31-Oct-2023	HA13 @ 0-0.15 31-Oct-2023	HA13 @ 0.4-0.55 31-Oct-2023	HA12 @ 0-0.15 31-Oct-2023
Lab Number:		3396070.1	3396070.2	3396070.4	3396070.6	3396070.7
Individual Tests						
TCLP Weight of Sample Taken	g	50	-	50	-	50
TCLP Initial Sample pH	pH Units	7.0	-	7.4	-	6.5
TCLP Acid Adjusted Sample pH	pH Units	1.7	-	1.6	-	1.5
TCLP Extractant Type*		NaOH/Acetic acid at pH 4.93 +/- 0.05	-	NaOH/Acetic acid at pH 4.93 +/- 0.05	-	NaOH/Acetic acid at pH 4.93 +/- 0.05
TCLP Extraction Fluid pH	pH Units	5.0	-	5.0	-	5.0
TCLP Post Extraction Sample pH	pH Units	5.0	-	5.0	-	4.9
Total Recoverable Lead	mg/kg dry wt	320	122	1,240	154	230

Sample Name:		HA12 @ 0.15-0.3 31-Oct-2023	HA11 @ 0-0.2 31-Oct-2023	HA10 @ 0-0.15 31-Oct-2023	HA08 @ 0-0.2 31-Oct-2023	HA09 @ 0-0.2 31-Oct-2023
Lab Number:		3396070.8	3396070.10	3396070.14	3396070.17	3396070.19
Individual Tests						
Dry Matter	g/100g as rcvd	-	66	75	68	68
Total Recoverable Lead	mg/kg dry wt	131	-	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	3	2	9	8
Total Recoverable Cadmium	mg/kg dry wt	-	0.25	0.35	0.70	0.62
Total Recoverable Chromium	mg/kg dry wt	-	11	10	22	18
Total Recoverable Copper	mg/kg dry wt	-	27	6	25	22
Total Recoverable Lead	mg/kg dry wt	-	22	12.7	38	31
Total Recoverable Nickel	mg/kg dry wt	-	4	3	10	8
Total Recoverable Zinc	mg/kg dry wt	-	30	18	54	60
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Total of Reported PAHs in Soil	mg/kg dry wt	-	< 0.4	< 0.4	< 0.4	< 0.4
1-Methylnaphthalene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
2-Methylnaphthalene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Acenaphthylene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Acenaphthene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Anthracene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Benzo[a]anthracene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt	-	< 0.036	< 0.032	< 0.035	< 0.035
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt	-	< 0.036	< 0.032	< 0.035	< 0.035
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Benzo[e]pyrene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015

Sample Type: Soil						
Sample Name:		HA12 @ 0.15-0.3 31-Oct-2023	HA11 @ 0-0.2 31-Oct-2023	HA10 @ 0-0.15 31-Oct-2023	HA08 @ 0-0.2 31-Oct-2023	HA09 @ 0-0.2 31-Oct-2023
Lab Number:		3396070.8	3396070.10	3396070.14	3396070.17	3396070.19
Polycyclic Aromatic Hydrocarbons Screening in Soil*						
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Chrysene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Fluoranthene	mg/kg dry wt	-	0.018	< 0.013	< 0.015	< 0.015
Fluorene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Naphthalene	mg/kg dry wt	-	< 0.08	< 0.07	< 0.08	< 0.08
Perylene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Phenanthrene	mg/kg dry wt	-	< 0.015	< 0.013	< 0.015	< 0.015
Pyrene	mg/kg dry wt	-	0.023	< 0.013	< 0.015	< 0.015

Sample Name:		HA07 @ 0-0.1 31-Oct-2023	HA06 @ 0-0.15 31-Oct-2023	HA06 @ 0.3-0.6 31-Oct-2023	HA05 @ 0-0.15 31-Oct-2023	HA02 @ 0-0.15 31-Oct-2023
Lab Number:		3396070.22	3396070.23	3396070.25	3396070.26	3396070.29
Individual Tests						
TCLP Weight of Sample Taken	g	-	50	-	-	-
TCLP Initial Sample pH	pH Units	-	7.5	-	-	-
TCLP Acid Adjusted Sample pH	pH Units	-	1.6	-	-	-
TCLP Extractant Type*		-	NaOH/Acetic acid at pH 4.93 +/- 0.05	-	-	-
TCLP Extraction Fluid pH	pH Units	-	5.0	-	-	-
TCLP Post Extraction Sample pH	pH Units	-	5.0	-	-	-
Total Recoverable Lead	mg/kg dry wt	78	270	48	162	104

Sample Name:		HA01 @ 0-0.15 31-Oct-2023	HA03 @ 0-0.15 31-Oct-2023	HA04 @ 0-0.15 31-Oct-2023	HA04 @ 0.15-0.3 31-Oct-2023
Lab Number:		3396070.32	3396070.35	3396070.38	3396070.39
Individual Tests					
TCLP Weight of Sample Taken	g	-	-	50	-
TCLP Initial Sample pH	pH Units	-	-	7.0	-
TCLP Acid Adjusted Sample pH	pH Units	-	-	1.6	-
TCLP Extractant Type*		-	-	NaOH/Acetic acid at pH 4.93 +/- 0.05	-
TCLP Extraction Fluid pH	pH Units	-	-	5.0	-
TCLP Post Extraction Sample pH	pH Units	-	-	5.0	-
Total Recoverable Lead	mg/kg dry wt	170	113	830	161

Sample Type: Aqueous						
Sample Name:		HA14 @ 0-0.15 [TCLP Extract]	HA13 @ 0-0.15 [TCLP Extract]	HA12 @ 0-0.15 [TCLP Extract]	HA06 @ 0-0.15 [TCLP Extract]	HA04 @ 0-0.15 [TCLP Extract]
Lab Number:		3396070.41	3396070.42	3396070.43	3396070.44	3396070.45
Heavy metals, totals, screen As,Cd,Cr,Cu,Ni,Pb,Zn, for TCLP samples						
Total Arsenic	g/m³	< 0.021	< 0.021	< 0.021	< 0.021	< 0.021
Total Cadmium	g/m³	0.0019	0.0048	0.0018	0.0032	0.0022
Total Chromium	g/m³	< 0.011	< 0.011	< 0.011	< 0.011	< 0.011
Total Copper	g/m³	0.016	0.108	< 0.011	0.022	0.014
Total Lead	g/m³	0.065	0.30	0.053	0.116	0.62
Total Nickel	g/m³	< 0.011	< 0.011	< 0.011	0.015	< 0.011
Total Zinc	g/m³	0.75	4.3	2.8	1.07	1.99

Analyst's Comments

Amended Report: This certificate of analysis replaces report '3396070-SPv3' issued on 15-Nov-2023 at 3:35 pm.
Reason for amendment: Additional testing added as per clients request.

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-2, 4, 6-8, 10, 14, 17, 19, 22-23, 25-26, 29, 32, 35, 38-39
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation May contain a residual moisture content of 2-5%.	-	1-2, 4, 6-8, 22-23, 25-26, 29, 32, 35, 38-39
Total of Reported PAHs in Soil	Sonication extraction, GC-MS/MS analysis. In-house based on US EPA 8270.	0.03 mg/kg dry wt	10, 14, 17, 19
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	10, 14, 17, 19
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-2, 4, 6-8, 22-23, 25-26, 29, 32, 35, 38-39
Total Recoverable Lead	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	1-2, 4, 6-8, 22-23, 25-26, 29, 32, 35, 38-39
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	BaP Potency Equivalence calculated from; Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1.0 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.024 mg/kg dry wt	10, 14, 17, 19
Benzo[a]pyrene Toxic Equivalence (TEF)*	Benzo[a]pyrene Toxic Equivalence (TEF) calculated from; Benzo[a]pyrene x 1.0 + Benzo(a)anthracene x 0.1 + Benzo(b) fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.0 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.024 mg/kg dry wt	10, 14, 17, 19
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	10, 14, 17, 19
Polycyclic Aromatic Hydrocarbons Screening in Soil*	Sonication extraction, GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.010 - 0.05 mg/kg dry wt	10, 14, 17, 19
TCLP Profile*	Extraction at 30 +/- 2 rpm for 18 +/- 2 hours, (Ratio 1g sample : 20g extraction fluid). US EPA 1311.	-	1, 4, 7, 23, 38
TCLP Profile			
TCLP Weight of Sample Taken	Gravimetric. US EPA 1311.	0.1 g	1, 4, 7, 23, 38
TCLP Initial Sample pH	pH meter. US EPA 1311.	0.1 pH Units	1, 4, 7, 23, 38
TCLP Acid Adjusted Sample pH	pH meter. US EPA 1311.	0.1 pH Units	1, 4, 7, 23, 38
TCLP Extractant Type*	US EPA 1311.	-	1, 4, 7, 23, 38
TCLP Extraction Fluid pH	pH meter. US EPA 1311.	0.1 pH Units	1, 4, 7, 23, 38
TCLP Post Extraction Sample pH	pH meter. US EPA 1311.	0.1 pH Units	1, 4, 7, 23, 38

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Total Digestion of Extracted Samples*	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	41-45
Heavy metals, totals, screen As,Cd,Cr,Cu,Ni,Pb,Zn, for TCLP samples	Nitric acid digestion, ICP-MS, screen level. APHA 3125 B (modified) 23rd ed. 2017.	0.0011 - 0.053 g/m^3	41-45

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

Testing was completed between 06-Nov-2023 and 13-Mar-2024. For completion dates of individual analyses please contact the laboratory.

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Engeo Limited	**Lab No:**	3396075	A2Pv1
Contact:	Lyn Nugent C/- Engeo Limited PO Box 373 Christchurch 8140	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	31-Oct-2023 11-Nov-2023 82742 13451.000.001 Nandhini R	

Sample Type: Soil

Sample Name:		HA14 @ 0-0.15 31-Oct-2023	HA13 @ 0-0.15 31-Oct-2023	HA12 @ 0-0.15 31-Oct-2023	HA11 @0-0.2 31-Oct-2023	HA10 @ 0-0.15 31-Oct-2023
Lab Number:		3396075.1	3396075.4	3396075.7	3396075.10	3396075.13
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	629.6	648.4	559.9	451.9	699.7
Dry Weight	g	440.4	442.0	389.5	307.4	522.4
Moisture*	%	30	32	30	32	25
Sample Fraction >10mm	g dry wt	< 0.1	10.6	5.9	< 0.1	< 0.1
Sample Fraction <10mm to >2mm	g dry wt	159.3	204.0	205.9	157.0	209.5
Sample Fraction <2mm	g dry wt	278.7	224.5	174.6	148.1	310.6
<2mm Subsample Weight	g dry wt	58.5	56.5	58.6	53.7	53.8
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		HA08 @ 0-0.2 31-Oct-2023	HA09 @ 0-0.2 31-Oct-2023	HA07 @ 0-0.1 31-Oct-2023	HA06 @ 0-0.15 31-Oct-2023	HA05 @ 0-0.15 31-Oct-2023
Lab Number:		3396075.16	3396075.18	3396075.21	3396075.22	3396075.25
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	589.8	489.0	705.8	585.7	555.2
Dry Weight	g	409.0	344.9	618.7	448.8	357.6
Moisture*	%	31	29	12	23	36

Sample Type: Soil						
Sample Name:		HA08 @ 0-0.2 31-Oct-2023	HA09 @ 0-0.2 31-Oct-2023	HA07 @ 0-0.1 31-Oct-2023	HA06 @ 0-0.15 31-Oct-2023	HA05 @ 0-0.15 31-Oct-2023
Lab Number:		3396075.16	3396075.18	3396075.21	3396075.22	3396075.25
Sample Fraction >10mm	g dry wt	15.0	67.3	134.0	20.4	< 0.1
Sample Fraction <10mm to >2mm	g dry wt	252.9	195.7	288.4	239.8	187.5
Sample Fraction <2mm	g dry wt	133.7	78.2	193.8	186.8	165.7
<2mm Subsample Weight	g dry wt	55.7	57.0	57.9	55.7	54.5
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Sample Name:		HA02 @ 0-0.15 31-Oct-2023	HA01 @ 0-0.15 31-Oct-2023	HA03 @ 0-0.15 31-Oct-2023	HA04 @ 0-0.15 31-Oct-2023
Lab Number:		3396075.28	3396075.31	3396075.34	3396075.37
Asbestos Presence / Absence		Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.	Asbestos NOT detected.
Description of Asbestos Form		-	-	-	-
Asbestos in ACM as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
Combined Fibrous Asbestos + Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Fibrous Asbestos as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
Asbestos as Asbestos Fines as % of Total Sample*	% w/w	< 0.001	< 0.001	< 0.001	< 0.001
As Received Weight	g	540.5	603.6	636.2	544.8
Dry Weight	g	366.8	407.6	462.3	403.9
Moisture*	%	32	32	27	26
Sample Fraction >10mm	g dry wt	< 0.1	< 0.1	< 0.1	2.0
Sample Fraction <10mm to >2mm	g dry wt	196.2	215.4	185.9	209.9
Sample Fraction <2mm	g dry wt	165.3	189.2	273.3	190.8
<2mm Subsample Weight	g dry wt	56.1	58.1	50.7	54.4
Weight of Asbestos in ACM (Non-Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Fibrous Asbestos (Friable)	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Weight of Asbestos as Asbestos Fines (Friable)*	g dry wt	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Glossary of Terms

• Loose fibres (Minor) - One or two fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• Loose fibres (Major) - Three or more fibres/fibre bundles identified during analysis by stereo microscope/PLM.
• ACM Debris (Minor) - One or two small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• ACM Debris (Major) - Large (>2mm) piece, or more than three small (<2mm) pieces of material attached to fibres identified during analysis by stereo microscope/PLM.
• Unknown Mineral Fibres - Mineral fibres of unknown type detected by polarised light microscopy including dispersion staining. The fibres detected may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required.
• Trace - Trace levels of asbestos, as defined by AS4964-2004.
For further details, please contact the Asbestos Team.

Please refer to the BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soil.
https://www.branz.co.nz/asbestos

The following assumptions have been made:

1. Asbestos Fines in the <2mm fraction, after homogenisation, is evenly distributed throughout the fraction
2. The weight of asbestos in the sample is unaffected by the ashing process.

Results are representative of the sample provided to Hill Laboratories only.

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
New Zealand Guidelines Semi Quantitative Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g	1, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
Moisture*	Sample dried at 100 to 105°C. Calculation = (As received weight - Dry weight) / as received weight x 100.	1 %	1, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
Sample Fraction >10mm	Sample dried at 100 to 105°C, 10mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
Sample Fraction <10mm to >2mm	Sample dried at 100 to 105°C, 10mm and 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
Sample Fraction <2mm	Sample dried at 100 to 105°C, 2mm sieve, measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch.	0.1 g dry wt	1, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	0.01%	1, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
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; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
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, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
Weight of Asbestos as Fibrous Asbestos (Friable)	Measurement on analytical balance, from the >10mm Fraction. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
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, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
Weight of Asbestos as Asbestos Fines (Friable)*	Measurement on analytical balance, from the <10mm Fractions. Analysed at Hill Laboratories - Asbestos; Unit 1, 17 Print Place, Middleton, Christchurch. New Zealand Guidelines for Assessing and Managing Asbestos in Soil, November 2017.	0.00001 g dry wt	1, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37

Sample Type: Soil			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37
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, 4, 7, 10, 13, 16, 18, 21-22, 25, 28, 31, 34, 37

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

Testing was completed between 09-Nov-2023 and 11-Nov-2023. For completion dates of individual analyses please contact the laboratory.

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

Dexter Paguirigan Dip Chem Engineering Tech
Laboratory Technician - Asbestos

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Quality Assurance Report

Client:	Engeo Limited	**Lab No:**	3396070	QCPv1
Contact:	Lyn Nugent C/- Engeo Limited PO Box 373 Christchurch 8140	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	31-Oct-2023 08-Nov-2023 82742 13451.000.001 Ben Croze	

Sample Specific QCs

Polycyclic Aromatic Hydrocarbons Screening in Soil

		3396070.10	Control Limits	Outside Limit (Yes/No)
1-methylnaphthalene-d10	%	91	65 – 130	No
Benzo[a]pyrene-d12	%	94	70 – 140	No
Fluoranthene-d10	%	96	66 – 130	No

Polycyclic Aromatic Hydrocarbons Screening in Soil

		3396070.14	Control Limits	Outside Limit (Yes/No)
1-methylnaphthalene-d10	%	87	65 – 130	No
Benzo[a]pyrene-d12	%	88	70 – 140	No
Fluoranthene-d10	%	92	66 – 130	No

Polycyclic Aromatic Hydrocarbons Screening in Soil

		3396070.17	Control Limits	Outside Limit (Yes/No)
1-methylnaphthalene-d10	%	92	65 – 130	No
Benzo[a]pyrene-d12	%	92	70 – 140	No
Fluoranthene-d10	%	95	66 – 130	No

Polycyclic Aromatic Hydrocarbons Screening in Soil

		3396070.19	Control Limits	Outside Limit (Yes/No)
1-methylnaphthalene-d10	%	92	65 – 130	No
Benzo[a]pyrene-d12	%	94	70 – 140	No
Fluoranthene-d10	%	96	66 – 130	No

Blank QCs

Digest Blank 1 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9517.16

		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No

Digest Blank 2 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9517.32

		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No

Digest Blank 1 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9519.16

		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No

Digest Blank 1 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9519.16				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Digest Blank 2 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9519.40				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.27	-0.40 – 0.40	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.27	-0.40 – 0.40	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

50x Manual Dilution Digest Blank PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9519.77				
		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Cadmium	mg/kg dry wt	< 0.10 ± 0.066	-0.100 – 0.100	No
Total Recoverable Chromium	mg/kg dry wt	< 2 ± 1.3	-2.0 – 2.0	No
Total Recoverable Copper	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Lead	mg/kg dry wt	< 0.4 ± 0.26	-0.40 – 0.40	No
Total Recoverable Nickel	mg/kg dry wt	< 2 ± 1.4	-2.0 – 2.0	No
Total Recoverable Zinc	mg/kg dry wt	< 4 ± 2.7	-4.0 – 4.0	No

Blank 1 PrepWS xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15319.1				
		Results	Control Limits	Outside Limit (Yes/No)
1-Methylnaphthalene	mg/kg dry wt	< 0.010 ± 0.032	0.0 – 0.0100	No
2-Methylnaphthalene	mg/kg dry wt	< 0.010 ± 0.032	0.0 – 0.0100	No
Acenaphthylene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Acenaphthene	mg/kg dry wt	< 0.010 ± 0.0060	0.0 – 0.0100	No
Anthracene	mg/kg dry wt	< 0.010 ± 0.0060	0.0 – 0.0100	No
Benzo[a]anthracene	mg/kg dry wt	< 0.010 ± 0.0062	0.0 – 0.0100	No
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.010 ± 0.0064	0.0 – 0.0100	No
Benzo[e]pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.010 ± 0.0064	0.0 – 0.0100	No
Benzo[k]fluoranthene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Chrysene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Fluoranthene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Fluorene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Naphthalene	mg/kg dry wt	< 0.05 ± 0.031	0.0 – 0.050	No
Perylene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No
Phenanthrene	mg/kg dry wt	< 0.010 ± 0.0067	0.0 – 0.0100	No
Pyrene	mg/kg dry wt	< 0.010 ± 0.0066	0.0 – 0.0100	No

QC Spike QCs

LCS OC/PAH xsSHOC - WS: Polycyclic Aromatic Hydrocarbons Soil Analysis: 15319.2

		Results	Control Limits	Outside Limit (Yes/No)
1-Methylnaphthalene	%	100 ± 25	82 – 125	No
2-Methylnaphthalene	%	93 ± 23	82 – 121	No
Acenaphthylene	%	101.0 ± 9.1	76 – 109	No
Acenaphthene	%	108 ± 31	85 – 115	No
Anthracene	%	107 ± 33	79 – 113	No
Benzo[a]anthracene	%	108 ± 29	90 – 137	No
Benzo[a]pyrene (BAP)	%	109.0 ± 8.3	80 – 120	No
Benzo[b]fluoranthene + Benzo[j]fluoranthene	%	107 ± 22	83 – 120	No
Benzo[e]pyrene	%	95.0 ± 7.3	87 – 123	No
Benzo[g,h,i]perylene	%	113 ± 20	81 – 117	No
Benzo[k]fluoranthene	%	106 ± 14	84 – 117	No
Chrysene	%	109 ± 17	83 – 120	No
Dibenzo[a,h]anthracene	%	112 ± 15	84 – 124	No
Fluoranthene	%	105 ± 11	84 – 123	No
Fluorene	%	107 ± 13	84 – 118	No
Indeno(1,2,3-c,d)pyrene	%	108 ± 10	81 – 120	No
Naphthalene	%	106 ± 26	84 – 113	No
Perylene	%	81.0 ± 6.2	80 – 112	No
Phenanthrene	%	108 ± 16	86 – 118	No
Pyrene	%	109 ± 14	84 – 127	No

Reference Material QCs

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9517.17

		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Lead	mg/kg dry wt	12.7 ± 2.0	10.0 – 14.8	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9517.19

		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Lead	mg/kg dry wt	21.8 ± 3.3	13.2 – 30	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9517.43

		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Lead	mg/kg dry wt	19.7 ± 3.0	13.2 – 30	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9517.68

		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Lead	mg/kg dry wt	20.4 ± 3.1	13.2 – 30	No

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9519.17

		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	10.6 ± 2.1	9.4 – 13.9	No
Total Recoverable Lead	mg/kg dry wt	11.7 ± 1.8	10.0 – 14.8	No
Total Recoverable Lead	mg/kg dry wt	11.7 ± 1.8	10.0 – 14.8	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9519.19

		Results	Control Limits	Outside Limit (Yes/No)
Total Recoverable Arsenic	mg/kg dry wt	5.1 ± 1.6	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.329 ± 0.080	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	8.5 ± 1.9	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.2 ± 2.2	10.5 – 14.5	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9519.19				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Lead	mg/kg dry wt	26.1 ± 4.0	13.2 – 30	No
Total Recoverable Lead	mg/kg dry wt	26.1 ± 4.0	13.2 – 30	No
Total Recoverable Nickel	mg/kg dry wt	3.9 ± 1.5	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	60.7 ± 5.1	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9519.52				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	4.9 ± 1.5	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.285 ± 0.077	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	7.6 ± 1.8	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.3 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	20.4 ± 3.1	13.2 – 30	No
Total Recoverable Lead	mg/kg dry wt	20.4 ± 3.1	13.2 – 30	No
Total Recoverable Nickel	mg/kg dry wt	3.4 ± 1.4	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	58.5 ± 4.9	48 – 72	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9519.68				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	4.7 ± 1.5	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.303 ± 0.078	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	8.0 ± 1.8	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	12.5 ± 2.2	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	24.8 ± 3.8	13.2 – 30	No
Total Recoverable Lead	mg/kg dry wt	24.8 ± 3.8	13.2 – 30	No
Total Recoverable Nickel	mg/kg dry wt	3.5 ± 1.4	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	59.8 ± 5.0	48 – 72	No

QC A7 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9519.78				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	10.3 ± 2.1	9.4 – 13.9	No
Total Recoverable Lead	mg/kg dry wt	11.0 ± 1.7	10.0 – 14.8	No
Total Recoverable Lead	mg/kg dry wt	11.0 ± 1.7	10.0 – 14.8	No

QC A6 PrepWS esDig - WS: High Volume Environmental Soils by ICP-MS (HVesTR): 9519.80				
		Results	**Control Limits**	**Outside Limit (Yes/No)**
Total Recoverable Arsenic	mg/kg dry wt	5.0 ± 1.5	4.2 – 6.1	No
Total Recoverable Cadmium	mg/kg dry wt	0.290 ± 0.077	0.25 – 0.37	No
Total Recoverable Chromium	mg/kg dry wt	8.3 ± 1.9	7.0 – 10.8	No
Total Recoverable Copper	mg/kg dry wt	11.4 ± 2.1	10.5 – 14.5	No
Total Recoverable Lead	mg/kg dry wt	24.7 ± 3.8	13.2 – 30	No
Total Recoverable Lead	mg/kg dry wt	24.7 ± 3.8	13.2 – 30	No
Total Recoverable Nickel	mg/kg dry wt	3.7 ± 1.4	2.8 – 5.1	No
Total Recoverable Zinc	mg/kg dry wt	59.0 ± 5.0	48 – 72	No

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Certificate of Analysis

Client:	Engeo Limited	**Lab No:**	3431054	SPv1
Contact:	Lyn Nugent	**Date Received:**	15-Dec-2023	
	C/- Engeo Limited	**Date Reported:**	22-Dec-2023	
	PO Box 373	**Quote No:**	82742	
	Christchurch 8140	**Order No:**		
		Client Reference:	13451.000.001	
		Submitted By:	Ben Croze	

Sample Type: Soil

	Sample Name:	S01 15-Dec-2023	S02 15-Dec-2023	S03 15-Dec-2023	S04 15-Dec-2023	S05 15-Dec-2023
	Lab Number:	3431054.1	3431054.2	3431054.3	3431054.4	3431054.5
Total Recoverable Lead	mg/kg dry wt	39	82	48	37	35

	Sample Name:	S06 15-Dec-2023	S07 15-Dec-2023	S08 15-Dec-2023	S09 15-Dec-2023	S10 15-Dec-2023
	Lab Number:	3431054.6	3431054.7	3431054.8	3431054.9	3431054.10
Total Recoverable Lead	mg/kg dry wt	48	63	90	58	77

	Sample Name:	S11 15-Dec-2023	S12 15-Dec-2023	S13 15-Dec-2023	S14 15-Dec-2023	S15 15-Dec-2023
	Lab Number:	3431054.11	3431054.12	3431054.13	3431054.14	3431054.15
Total Recoverable Lead	mg/kg dry wt	58	60	73	43	80

	Sample Name:	S16 15-Dec-2023
	Lab Number:	3431054.16
Total Recoverable Lead	mg/kg dry wt	74

Analyst's Comments

Appendix No.1 - Chain of Custody

Summary of Methods

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

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-16
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation May contain a residual moisture content of 2-5%.	-	1-16
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-16
Total Recoverable Lead	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	1-16

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

Testing was completed between 20-Dec-2023 and 22-Dec-2023. For completion dates of individual analyses please contact the laboratory.

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

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

ANALYSIS REQUEST

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28 Duke Street, Hamilton 3204
Private Bag 3205
Hamilton 3240, New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Job No: **343 1054**

Date Recv: 15-Dec-23 15:04

Received by: Lya Avila

3134310547

Quote No

Primary Contact Lnugent@engeo.com

Submitted By Ben Croze

Client Name ENGEO

Address

Postcode

Phone *Mobile*

Email bcroze@engeo.com

Charge To

Client Reference 13451.000.001

Order No

Results To *Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.*

☑ Email Primary Contact ☐ Email Submitter ☐ Email Client

☐ Email Other

☐ Other

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time: 15/12/23 3:15

Name: Ben Croze

☐ Tick if you require COC to be emailed back

Signature: B~JCroze

Received at Hill Laboratories (Refer to Lab created Job No above)

Date & Time:

Name:

Signature:

Condition ☐ Room Temp ☐ Chilled ☐ Frozen

Temp: 18.5

ADDITIONAL INFORMATION / KNOWN HAZARDS

all samples on cold hold.

Priority ☐ Low ☑ Normal ☐ High ☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	S01	15/12/23		SOIL	COLD HOLD
2	S02				
3	S03				
4	S04				
5	S05				
6	S06				
7	S07				
8	S08				
9	S09				
10	S10				
11	S11				
12	S12				

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	S13	15/12/23		SOIL	COLD HOLD
14	S14	↓		↓	↓
15	S15				
16	S16				
17					
18					
19					
20					
21					
22					
23					
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APPENDIX 4:

Asbestos Controls

64-120 Flanagan Road, Drury
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)	Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil		≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w		≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume		≤ NESCS	> NESCS	-	-	
Asbestos in air		< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
REMOVAL WORKS RESPONSIBILITIES						
Remedial Works Supervision / Oversight	OBJECTIVE: *Undertake work by persons who have adequate knowledge and experience to assess the risks and implement appropriate control measures*	A Suitably Qualified and Experienced Practitioner (Contaminated Land – refer to NESCS)		Class B Supervisor	Class A Supervisor	*ACOP*
WorkSafe Notification		Not required		Notification five days before earthworks are to be undertaken		*ACOP*
Contractor License Requirements		Not required		Class B License	Class A License	*ACOP*
Training/Certification Requirements		Non-certified training in asbestos identification, safe handling and suitable controls. A copy of the training shall be kept on record.		Certified training for workers. Certified, competent supervisors.	Certified training for workers. Certified, competent supervisors. Certified safety management system.	*Figure 17 ACOP*
SITE SET-UP						
Boundary Controls	OBJECTIVE: *Prevent unauthorised access into works areas and accidental transport of contaminated soils on boots, clothing, equipment, skin, or in air / dust.*	Physical barriers must be in place to prevent unauthorised access.	Physical barriers must be in place to prevent unauthorised access. Warning signs must be present that clearly show that asbestos related works are underway.	Physical barriers must be in place to prevent unauthorised access. Polythene sheeting may be necessary to prevent spread of airborne fibres outside of works area. Warning signs must be present that clearly show that asbestos removal works are underway.	Physical barriers must be in place to prevent unauthorised access. Consider use of solid hoarding placed at a suitable distance beyond the works area, or full enclosure. Warning signs must be present that clearly show that asbestos removal works are underway.	*ACOP*
Personal Decontamination Facilities		Educate site workers to minimise contact with soil. Provide a boot wash and lidded and plastic lined bin for secure disposal of used PPE.	Basic disposable decontamination tent and boot wash.		Basic disposable wet decontamination tent or trailer.	*NZ GAMAS Table 6*
Dust / Asbestos Fibre Suppression	OBJECTIVE: *Minimise the release of asbestos fibres from soils.*	Minimise the size of the earthworks areas and time exposed to the elements. Stabilise exposed earth surfaces as soon as possible following works.				
		Spray mist water via localised points. Consider use of surfactants or polymers where a reliable source of water is not available. Consider implementing additional controls (as per Class B works) if sensitive receptors nearby (such as adjacent to busy centres, schools).		Spray mist water via localised points. Addition of surfactants and polymers where the location is sensitive (such as adjacent to busy centres, schools) or if a source of water is not readily available. Consider temporary cover of contaminated areas awaiting remediation.		*NZ GAMAS Table 6*

64-120 Flanagan Road, Drury
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)		Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil			≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w			≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume			≤ NESCS	> NESCS	-	-	
Asbestos in air			< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
OCCUPATIONAL HEALTH AND SAFETY							
Personal Protective Equipment & Respiratory Protective Equipment		OBJECTIVE: *Minimise workers exposure to asbestos fibres.* *Reduce accidental transport of asbestos contaminated soils off site on workers clothing, boots.*	Educate site workers to minimise contact with soil; to clean equipment and to undertake activities in a manner that reduces dust. Disposable P2 dust mask recommended.	Disposable coveralls rated type 5, category 3, nitrile gloves Steel toe capped gumboots are preferred as these can be readily washed down. Disposable overshoes can be used to prevent contamination of laces.	Half-face P3 respirator with particulate filter. Consider increasing to full-face if friable ACM present.	Full-face P3 respirator with particulate filter. Consider increasing to power-assisted if required.	*NZ GAMAS Table 6* *NZ GAMAS Table 6* *Refer to Part C section 14 of the ACOP and AS/NZS 1715:2009 for more information*
Contractor Health Monitoring		OBJECTIVE: *Mitigate risks to workers from the potentially harmful effects of asbestos through the workplace.*	The contractor must ensure that worker health monitoring is undertaken in accordance with the Asbestos Regulations Clause 15 and 16.		In accordance with the Asbestos Regulations Clause 15 and 16, a PCBU must ensure that health monitoring is provided to workers involved in more than four weeks of Class B work in any twelve-month period. Refer ACOP Section 16	In accordance with the Asbestos Regulations Clause 15 and 16, a PCBU must ensure that health monitoring is provided to workers involved in Class A work. Refer ACOP Section 16	*ACOP* *Section 16*
MONITORING PROCEDURES							
Air Monitoring	**Responsibility**	OBJECTIVE: *Provide a clear expectation of who is responsible for undertaking monitoring, and that the person has the appropriate skills and knowledge to do so.* *To provide verification that works have been safely undertaken.* *To provide early warning of potentially harmful levels of exposure.* *To identify when asbestos is present in air at a concentration that presents an*	SQEP / Competent Person		Independent Licensed Asbestos Assessor OR Independent Competent Person as defined within Section 30.4 of the ACOP	Independent Licensed Asbestos Assessor	*Section 30.4 of the ACOP*
	Requirement		Air monitoring is not required for Unlicensed Asbestos works, or Asbestos Related works (as defined under the NZ GAMAS) however it is recommended where possible to provide assurances regarding cross contamination and protection of workers.		If the SQEP or competent person considers that the trace level of 0.01 f/ml may be exceeded, then air monitoring must be undertaken.	Air monitoring must be conducted before and during Class A asbestos removal work.	*NZ GAMAS Section 5.5*

64-120 Flanagan Road, Drury
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)		Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil			≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w			≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume			≤ NESCS	> NESCS	-	-	
Asbestos in air			< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
	Compliance	*unacceptable risk to site workers and surrounding receptors.* *Undertake works by persons who have been trained to manage the risks associated with asbestos.* *Implement additional control measures when necessary.*	If the concentration exceeds 0.01 f/ml then works are Class B or Class A works under the NZ GAMAS definition.		All results shall be below 0.01 fibres / ml. < 0.01 f/ml – continue with works > 0.01 f/ml – investigate the cause and implement additional controls > 0.02 f/ml – stop works and investigate, notify WorkSafe >0.1 f/ml – Remedial works required. PCBUs with management or control of workplace are to ensure that exposure of a person at the workplace to airborne asbestos is eliminated so far as is reasonably practicable.		*Section 30 of the ACOP*
SITE CONTROLS							
Vehicle Decontamination	**Vehicle assessment before demobilisation from site**	OBJECTIVE: *Minimise the potential for accidental transport of contaminated soils or asbestos fibres out of the works areas on, or in vehicles.*	Minimise vehicle transport onto site areas containing asbestos soils, or in locations where asbestos fibres may be present in air. Visual assessment.		Visual (plus swab samples if friable ACM is elsewhere on-site – lagging, insulation, etc).	Visual plus swab samples, air sampling should be undertaken inside the cab.	*NZ GAMAS Table 7*
	Vehicle assessment completed by		Competent person or SQEP.		Independent licensed assessor or independent competent person (meeting the requirements of regulation 41(3) under the Asbestos Regulations).	Independent licensed assessor.	*NZ GAMAS Table 7*
	Truck/excavator air conditioning	OBJECTIVE: *To prevent the contamination of internal spaces of equipment where people work.* *To avoid worker exposure to asbestos fibres.*	Standard air conditioning.		HEPA filter system fitted for all occupied vehicles where friable ACM on-site.	HEPA filter system fitted for all occupied vehicles, filter replaced or clean down with HEPA vacuum cleaner post work.	*NZ GAMAS Table 7*
MANAGEMENT OF CONTAMINATED MATERIAL							
Stockpiles of impacted soils		OBJECTIVE: *To minimise the release of asbestos fibres into air.*	Stockpiles should be avoided where possible to ensure that exposed areas of soil are minimised. All temporary stockpiled asbestos contaminated material which is created and not proposed to be immediately moved should be covered. Stockpiles shall be located on an impermeable surface within an area protected by erosion and sediment controls. Consider covering stockpiles with polythene.				*NZ GAMAS Section 6.6*

64-120 Flanagan Road, Drury
Asbestos Controls

Scenario (NZ GAMAS 2017 definitions)	Control Measure Objectives	Unlicensed Asbestos Work	Asbestos-related Work	Class B: non-friable	Class A: friable	*Source Guideline Reference*
FA/AF % w/w in soil		≤ 0.001	> 0.001	> 0.01	> 1	
ACM % w/w		≤ 0.01%	> 0.01	> 1	-	
Scale, soil volume		≤ NESCS	> NESCS	-	-	
Asbestos in air		< 0.01 f/mL in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air	≥ 0.01 f/mL in air	
Used PPE	*Asbestos contaminated material is to be appropriately transported and disposed in a location where the material presents no unacceptable human health risk.* *To track the movement of contaminated materials.*	All disposable PPE used during remediation of asbestos impacted soil should be placed in a 200 micron HDPE plastic bag within the decontamination area. The bag should be taped closed (in a goose neck fashion) after each item is added and kept damp via the addition of water. Once full, the bag should be double bagged (200 micron HDPE) and labelled “Asbestos hazard – wear respirator and protective clothing while handling contents”.				*NZ GAMAS Section 6.6*
Contaminated Soil		The location of any soils retained on-site shall be recorded on as built drawings. The receiving facility should be contacted in advance of the soil disposal to verify the requirements for receiving the wastes. Trucks shall have their loads securely covered during off-site transport of material. Waste manifests should be completed and retained for all off-site disposal of soils. Site records shall be cross checked against receipts of soil disposal from the receiving facility. The bins / skips or trucks shall be loaded within the site where runoff and possible spills during loading will be controlled and contained.				*NZ GAMAS Section 6.6*
		Special waste bins / skips or trucks, approved for the transport of ACM to the appointed licensed landfill facility shall be placed on-site. The bins / skips or trucks will be lined / wrapped in accordance with requirements of receiving facility. It is recommended that any soil which contains asbestos in concentrations >0.001% w/w is considered hazardous and the controls stated in the Land Transport Rules adopted. For asbestos soil waste in significant quantities, hazard label signage should be displayed on the vehicles transporting the soil for disposal.	Special waste bins / skips or trucks, approved for the transport of ACM to the appointed licensed landfill facility shall be placed on-site. The bins / skips or trucks will be lined with 200 micron sealed plastic. It is recommended that any soil which contains asbestos in concentrations >0.001% w/w is considered hazardous and the controls stated in the Land Transport Rules adopted. For asbestos soil waste in significant quantities, hazard label signage should be displayed on the vehicles transporting the soil for disposal.		
Contaminated Water		Water used for cleaning asbestos-contaminated equipment (including vehicles) shall be placed into a drum or skip and disposed of at an appropriately licensed facility. If excessive water is applied, ponding or runoff may occur which could permit the transport and accumulation of asbestos fines outside of the site. Water from the work area should be retained inside the boundary of the site and wash water directed back into excavations and the site.				*NZ GAMAS Section 6.6*