Before the Gisborne District Council

In the matter of	the Resource Management Act 1991
And	
In the matter of	An application by NZHG Gisborne Limited to construct eight dwellings and create an eight-lot fee simple subdivision of the property at 99A Stanley Road, Gisborne and pursuant to Regulation 10 of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health

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STATEMENT OF EVIDENCE OF JASON STRONG
FOR NZHG GISBORNE LIMITED

Dated 6 September 2024

INTRODUCTION

1 My name is Jason Mark Strong. I am a Principal Environmental Scientist and a Director of EAM NZ Limited (**EAM**). I hold the qualification Master of Science in Environmental Science, with first class Honors.

2 I have over 15 years' experience in contaminated land assessments and remediation, in New Zealand. My work involves Preliminary and Detailed Site Investigations, Site remediation and management, and asbestos related work.

3 EAM was engaged by the applicant to undertake a Detailed Site Investigation at 99A Stanley Road, Gisborne (**the Site**), on which an 8-unit residential development and subdivision is proposed. The objectives of the investigation were to evaluate:

3.1 The type, extent and level of contamination, if any, within the Site.

3.2 Whether any contaminants identified at the Site present an unacceptable risk to human health; and

3.3 Whether remediation is required to ensure the Site is suitable for the proposed development.

4 Karen Toulmin, a Senior Environmental Scientist at EAM completed the Detailed Site Investigation for this Site and the Remedial Options Assessment (part of the DSI) as well as the August 2024 Remedial Action Plan report (discussed later in this evidence). I reviewed each of those reports before they were issued and am therefore familiar with the work done in relation to the Site. Ms Toulmin has left EAM, which is why I am giving this evidence on site contamination matters.

CODE OF CONDUCT

5 I confirm that I have read and agree to comply with the 'Expert Witnesses Code of Conduct' contained in the Environment Court of New Zealand Practice Note 2023. My evidence has been prepared in compliance with that Code in the same way as if I was giving evidence in the Environment Court. In particular, unless I state otherwise, this evidence is within my sphere of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

PURPOSE AND SCOPE OF EVIDENCE

6 In my evidence I will:

6.1 Provide an overview of the Detailed Site Investigation completed for the Site and the findings and recommendations arising out of that investigation; and

6.2 Respond to matters raised in the Section 42A Report.

TECHNICAL REPORT - SUMMARY OF CONCLUSIONS

7 The Detailed Site Investigation, 99A Stanley Road, Gisborne dated February 2024 (**DSI**) is at Appendix 5 of the application lodged with the Gisborne District Council. For ease of reference, a copy of that report is attached to my evidence.

8 The DSI began with a comprehensive background overview of the Site, investigating the site history and land use, the surrounding environmental setting, and a review of Gisborne District Council property files. Using the information gathered, the Site was then assessed against the MfE NESCS Hazardous Activities Industrial List (**HAIL**) to determine if HAIL activities had likely occurred at the site during the duration of the Site's reported history.

9 The Site was determined to have been residential sections since at least 1942, which is the date of the earliest available aerial photography. A large multistorey dwelling and garage existed on the Site until the late 1970's when they were replaced with the existing buildings (a single dwelling and a garage). Given the historic age of the former buildings on the Site, the site was considered a HAIL activity based on the likely use of lead-based paint on buildings. Lead based paint was a common paint used prior to the late 1960's in New Zealand, when it was banned due to the discovery of its human health and environmental impacts. The Site therefore falls within 'Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment' (Section I Appendix C: Hazardous Activities and Industries List).

10 The existing buildings were constructed between 1966 and 1977, suggesting that the use of lead-based paint was not likely. However, I understand that the existing dwelling has decramastic asbestos roofing tiles.

11 A conceptual model was developed based on an analysis of potential contaminants, receptors, and pathways between potentially contaminated soils, and the proposed residential land use. Potential pathways were established between human receptors who would be working on earthworks and construction as part of the development, and future residents at the Site. Pathways of exposure included dermal contact, direct inhalation of dusts, and consumption of soils.

12 Detailed soil analysis was completed at the Site as a second stage of investigation, due to confirmation of HAIL risk. This analysis was required to investigate the suitability of site soils for the proposed development. In accordance with the MfE Contaminated Land Management Guidelines, twenty-three boreholes were augured across the site in a systematic sampling pattern. The areas beneath the concrete driveway and dwelling were unable to be investigated and will require further analysis at the time of building removal. At each borehole location, soil samples were collected at depths of 0-150mm, 150-300mm, 400mm and 500mm. The purpose of the series of intervals was to establish vertical migration of potential contaminants of concern. All samples were analysed for heavy metals by Hills Laboratory (an IANZ accredited laboratory), which included the key contaminant of concern - the heavy element, lead.

13 The findings of the soil analysis reported exceedances of the NES standards for residential land use (10% produce) for lead, in the surface 0-150mm through 400mm depths in the north-west of the site, western boundary, and immediately adjacent to the east of the dwelling. One location still reported exceedances of NES at 500mm depth on the western boundary.

14 Elevated concentrations above NES were generally reported in the proximity to the existing and former dwellings/buildings. The eastern grassed garden areas of the Site, and the north-eastern corner reported soil concentrations within acceptable NES standards, and/or background concentrations.

15 Concentrations of lead were typically elevated above NES and uncontaminated background values in topsoil, which ranged between 250-400mm below the ground surface, across the Site. Below the topsoil is a brownish grey, medium to fine sand. Soil metal concentrations once in the sand were typically reduced to background concentrations. To generalise, elevated concentrations of heavy elements above background values are typically confined to topsoil.

16 It was observed that elevated concentrations of lead were present in the proximity to existing and former buildings. This is typical of leaded paint which usually forms a halo soil contamination around lead-painted buildings because of weathering, erosion and redecoration.

17 Lead contamination above NES standards, is largely confined to the north and west of the Site. A Remedial Options Assessment was prepared as part of the DSI, providing possible remediation methods to rectify site contamination. These options included excavation to landfill, soil mixing of lesser contaminated soil concentrations, or a combination of the two options. Various remedial options are available, and this Site can be remediated to the required standards for residential land use and development.

18 A Remedial Action Plan report has been prepared for the Site, titled, Remedial Action and Contaminated Site Management Plan, dated August 2024, a copy of which is attached to my evidence. The proposed remediation is to excavate contaminated material above NES standards from the Site to landfill.

19 At the time of completing this evidence Toxicity Characteristic Leaching Procedure (**TCLP**) tests are currently being completed on samples of soils taken from the Site. The purpose of that testing is to confirm whether concentrations in those samples

meet the Class A Landfill disposal criteria for Wairoa Landfill. If the disposal criteria are met, it is expected that Wairoa Landfill will confirm it will accept the material. I expect to be able to confirm that either in a supplementary statement of evidence provided prior to the hearing, or at the hearing itself.

RESPONSE TO MATTERS RAISED IN THE SECTION 42A REPORT

20 I have reviewed the Section 42A Report issued on 30 August 2024. Matters relating to contamination are addressed primarily in Section 6.1, paragraphs 207-213 of that report.

21 The technical review completed by Dr Dave Bull of HAIL Environmental Ltd, identified there was insufficient leaching assessment undertaken, to be able to determine landfill disposal as acceptable. In August 2024, five Toxic Characteristic Leaching Procedure (**TCLP**) samples were collected by EAM, and analysed by Hills Laboratory, to assess against the MfE Landfill Waste Acceptance Criteria (MfE, 2004). Comparison of the TCLP results with the relevant criteria has determined that the contaminated site soils comply with the acceptance criteria for a Class A Landfill.

22 Given that the acceptance criteria are met, it is expected that Wairoa Landfill will confirm it will accept the material. At the time of writing this evidence, the applicant does not yet have confirmation from Wairoa Landfill that it will accept the material; however, the applicant should be in a position to confirm that prior to the hearing, or at the hearing itself.

23 Asbestos analysis has not been completed for the Site. It is understood that the dwelling has decramastic roofing tiles, which contain asbestos. There is likely to be some other asbestos containing products within the Site, such as soffits, and plumbing. It is expected that building demolition will be undertaken in accordance with the appropriate rules and regulations for building demolition by licenced asbestos removal contractors, and therefore risk of residual asbestos contamination should be less than minor. Should asbestos contamination be identified in the location of buildings upon their removal, contaminated soil will be removed to appropriate landfill which accepts asbestos containing material.

24 The Site is expected to be subjected to significant geotechnical earthworks for building platforms and contaminated soil removal. Contamination extends to a range of depths across the Site, with elevated concentrations above NES standards

generally extend deeper around the buildings, and the area in the north-west of the Site. It is expected that soil excavation could extend as deep as 400mm in some areas of the Site for soil contamination, and possibly deeper for foundation work. Soil concentrations will be monitored during the excavation process to ensure that unnecessary soil removal and disturbance does not occur.

25 The Remediation Action Plan methodology states that contaminated material will be excavated to landfill. Soil mixing is not expected to be implemented at this site. Should remedial methodology change, then calculations and volumes of material requiring soil mixing, together with expected concentration predictions because of mixing, will be provided to GDC for approval.

RESPONSE TO MATTERS RAISED IN SUBMISSIONS

26 None of the submissions received from neighbours in response to this application raised concerns about contamination or remediation of the Site.

CONCLUSIONS AND RECOMMENDATIONS

27 The key conclusions from the DSI are as follows:

27.1 The soils at 99A Stanley Road contain lead which exceeds NES residential (10% produce) standards in the north and western extent of the site. Further assessment is required beneath the existing driveway and concrete areas, and the dwelling, once removed.

27.2 Most of the site soils exceed Gisborne contaminated background values in the 0-150mm depth. By 300mm, nearly all the eastern side of the dwelling is representative of background soil values. By 400mm, most of the north and north-eastern area of the site exhibits background concentrations. Soils which exceed background values but present concentrations below NES standards are completely suitable to be retained on site for the proposed development.

27.3 Soil contamination exceeding NES standards is typically confined to the topsoil, with the most significant concentrations present in the 0-150mm and 150-300mm depth. Soil contaminants exceeding NES are significantly reduced by 400mm depth and by 500mm only one exceedance was reported.

27.4 Remedial Options have been assessed for the site. The site can be remediated.

27.5 A Remedial Action and Site Management Plan has been prepared for the site. The proposed remediation method is to excavate contaminated soil from the site and dispose it to Landfill.

27.6 Once that remediation has been completed, the risk posed by the contaminants to human health will be removed, and the Site will be suitable for the proposed development.

Jason Strong

REMEDIATION ACTION AND CONTAMINATED SITE MANAGEMENT PLAN

99A STANLEY ROAD GISBORNE

PROJECT NO. EAM2422-02

PREPARED FOR
TW GROUP

PREPARED BY
KAREN TOULMIN
AUGUST 2024

EAM NZ LTD – ENVIRONMENTAL CONSULTANTS
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DOCUMENT INFORMATION

TITLE	Remedial Action and Contaminated Site Management Plan; 99a Stanley Road, Gisborne
CLIENT	TW GROUP
VERSION	FINAL
ISSUE DATE	1 August 2024
JOB REFERENCE	EAM2422-02

DOCUMENT CONTRIBUTORS

Report prepared by:

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Senior Environmental Scientist
EAM NZ Limited

Report reviewed by:

Jason Strong (MSc)
Principal Environmental Scientist
EAM NZ Limited

TABLE OF CONTENTS

1 INTRODUCTION

1.1 BRIEF

EAM have completed a Detailed Site Investigation (DSI) at 99a Stanley Road, Gisborne (hereon in referred to as the Site).

The findings of this investigation is presented in the following report:

"EAM2422-01 Detailed Site Investigation,99a Stanley Road, Gisborne (EAM NZ LTD, Feb 2024).

Site history indicates that the properties have been residential sections since at least 1942. Based on the era of the buildings within the site, the probable use of lead-based paint is considered high. Lead-based exterior paint is known for its soil contamination legacy and therefore the site is likely HAIL[1] in accordance with Appendix C of the NESCS[2].

Systematic soil analysis was completed in twenty-three locations across the site to characterise site contamination. Soil was sampled in each location in discreet intervals of 0-150mm, 150-300mm, 400mm and 500mm, with all depths analysed buy Hills Laboratories for heavy elements.

Comparison of laboratory results with the NESCS standards for residential land use (10% produce) indicates, that the site exhibits soil contamination of lead and arsenic.

Soils exceed Gisborne background values over most of the site, extending to at least 300mm in the east of the site, and 500mm depth in the north and west of the site.

Soil in the north and west of the site exceeds NES standards of 210mg/kg for lead, at depths up to between 150mm and 500mm.

Soil in the north, of the site, and the west of the former dwelling exceeds the Landcare Updated Development of Soil Guideline Values for Protection of Ecological Receptors (Eco-SGVs) for zinc and/or lead.

For the site to be developed for residential use, remediation of the site is considered necessary.

This report has been prepared for submission to Gisborne District Council and details the works proposed to remediate the areas of soil contamination at this site.

This investigation has been conducted in accordance with the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES).

1.2 SUITABLY QUALIFIED ENVIRONMENTAL PRACTITIONERS

EAM are Suitably Qualified and Experienced Practitioners (SQEP) in the field of contaminated sites. We offer 20+ years' experience in the contaminated site and environmental science fields. EAM routinely carry out contaminated land assessments in both the North and South Islands over many different Council jurisdictions.

[1] Hazardous Activities and Industries List, Ministry for the Environment, 2011.

[2] Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil for the Protection of Heath) Act, 2011.

Jason Strong (Principle Environmental Scientist - MSc Environmental Science1st Class)

Jason has undertaken literally hundreds of contaminated site assessments and remediation over the past 15 years. He has an MSc in Environmental Science where his thesis was based around trace metal contamination of soils/sediment.

Karen Toulmin (Senior Environmental Scientist – BSc Environmental Science)

Karen has 8 years' experience in contaminated land assessments and remediation, in both Australia and New Zealand.

1.3 SCOPE

The following scope of work was completed:

- Preparation of a Remedial Action and Contaminated Site Management Report, including methods for remediation of site soils in accordance with the requirements of the NESCS and with the current 2021 revised edition of the MfE Contaminated Land Management Guidelines No. 1 and No. 5.

1.4 LIMITATIONS

This report: has been prepared by EAM for TW GROUP and may only be used and relied on by Gisborne District Council for the purpose agreed between EAM and TW GROUP as set out in section 1.1 of this report. EAM otherwise disclaims responsibility to any person TW GROUP arising in connection with this report. EAM also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by EAM in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. EAM has no responsibility or obligation to update this report to account for events or changes occurring after the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by EAM described in this report (refer section(s) 1.3 of this report). EAM disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the site conditions, such as the location of buildings, services, and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. EAM does not accept responsibility arising from, or in connection with, any change to the site conditions. EAM is also not responsible for updating this report if the site conditions change.

EAM has prepared this report based on information provided by TW GROUP and others who provided information to EAM (including Government authorities), which EAM has not independently verified or checked beyond the agreed scope of work. EAM does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.5 ASSUMPTIONS

EAM has made the following assumptions during the preparation of this report:

- Information obtained from third parties and TW GROUP is complete and accurate.
- The observed and inferred conditions are representative of the actual conditions associated with HAIL sites and / or other sites not directly assessed.
- That the future land use of the site will remain residential.

1.6 ROLES AND RESPONSIBILITIES

The following section outlines the various roles and responsibilities during the site preparation and civil works phases.

Table 1. Key Personnel

Role	Responsible person	Tasks	Contact Details
Project Manager	TW Group	Responsible for the management of the site, ensure compliance with the resource consent, implement the RAP/CSMP	
Contaminated Site Consultant	Karen Toulmin (EAM NZ LTD)	• Prepare RAP/CSMP (this plan). • Review soil data • Carry out validation sampling • Complete Site Validation Report.	021 02876772
Hazardous Waste Contractor	TBC	• Implement all necessary control measures as stated in this RAP/CSMP. • Supply heavy equipment and materials. • Undertake civil works and excavation.	TBC
Landfill Owner/Operator	TBC	• Confirm acceptance of contaminated soil/waste. • Provide landfill disposal records	TBC

1.7 OBJECTIVES

The Detailed Site Investigation (EAM, 2024) highlighted lead contamination, in exceedance of the NES Health Based Guidelines for residential land use (10% produce). Soil remediation at the site is required to ensure the protection of human health.

The objective of this document is to clearly identify the strategy which will be used to ensure compliance with NES and to detail specific site activities and management plans required.

1.8 IMPLEMENTATION

Implementation of this plan is mandatory for the proposed development for the protection of site workers. Implementation is required by the conditions of any resource consent issued for the site. All persons working on this site should be familiar with this plan and a construction site manager is required to ensure the process detailed by this plan is carried out in an effective and responsible manner.

2 REMEDIATION OVERVIEW

The following remedial works will be supervised by a Suitably Qualified Environmental Practitioner (SQEP) and will be completed in accordance with the earthwork's procedures and contingency plan as discussed in this plan.

2.1 REMEDIATION OPTIONS ASSESSMENT

A remediation options assessment was prepared for this site and is presented in Appendix F of the DSI. Our client has adopted the remediation method of excavation and disposal to landfill.

2.2 ADOPTED REMEDIAL METHOD

The adopted remedial method for this site is excavation and disposal to landfill. All soil exceeding NES standards for lead (locations shown in red in Figures 1, 2, 3 and 4 below) will be excavated to appropriately licenced landfill. Any additional soil requiring removal, above background values, but below NES, will also be removed to landfill, if it is to leave the site.

Clean fill, which describes any soil at concentrations representative of Gisborne background values, may be used for any purpose, offsite.

2.3 REMEDIAL AREA

The following figures show sample locations within the site, which were collected as part of the Detailed Site Investigation (EAM, 2024). Red indicates exceedance of NES residential (10% produce) standards for lead. Yellow indicates soils exceeding Gisborne background values, but below NES, and green indicates concentrations representative of uncontaminated soil (clean fill).

The location of these samples are shown in Figures 1, 2, 3, and 4.

Figure 1. Sample locations, depth 0-150mm.

Figure 2. Sample locations, depth 150-300mm.

Figure 3. Sample locations, depth 400mm.

Figure 4. Sample locations, depth 500mm

2.4 REMEDIAL CRITERIA

The proposed remedial assessment criteria for lead in a residential (10% produce) land use setting are shown in Table 2.

Table 2. Summary of Remedial Criteria

CONTAMINANT	NES (mg/kg)
Lead	210

3 REMEDIAL METHODOLOGY

Our client has opted to remove all contaminated material exceeding NES standards for residential (10% produce) land use, to landfill. Should our client wish to remove other contaminated material above background values, this too shall be taken to landfill.

X-Ray Fluorescence (XRF) will be used as a scanning tool as part of this remedial project. XRF is a handheld analyser used to measure metal concentrations within the soil. XRF provides fast, and non-destructive alloy identification and elemental analysis. It is considered a highly useful scanning tool to complement laboratory analysis for lead and arsenic.

3.1 EXCAVATION TO LANDFILL

The following remedial methodology and procedures will be followed:

1. The SQEP will mark out the remedial areas on the ground surface using XRF.
2. The remedial areas will be excavated to their target depth as instructed by the SQEP. The SQEP will continually screen the base and sides of the excavation using XRF to ensure that remaining

soil concentrations meet NES. Excavation will continue until NES residential standards are achieved.
3. Material will be loaded directly into trucks, covered, and transported to the chosen landfill.
4. Upon completion of excavation, the SQEP will map and record lead concentrations using XRF in a systematic grid pattern across the excavated area. Samples will be collected to validate concentrations of lead and the XRF.
5. The SQEP will send validation samples for laboratory analysis.

3.2 SITE VALIDATION AND REPORTING

Validation sampling will be conducted in accordance with relevant guidance (Refs: MfE1, MfE2), and the Remedial Action Plan.

Soils will be validated using XRF, and the following quality controls will be implemented to ensure the accuracy of XRF.

- The XRF will be operated by a SQEP experienced in the use of XRF analysis.
- Calibration of XRF against manufacturer supplied blank and standard reference material, which has been laboratory verified for the elements of interest, and of similar soil composition.
- Assessment of nearby background control soil samples with XRF to establish range of background readings.
- Logging of soil.
- Assessment of a host of soil locations across the site.
- Conservative delineation concentrations to define boundaries.
- Verification of XRF analysis with a minimum 10% Laboratory analysis.

Should elevate concentrations above NES remain, further excavation and validation will be completed. This will continue until the site meets NES standards.

Sampling at the base and edges of the excavated areas is required to confirm that soil contamination has been removed, and that any remaining contamination levels are below the Soil Contamination Standards for residential (10% produce) land use.

Within two months of completing earthworks a Site Validation Report (SVR) shall be prepared. The report shall be completed in accordance with *Contaminated Land Management Guideline No. 1: Reporting on Contaminated Sites in New Zealand (Ref: MfE1)* and shall include:

- An overview of works completed at the site, noting compliance status with respect to this RAP and the relevant land use consent.
- Site plan showing location of final excavations and soil sample locations.
- Soil test results for any soil disposed offsite or imported to site.
- QA/QC including a PARCCS[3] assessment of the XRF dataset.
- Linear regression analysis on the XRF readings and laboratory duplicates.
- Soil test results for validation samples collected.
- Total volume of soil disposed offsite, including copies of disposal receipts.
- Overview of any unexpected areas of contamination encountered during the works, and associated remediation methods employed.
- Summary of any complaints received, or environmental or human health incidents and subsequent mitigation measures.
- Site plan showing any areas of residual soil contamination exceeding SCS for a residential land use.

[3] Field Use of X-RAY Fluorescence Spectroscopy for Investigation of Contaminated Soil. MfE, 2024.

The Site Validation Report will confirm the adherence to the Site Remedial Action Plan. The report will detail the remedial actions and processes conducted, present photographs documenting site activities, soil sample locations and will include laboratory results.

4 GENERAL SITE REQUIREMENTS

This section provides procedures for personnel working in and around contaminated soil during the remediation programme. This plan should supplement the hazardous waste contractor's own health and safety procedures.

Potential human health risks associated with earthwork activities in the proposed development areas relate to contaminants derived from previous site activities (heavy metals). Potential risks relate to:

- Dermal contact with contaminated soils during remediation or development earthworks.
- Ingestion and inhalation of contaminated soil particles.
- Leaching of heavy metals to nearby waterways. If unexpected contamination is observed, works shall cease and the contingency plan in Section 6 shall be immediately implemented.

4.1 AVAILABLE DOCUMENTS

A copy of this Remedial Action and Site Management Plan shall be always available on site. In case of any doubt or uncertainty as to what controls are required, the SQEP shall be consulted.

4.2 SITE ESTABLISHMENT

Site establishment works in any remediation area shall comprise:

- Cordon off the remedial area and set up designated entry/exit points.
- Posting signage around the remediation area clearly indicating the presence and location of contaminated soil and warning of the remedial work being undertaken, and the danger posed by heavy machinery.
- Induction for workers working at the site, which shall include training on indicators of contamination, protocols for discovery of unexpected contamination, and personal protective equipment (PPE) requirements**.**
- Sediment and erosion control measures.
- A change and wash facility and a personal protective store for workers (located adjacent to the designated entry/exit point) who encounter contaminated material.

During earthworks:

- The controls set out in the following sections shall be implemented.
- Daily health and safety toolbox meetings should also be undertaken and documented. Where necessary this plan shall be updated to reflect changing site conditions.

4.3 PERSONAL PROTECTIVE EQUIPMENT (PPE)

As a minimum, workers undertaking works during the remediation of the impacted soil must wear the following additional PPE:

- Single use disposable gloves.
- Safety eye wear.
- P2 dust mask
- Lace less boots (preferred) with disposable covers or steel cap gumboots.

- Machinery and/or trucks involve in the removal of impacted soil shall keep cab windows closed and use air conditioning.
- As general good practice, workers shall maintain good personal hygiene:
- Avoid hand to mouth/face contact during work.
- Wash hands before eating, drinking, applying sunscreen and/or cosmetics, smoking, which should be done only in designated area.

4.4 DECONTAMINATION FACILITIES

- Decontamination is required for machinery and personnel that may have encountered contaminated soil and should be undertaken.
- As a general guide, a dedicated decontamination area shall be located at the entry/exit point of the remedial area. As a minimum, the following should be provided in the decontamination area:
- Boot wash.
- A hand and face wash facility with wet wipes.
- Polythene bags for disposal of contaminated PPE and other consumables.
- Machinery and tools leaving the remedial area shall be inspected for debris and soil (on tracks, wheels, and buckets). Accumulated dirt shall be removed.

4.5 SOIL DISPOSAL FACILITIES AND WASTE ACCEPTANCE CRITERIA

The landfill adopted for disposal of waste material is Wairoa Landfill, Wairoa, Hawke's Bay.

Wairoa Landfill accepts previously characterised (in accordance with *CLMG No. 5* methodology) contaminated soils (being soil, subsoil, or gravel fill).

A formal soil acceptance contract will be required to be completed prior to confirmation that specific soils will be accepted by the landfill facility. Any soils arriving in advance of a completed soil acceptance contract will be rejected by the landfill facility as prohibited material.

To enable a soil acceptance contract to be entered, the suitably qualified and experienced (contaminated land) practitioner attached to the export site shall provide written confirmation that the subject soil accords with the landfill facility soil acceptance criteria by way of compliant Total Recoverable contaminant levels and confirmation of no other materials within the soil waste. Such written confirmation shall include full details of sample locations and laboratory analysis results and a copy of the related detailed site investigation.

The suitably qualified and experienced (contaminated land) practitioner attached to the export site shall also provide a copy of the approved land use consent authorising the export of the material from the source site prior to completion of a soil acceptance contract.

In addition to the details of the contamination of the subject soils, the soil acceptance contract will include details of the source site (location, ownership, former HAIL activities) details of the subject soils (location within source site, volume, depth of soil, vegetative component), the volume of subject soil, cartage contractor and anticipated date of export to the landfill facility.

The soil acceptance contract shall include contact details of the contaminated soil practitioner attached to the export project, the site owner, the site manager and the cartage contractor.

4.5.1 TOXICITY CHARACTERISTIC LEACHING PROCEEDURE (TCLP)

Toxicity Characteristic Leaching Procedure (TCLP) will be carried out on soils prior to contacting the landfill, if required. The TCLP test simulates leaching from soil within a typical municipal landfill in its operating phase. One TCLP test was completed as part of the DSI. Given the large volume of soil expected to be disposed at landfill, additional TCLP tests will be taken across the site prior to excavation,

to ensure that representative test results are achieved. Table 3 shows the maximum allowable TCLP concentrations for Class A Landfill disposal.

Table 3. Maximum allowable TCLP concentration for Class A Landfill.

Sample Name:	Arsenic mg/L	Cadmium mg/L	Chromium mg/L	Copper mg/L	Lead mg/L	Nickel mg/L	Zinc mg/L
Max TCLP Concentration [1]	5 [3]	1 [3,6]	5 [3]	5 [5]	5 [3]	10 [5,6]	10 [5]

[1]https://environment.govt.nz/publications/module-2-hazardous-waste-guidelines-landfill-waste-acceptance-criteria-and-landfill-classification/3-landfill-waste-acceptance-criteria/

4.6 DUST CONTROL PROCEDURES

Dust generated from the excavation of material has the potential to contain contaminants and during windy conditions could migrate offsite. Dust must be managed during the excavation works to ensure that it generally complies with the Good Practice Guide for Assessing and Managing Dust, MfE (2016).

To control the generation of dust, the contractor will ensure that:

- All areas subject to soil disturbance activities are always wetted and remain damp during soil works, and until such time as existing soils have been covered with cleanfill.
- When utilising water to control dust, the contractor will ensure that the volume of water used does not exceed soil field capacity of the wetted areas causing surface run-off, and the application of water does not induce soil erosion and/or soil pugging.
- Access onto the works area is limited where possible; and
- Working in windy conditions is avoided.

A dust and odour complaints log will be maintained by the site contractor. If complaints regarding dust are received, the following information will be recorded:

- Time and date of the complaint.
- Name and location of the complainant.
- Weather conditions, description of site activities, and location of site activities.
- Nature of the complaint.
- Mitigation measures undertaken and evaluation of effectiveness

4.7 STORMWATER AND SEDIMENT CONTROL

The general topography of the site and surrounding land is relatively flat. To mitigate potential offsite discharges the following sediment and stormwater controls shall be implemented during remediation and earthworks activities:

- Before land disturbance activities start stormwater drains around or near the site by either:
- Wrapping geotextile fabric around stormwater inlets, securing the fabric to the stormwater grates. Place a geotextile sock filled with gravel above the grate to intercept runoff.
- Laying coarse geotextile fabric over the stormwater grates with a layer of aggregate material to act as a primary filter to hold the fabric in place. These shall be kept in place until the site is stabilised.
- Stormwater runoff should be preferentially maintained onsite and allowed to infiltrate whenever possible.
- Monitor the stormwater inlet protection and diversion measures regularly, i.e., daily and after every rainfall event. Check to ensure it is not blocked and that it has not directed water away to cause localised flooding. Repair and modify the devices as necessary.

4.8 ODOUR

Odours may occur if unexpected discovery of contamination is unearthed. The following shall then be implemented:

- Areas of exposed impacted soil shall be limited.
- Impacted material shall not be stockpiled on site but shall be placed directly into truck and trailer units for offsite disposal.
- Heavy tarpaulins will be always available on site, and if necessary, shall be used to minimise odour levels.
- If odours occur, the downwind perimeter of the site shall be monitored by the SQEP for objectionable or offensive levels. If objectionable or offensive odours are observed, works shall cease, and tarpaulins shall be applied over the source area. Works may commence when there is no longer objectionable or offensive odour at or beyond the downwind site boundary, or an alternative process is identified by the SQEP to reduce odours during the works.
- If hydrocarbon odours are present or hydrocarbon-stained soil or impacted groundwater is encountered volatile contaminants may pose a risk to site workers. The contingency measures in Section 5 must then be implemented.

4.9 IMPORTED FILL

Clean fill is as defined by MfE *Guide to the Management of Cleanfill* (2002) as follows:

"*Material that when buried will have no adverse effect on people or the environment. Cleanfill material includes virgin natural materials such as clay, soil and rock, and other inert materials such as concrete or brick that are free of:*

- *Combustible, putrescible, degradable or leachable components.*
- *Hazardous substances.*
- *Products or materials derived from hazardous waste treatment, hazardous waste stabilisation or hazardous waste disposal practices.*
- *Materials that may present a risk to human or animal health such as medical and veterinary waste, asbestos, or radioactive substances.*
- *Liquid waste*."

In simpler terms clean fill includes materials such as uncontaminated soils, cured asphalt, bricks, unreinforced concrete, fibre cement building products (excluding asbestos) and glass.

4.10 GROUNDWATER PROCEDURES

It is not expected the proposed remediation will encounter groundwater

5 CONTINGENCY PLAN

5.1 UNEXPECTED DISCOVERY OF CONTAMINATION PROTOCOL

It is possible that other contaminated soil or wastes such may be encountered during earthwork activities. Odours, stained soils, or general waste material would be a particularly concerning sign. Should there be any concerns the SQEP must be consulted, and this RAP and Contaminated Site management Report may need to be revised.

If other unexpected material is encountered (i.e., green stained or odorous soil, unusually coloured soil, anthropogenic material such as refuse, intact or broken drums and containers or potential ACM) it is unlikely to be suitable for reuse and disposal options must be reviewed.

The SQEP will assess the material and advise on its management. A site contamination report shall be prepared. Where relevant the report shall document: the nature and extent of the material; its suitability to remain on site (from an environmental impact and human health perspective); proposed disposal location and estimated volumes.

The SQEP must immediately contact Gisborne District Council if further contamination is discovered and seek approval for these proposed contingency plan measures prior to them being implemented.

If significant waste burial pits are uncovered during earthworks the following shall be implemented:

- Earthworks should cease in the area. The area should be cordoned off from worker access.
- A SQEP shall attend the site and shall investigate the area.
- Works may commence when investigations are completed and following approval from the SQEP.
- Areas of exposed impacted soil shall be limited.
- If odours are observed, the downwind perimeter of the site shall be monitored for objectionable or offensive levels. If objectionable or offensive odours are observed, works shall cease, and tarpaulins or a cover of soil applied to the source area. Works may commence when there is no longer objectionable or offensive odour at or beyond the downwind site boundary.

The above is an initial outline of what is being proposed. Actual measures to be implemented will be those recommended by the SQEP and approved by GDC.

6 COMPLAINTS PROCEDURE

Site works will be undertaken in accordance with this document. The SQEP will ensure works are undertaken in accordance with this Remedial Action and Contaminated Site Management Report and this role will extend to one of Complaints Manager. Complaints will be managed according to the following:

- The Complaints register will be held on site.
- The Complaints Manager will form the primary contact for complaints and will complete the complaints register.
- Potential conflicts or disputes will be referred to the Project Manager.
- NCC shall be notified of received complaints on the same day.

7 CONTACTS

The following contact details are required to be filled out before the site works commence to ensure clear lines of communication are possible:

Table 4. Contact details

Role	Name/Organisation	Contact Number-
Client	TW Group	
Development Manager	Mitch Jackson	0212611257
Contaminated Land Consultant	EAM-Karen Toulmin	021 02876772
Earthmovers	TBC	TBC

8 REFERENCES

MfE 2021 Contaminated Land Management Guidelines No.1 Reporting on Contaminated Sites in New Zealand. Ministry for the Environment.

MfE 2012 Users' Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Ministry for the Environment.

MfE 2021 Contaminated Land Management Guidelines No.5; Site Investigation and Analysis of Soil. Ministry for the Environment

MfE 2024. Field Use of X-RAY Fluorescence Spectroscopy for Investigation of Contaminated Soil. Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.

DETAILED SITE INVESTIGATION

99a STANLEY ROAD
GISBORNE

PROJECT NO. EAM2422-01

PREPARED FOR
TW GROUP

PREPARED BY
KAREN TOULMIN
FEBRUARY 2024

EAM NZ LTD – ENVIRONMENTAL CONSULTANTS
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DOCUMENT CONTRIBUTORS

Report prepared by:

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EAM
ENVIRONMENTAL CONSULTANTS

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9 INTRODUCTION

EAM NZ Limited (EAM) has been engaged by TW GROUP to undertake a review of site history (i.e., preliminary site investigation; PSI) and a Detailed Site Investigation (DSI), at 99a Stanley Road, Gisborne (hereon in referred to as the Site).

EAM have been commissioned to complete the required Detailed Site Investigation at this site to characterise potential contaminants in site soils because of former land use.

This DSI has been undertaken to provide a contamination assessment of the Site and to evaluate human health risks at the Site.

The objectives of this DSI are to:

- Review the site history to identify HAIL[4] activities, associated potential sources of contamination and the principal contaminants of concern.
- Determine the contamination status of the soils through a comprehensive sampling investigation.
- Assess compliance under the NESCS[5] for the proposed future development of the site.
- Provide a risk assessment for soil within the site regarding future land use of the site.
- Determine whether contaminants of concern identified present an unacceptable risk to human health or identified environmental receptors.
- Assess whether the soils remaining on-site are suitable for the proposed end use.
- Provide options for removal and disposal of any soils from the site as part of development works.

A PSI has been undertaken as a first step in this investigation to assess the site history and identify HAIL activities over the site and potential and likely contaminants of concern. Following the PSI, a comprehensive sampling investigation was completed (DSI) to assess the contamination status of soils at the property. Soil analysis was completed systematically across the site, where possible in a grid-based system, to assess the site sufficiently.

This investigation has been conducted in accordance with the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES) and the current edition (2021) Ministry for Environment (MfE) Contaminated Land Management Guidelines, No1 and No 5.

9.1 SUITABLY QUALIFIED ENVIRONMENTAL PRACTITIONERS

EAM are Suitably Qualified and Experienced Practitioners (SQEP) in the field of contaminated sites. We offer 20+ years' experience in the contaminated site and environmental science fields. EAM routinely carry out contaminated land assessments in both the North and South Islands over many different Council jurisdictions.

Jason Strong (Principle Environmental Scientist - MSc Environmental Science1st Class)

Jason has undertaken literally hundreds of contaminated site assessments and remediation over the past 15 years. He has an MSc in Environmental Science where his thesis was based around trace metal contamination of soils/sediment.

[4] Hazardous Activities and Industries List (Ministry for the Environment; MfE, 2011)
[5] Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) regulations 2011.

Karen Toulmin (Senior Environmental Scientist – BSc Environmental Science)

Karen has 8 years' experience in contaminated land assessments and remediation, in both Australia and New Zealand.

9.2 SCOPE

The following scope of work was completed:

- Review of available information from Gisborne District Council, namely, the Listed Land Use Register (LLUR), historical aerial photographs, and available environmental reports.
- Review of the environmental setting of the site.
- Detailed Soil Investigation
- Collection of surface soil samples across the site.
- Analysis of soil samples at an accredited laboratory; Hills Laboratory Services, IANZ accredited.
- Preparation of a DSI report, including presentation and interpretation of results in accordance with the requirements of the NESCS and with the current 2021 edition of the MfE Contaminated Land Management Guidelines No. 1 and No. 5.

9.3 LIMITATIONS

This report: has been prepared by EAM for TW GROUP and may only be used and relied on by Gisborne District Council for the purpose agreed between EAM and TW GROUP as set out in section 1.1 of this report. EAM otherwise disclaims responsibility to any person other than TW GROUP arising in connection with this report. EAM also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by EAM in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. EAM has no responsibility or obligation to update this report to account for events or changes occurring after the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by EAM described in this report (refer section(s) 1.3 of this report). EAM disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the site conditions, such as the location of buildings, services, and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. EAM does not accept responsibility arising from, or in

connection with, any change to the site conditions. EAM is also not responsible for updating this report if the site conditions change.

EAM has prepared this report based on information provided TW GROUP and others who provided information to EAM (including Government authorities), which EAM has not independently verified or checked beyond the agreed scope of work. EAM does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Notwithstanding the Report Limitations, we confirm that Gisborne District Council can rely on this report for the purposes of determining compliance with the NES guidelines with respect to the development identified in this assessment.

9.4 ASSUMPTIONS

EAM has made the following assumptions during the preparation of this report:

- Information obtained from third parties and TW GROUP is complete and accurate.
- The observed and inferred conditions are representative of the actual conditions associated with HAIL sites and / or other sites not directly assessed.
- That the future land use of the site will remain residential.

9.5 NATIONAL ENVIRONMENTAL STANDARD (NES)

The NES Regulations (2011) ensures that land affected by contaminants in soil is appropriately identified and assessed. When soil disturbance and / or land development activities take place, it should be, if necessary, remediated or the contaminants contained to make the land safe for human use.
Under the NES, land is actually or potentially contaminated if an activity or industry on the MfE Hazardous Activities and Industries List (HAIL) has been, is, or is more likely than not to have been, undertaken on the land. Consequently, any subdivision or development requires a preliminary site investigation (PSI) of the land to determine if there is a risk to human health because of any current or former activities that are occurring, or may have occurred, on the land under investigation.

10 SITE DETAILS

10.1 SITE IDENTIFICATION

The Site is located at 99a Stanley Road, Gisborne. The legal descriptions are presented here.

TABLE 1. SITE DETAILS	
Address	99a Stanley Road, Te Hapara
Valuation Number	853065500
Legal Descriptions	Lot 1 DP 5799
Land area	0.159 ha
Land Use	Residential

Figure 1 and 2 of Appendix A details the current site boundaries and the proposed development scheme plan.

10.2 SITE DESCRIPTION AND CURRENT LAND USE

The property at 99a Stanley Road is a "L shaped" residential section. The property contains a single-story dwelling, located in the south-western corner. The dwelling is constructed of painted weatherboard with a tiled roof. It has aluminium windows. Some asbestos is present in the eaves, and as exterior cladding on the north facing porch. To the immediate north of the dwelling, abutting the north-west boundary is a garage which is constructed of blockwork, with a tiled roof. The northern corner of the site includes a small vegetable garden and fruit trees, whilst the eastern extent of the site is a large grassed and vegetated garden area. Concrete driveway extends from the property entrance in the east, through to the northern side of the dwelling. A large area of concrete driveway in a "T" shape, covers the central-northern area of the site.

11 ENVIRONMENTAL SETTING

11.1 TOPOGRAPHY

The site is in a residential zoned area. The topography of the site is low gradient flat land.

11.2 SOIL

Soils at the site are described by Manaaki Whenua[6] (2019) as well drained recent soils. Recent soils are weakly developed with a distinct topsoil, but a weak or absent B horizon. They typically occur on alluvial floodplains and young land surfaces. These soils are typical of low-lying areas.

The Manaaki Whenua, Landcare Research S map portal describes the soil at the sites as Fere_40 (100) %, which is a deep, well drained loam over sand.

11.3 HYDROGEOLOGY

Groundwater in the area is sourced from the Te Hapara Sands Aquifer, a shallow sand aquifer that can be encountered just below the topsoil. The aquifer extends up to 20 metres thick in places and forms an unconfined to confined shallow water table aquifer. This aquifer extends

[6] Manaaki Whenua- Landcare Research 2019. S-map - New Zealand's national digital soil map. 10.7931/L1WC7

inland for approximately 5 km from the coast. The Sands aquifer becomes confined by river silts inland, with sands interfinger with Waipaoa gravels and shallow fluvial deposits. The permeability of the aquifer decreases to the southwest, with the silt content of the sand increasing towards the Waipaoa Channel. Water takes within the aquifer range from 45- 1850m3/day, with variable water quality. Seasonal water level fluctuations tend to be within 0.5-1 metres; therefore, surface pumps are usually sufficient to extract water.

11.4 SURFACE WATER

The nearest surface waterways are the Waikanae Creek and the Taruheru River.

The Waikanae Creek is located approximately 500m south of the site at its closest point. The Waikanae Creek drains easterly, taking surface water from Matawhero, Makaraka and Awapuni areas before eventuating in the Turanganui River, approximately 3km east of the site.

The Taruheru River is located north and north-east of the site, approximately 2km north-east of the site at its closest point. It commences in the hills of Waihirere and drains surface water to the east where it joins the Waimata River and flows into the Pacific Ocean.

12 PROPERTY HISTORY

A desktop study was undertaken to gain an understanding of the history of the site. The review looks to determine potential contaminants which may be present at the site because of past and present land uses. The following information was sourced to establish the history of the site:

- Gisborne District Council Property Search
- Historical Aerial Photographs
- HAIL review
- Site Visit

12.1 GISBORNE DISTRICT COUNCIL PROPERTY SEARCH

A review of Gisborne District Council Property records found the following documents on file. They are presented in Table 2.

TABLE 2. BUILDING CONSENTS		
DATE	CONSENT/PERMIT	DESCRIPTION
1973	F12078	Erect a dwelling.
1973	6157	Application for plumbing and drainage work.

No files referring to potentially contaminating activities were found for this site.

12.2 HISTORICAL AERIAL PHOTOGRAPHS

Historical aerial photographs of the site, from 1942 through to 2023, were sourced from Retrolens, Google earth, Google maps and Gisborne District Council. Aerial photographs for the years 1942, 1948, 1951, 1966, 1977, 1988, 2007, 2011, 2017 and 2023 942,1951, 1962, 1976, 1988, 2013 and 2022 are presented in Appendix C.

The earliest available imagery is from 1942, sourced from Retrolens and shows the site as a residential section, containing a large dwelling, likely two stories high, based on multiple roof peaks. A garage is located on the north-west boundary. At this time, the neighbouring properties to the south and north of the site are part of the property.

The site remains in this configuration until a time between 1951 and 1966, when the north-eastern garden is subdivided from the site, forming 99 Stanley Road. A small square shaped dwelling, and two sheds occupy the neighbouring property at 99 Stanley Rd.

Imagery from 1977 shows significant changes to the site, with the large dwelling replaced with another dwelling and shed. This new dwelling is much smaller in size, L-shaped and appears single story. A shed is present on the north-western boundary.

Imagery from 1988 shows the southern area of the original site subdivided, and developed into a block of units, becoming 497 Childers Road.

No significant changes are noted to the site through to the present day.

12.3 HAZARDOUS ACTIVITIES AND INDUSTRIES LIST

In accordance with Appendix C: Hazardous Activities and Industries List (HAIL) of the MfE NES for Assessing and Managing Contaminants in Soil to Protect Human Health, the site is considered HAIL under:

Section I: Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment.

A large double story dwelling was present on this site from at least 1942, before being replaced with a new, single-story dwelling in 1973 (see property files). The original dwelling, located on the site from at least 1942 was most likely painted with lead-based paints. The second, and existing dwelling on the site was constructed in 1973. White lead was banned in paint in NZ from 1965 suggesting the unlikely use of lead-based paint on the existing dwelling. Lead based paint contributes to soil contamination through weathering, sanding, and redecoration.

12.4 SITE VISIT

A site visit was completed on 5th September 2023. The following observations were made:

- The site is a residential section comprising a single dwelling, and garage.
- The dwelling is of painted weatherboard construction with a tiled roof. It has aluminium windows. Some asbestos is present in the eaves, and as exterior cladding on the north facing porch.
- A garage is located on the central, western boundary adjacent to the dwelling. It is constructed of blockwork with a tiled roof.
- Sealed driveway extends from Stanley Road to the dwelling and garage.
- Grassed and garden areas are present along the eastern entranceway from Stanley Road, on the northern side of the dwelling, and a small area on the western boundary.

No visual or olfactory evidence of contamination or contaminating activities were observed during the site visit. Site photographs are presented in Appendix C.

13 CONCEPTUAL SITE MODEL

13.1 RATIONALE

The overall rationale for the site investigation was to determine whether historical activities on the Site may have caused soil contamination that would affect the proposed residential land use. The following is an analysis of potential contaminants, receptors, and pathways between potentially contaminated soils, and the proposed residential land use.

13.1.1 HAZARDOUS SUBSTANCES AND POTENTIAL CONTAMINANTS OF CONCERN

For the purposes of this investigation, the following contaminants were considered.

- Metals

Metals occur naturally in the soil environment from the process of weathering of parent materials. Soils may become contaminated by the accumulation of metals and through leaded paints, land application of fertilisers, animal manures, sewage, pesticides, leaching from treated timber and wastewater irrigation. Most metals do not undergo microbial or chemical degradation hence, their total concentration in soils persists forever. Metals are associated with human illness, particularly nervous system damage from long term exposure in humans.

The main source of metal contamination within residential sections is lead based paint. The domestic paints available today contain only very small quantities of lead and are unlikely to be a hazard. However, the lead content of paints used in the past was generally much higher. When lead-based paint is sanded or power blasted during redecoration, high concentrations of lead dust become widely dissipated. Dust particles are deposited on surrounding surfaces, and in the soil, and may affect those exposed to dust and fragments long after the work is completed.

13.1.2 POTENTIALLY RELEVANT SENSITIVE HUMAN AND ECOLOGICAL RECEPTORS

The site is proposed for residential land use (10% produce), which is considered one of the most sensitive of land uses. The MFEs National Environmental Standard (NESCS) for soil contaminants, considers that residential landowners may use the land for activities such as vegetable gardening or fruit trees. These activities pose a risk to the consumer/landowner's where contaminated soils are involved in an exposure pathway.

The following potential receptors were identified as being relevant to the Site:

- Earthworks, construction, maintenance, and excavation contractors who may encounter potentially contaminated soil during the proposed works via inhalation (dusts).
- Future residents at the Site via inhalation (dusts) and/or ingestion of contaminated soil.

13.1.3 EXPOSURE PATHWAYS

A human health risk can only occur when there is a direct link between contaminant source and receptor. Potential complete pathways for this Site may include:

- Dermal (skin) contact with soil, for gardening, construction.
- Direct contact and inhalation of dusts and soil during construction and site works.
- Consumption of foods grown in contaminated soils.
- Consumption of soils, particularly by small children.

14 FIELD INVESTIGATION

14.1 RATIONALE OF SAMPLE COLLECTION

Sampling locations across the Site were established using reference to the "Contaminated Land Guidelines No. 5" (MfE 2021). These guidelines set out (in Table B1; p91), indicate the *"number of samples required to detect hotspot with 95 percent confidence"*.

Twenty-three boreholes were investigated systematically across the site, with the locations presented in Figure 3, Appendix A.

Samples were collected using a 150mm soil augur and collected from the 0-150mm depth interval. One duplicate sample was collected during sampling for statistical accuracy and precision of results.

Samples were collected directly into laboratory supplied containers and were placed in a chilly bin with ice packs for transport. Samples were couriered to an IANZ accredited laboratory (Hills Laboratories) under standard chain of custody procedures.

14.2 SITE LITHOLOGY

Site soils were observed to be consistent across the site as consisting of an average of dark brown topsoil overlying greyish brown sand. Depth of topsoil ranged between 250mm and 500mm across the site. Table 3 shows site lithology at each sample location.

TABLE 3. SITE LITHOLOGY

Sample Location	Depth	Lithological Description
#1	0-250mm	Topsoil, dark brown, organic
	250-500mm	Sand, greyish brown, medium to fine
#2	0-350	Topsoil, dark brown, organic
	350-500mm	Sand, greyish brown, medium to fine
#3	0-350	Topsoil, dark brown, organic
	350-500mm	Sand, greyish brown, medium to fine
#4	0-400mm	Topsoil, dark brown, organic
	400-500mm	Sand, greyish brown, medium to fine
#5	0-550mm	Topsoil, dark brown, organic
	550-600mm	Sand, greyish brown, medium to fine
#6	0-400mm	Topsoil, dark brown, organic
	400-500mm	Sand, greyish brown, medium to fine
#7	0-350	Topsoil, dark brown, organic
	350-500mm	Sand, greyish brown, medium to fine
#8	0-350	Topsoil, dark brown, organic
	350-500mm	Sand, greyish brown, medium to fine
#9	0-300mm	Topsoil, dark brown, organic
	300-500mm	Sand, greyish brown, medium to fine
#10	0-350	Topsoil, dark brown, organic
	350-500mm	Sand, greyish brown, medium to fine
#11	0-400mm	Topsoil, dark brown, organic
	400-500mm	Sand, greyish brown, medium to fine
#12	0-400mm	Topsoil, dark brown, organic
	400-500mm	Sand, greyish brown, medium to fine
#13	0-400mm	Topsoil, dark brown, organic
	400-500mm	Sand, greyish brown, medium to fine
#14	0-500mm	Sand, greyish brown, coarse to fine.
#15	0-400mm	Topsoil, dark brown, organic
	400-500mm	Sand, greyish brown, medium to fine
#16	0-500mm	Topsoil, dark brown, organic
#17	0-350	Topsoil, dark brown, organic
	350-500mm	Sand, greyish brown, medium to fine
#18	0-300mm	Topsoil, dark brown, organic
	300-500mm	Sand, greyish brown, medium to fine
#19	0-300mm	Topsoil, dark brown, organic
	300-500mm	Sand, greyish brown, medium to fine
#20	0-300mm	Topsoil, dark brown, organic
	300-500mm	Sand, greyish brown, medium to fine
#21	0-250mm	Topsoil, dark brown, organic
	250-500mm	Sand, greyish brown, medium to fine
#22	0-300mm	Topsoil, dark brown, organic
	300-500mm	Sand, greyish brown, medium to fine
#23	0-300mm	Topsoil, dark brown, organic
	300-500mm	Sand, greyish brown, medium to fine

14.2.1 FIELD QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

Quality Assurance and Quality Control procedures undertaken during sampling included the following:

- Changing of disposable gloves after each sample.
- Decontamination and rinsing of augur between each sample.
- Collection of soil samples in new, clean, appropriately labelled sample bags and jars.
- Ten percent Duplicate analysis (collection of five duplicates).
- Use of chain of custody procedures and forms.
- Use of IANZ accredited laboratories with in-house QA/QC procedures for the analyses requested.

15 ASSESSMENT CRITERIA

The following soil assessment criteria have been selected for the site.

15.1 THE NATIONAL ENVIRONMENTAL STANDARD FOR ASSESSING AND MANAGING CONTAMINANTS IN SOIL TO PROTECT HUMAN HEALTH (NESCS)

The NESCS sets national standards for contaminants in soil to protect human health. It contains a national set of soil contaminant standards (SCS) for twelve priority contaminants for five standard land use scenarios. The land use category selected for this investigation was Residential (10% Produce) as described in the NES CS User Guide.

15.2 THE NATIONAL ENVIRONMENTAL PROTECTION MEASURE

In the absence of New Zealand specific risk-based human health criteria for nickel and zinc, the Australian National Environment Protection Measure 2013 (NEPM) guidelines have been adopted for this investigation. The intention of the NEPM is to enable safe use of contaminated land to ensure that contaminated land is appropriately assessed prior to development. The NEPM covers a range of land uses. For the purposes of this assessment, the NEPM Health-based Investigation Level A (Residential land use) have been selected based on the land use and Site attributes.

15.3 BACKGROUND CONCENTRATIONS OF HEAVY METALS

In the absence of available published data for uncontaminated background soils in the Gisborne region, a control sample was collected. The control sample was collected from the Gisborne A & P Showgrounds. The sample was collected from an undisturbed and undeveloped area of grass. If concentrations of contaminants are found to be at or less than typical background concentrations, then the NES CS does not apply.

15.4 ECOLOGICAL SOIL GUIDELINE VALUES

To assess potential risk to environmental receptors, the criteria for Residential / Recreational area developed for protection of ecological receptors from the updated, Development of soil guideline values for the protection of ecological receptors (Eco-SGVs): Technical Document (Manaaki Whenua Landcare Research, 2019) were used. Criteria were selected assuming a typical soil, aged contamination source, and a residential land use.

16 ANALYTICAL RESULTS

The following sections discusses the analytical results by analyte and compares against the adopted human health guideline criteria. In this case, the most appropriate SCS is likely to be those for the NES land use scenario of Residential (10% Produce). The NES description of this land use is as follows:

"Standard residential Lot, for single dwelling sites with gardens, including homegrown produce consumption (10 percent)".

The analytical results are summarised in Table 1 in Appendix D, along with the laboratory reports. The results of analysis have been compared directly against appropriate (where available) Soil Contaminant Standards (SCS) from the NES Priority contaminants list (MfE, 2012).

16.1 BACKGROUND SOIL CONCENTRATIONS

Soils at the site were compared with the background soil concentrations of a control sample, collected from parkland within the A & P Showgrounds in Gisborne by EAM. The soil here is considered unlikely to have been exposed to potentially contaminating activities.

The control sample shows very low concentrations of all metals. The sample results which were found to be "at or about the value" of the concentrations of the control sample were considered background. The results which are considered above the general background value are highlighted in blue in Table 1, Appendix D, and shown below in Table 4.

TABLE 4. BACKGROUND VALUES FOR THE GISBORNE REGION (CONTROL SAMPLE)

Arsenic	4 mg/kg
Cadmium	0.21 mg/kg
Chromium	8 mg/kg
Copper	9 mg/kg
Lead	38 mg/kg
Nickel	7 mg/kg
Zinc	56 mg/kg

Except for sample locations #18, #22 and #23, which are in the far east of the site, in a grassed garden area, all samples at 0-150mm depth exceed Gisborne uncontaminated background soil values. Contaminants which heavily exceed background values are lead and zinc, with lead concentrations up to 990mg/kg reported in Sample location #6, and zinc concentrations of 550mg/kg in this same location. These concentrations are well above the background values of 38mg/kg and 56mg/kg for lead and zinc, respectively. Lead exceedances above background values for the 0-150mm depth range from 50mg/kg to 990mg/kg, and for zinc range from 106mg/kg to 550mg/kg.

Milder exceedances of arsenic, copper and chromium are present across the northern and central area of the site at 0-150mm depth.

At 150-300mm depth, most of the eastern third of the site is representative of background values. The western and northern extents of the site, to the west and north of the dwelling in grassed areas remain elevated for lead, zinc, and mild arsenic.

Concentrations above background values remain at 400mm depth in the areas to the north and west of the dwelling, with sample locations #1 and #3 are now at background values.

Concentrations at 500mm depth remain above background values in the area to the north of the dwelling, and in sample locations #2 and #4.

16.2 METALS/METALLOIDS

Soil metal analysis was compared with the NES standards for Residential land use (10% produce). Sample locations #2 (0-400mm), #4 (0-500mm), #5(0- 400mm), #6 (0-400mm), #7 (0- 300), #8 (0- 300mm), #9 (0-150mm), #13 (0-300mm) and #17 (0-150mm) reported exceedance of the NES residential standards of 210 mg/kg for lead. This corresponds with the area to the north and west of the dwelling, and in one sample location on the eastern side of the dwelling.

All other samples reported concentrations of metals within the NES standards.

16.3 ECOLOGICAL SOIL GUIDELINE VALUES

Sample location #6 exceeds the Landcare Updated Development of Soil Guideline Values for Protection of Ecological Receptors (Eco-SGVs) for lead (900mg/kg), reporting a concentration of 990 mg/kg.

Sample locations #4, #5, #6, #7, #8, #9 and #13, exceed the Landcare Updated Development of Soil Guideline Values for Protection of Ecological Receptors (Eco-SGVs) for zinc (300mg/kg), at varying depths. Concentrations above the SGV's range from 560mg/kg to 320mg/kg.

16.4 QUALITY ASSURANCE AND QUALITY CONTROL

16.4.1 FIELD DUPLICATES

Duplicate analysis was completed as a means for determining uncertainty, accuracy, and precision of laboratory analysis. Five duplicate samples were collected during sampling at the same sample location and depth interval as Sample #1 0-150mm, #5 0-150mm, #10 0-150mm, #15 0-150mm and #20 0-150mm and labelled as #1a 0-150mm, #5a 0-150mm, #10a 0-150mm, #15a 0-150mm, and #20a 0-150mm, respectively.

The RPD between samples was calculated according to the following formula:

$$RPD = \frac{(Result\ No.1 - Result\ No.2)\ x\ 100}{(Mean\ of\ result\ No.1 + result\ No.2)}$$

The typical data quality objective is for an RPD to be within 30 – 50% (MfE, 2021). The RPD results were reported within the data quality objective. Mean RPDs for the seven metals for each duplicate pair were reported as 38%, 1%, 7%, 8% and 13%, respectively. RPD calculations are presented in Appendix D.

16.5 RISK ASSESSMENT

A hazard – pathway – receptor pollution linkage is considered to aid assessment of risk associated with results of the site investigation.

For contaminated soils to pose a risk to a receptor, a complete pathway must exist between the contamination source and the identified receptor(s). If there is an incomplete pathway, then there is no risk. In this instance, there is a risk to human health across the site to lead exposure.

17 CONCLUSIONS AND RECOMMENDATIONS

EAM was engaged to undertake a Detailed Site Investigation of 99a Stanley Road, Gisborne. The objectives of the investigation were to evaluate:

1. The type, extent, and level of contamination, if any, within the proposed subdivision sites.
2. Whether contaminants of concern identified present an unacceptable risk to human health or identified environmental receptors.
3. Whether the soils remaining on-site are suitable for the proposed end use.

A detailed site history was undertaken to review the historical land use at the site. The site has been a residential section since at least 1942.

This investigation identified one potential site activities included on the HAIL (Ministry for the Environment, 2011):

- Section I: Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment – This was considered based on the potential for lead-based paint which was likely used on the buildings to contaminate site soils.

Due to the potential HAIL activities at the site, a total of ninety-seven samples were collected from twenty-three sample locations. Soil samples were collected systematically across the site, at depth intervals of 0-150mm, 150-300mm, 400mm and 500mm and analysed for heavy metals.

Laboratory analysis results and comparison with relevant NZ guidelines indicate that:

- Lead and zinc concentrations were reported well above regional background concentrations for the Gisborne area, when compared with a control sample. Soil contamination above background values, extends to at least 500mm in the northern third of the site, and to the west of the dwelling. Soil concentrations in the eastern third, on a large garden section, are above background values to approximately 300mm depth, where contamination then largely ceases.
- Soil metal analysis was compared with the NES standards for Residential land use (10% produce). Sample locations #2 (0-400mm), #4 (0-500mm), #5(0-400mm), #6 (0-400mm), #7 (0- 300), #8 (0- 300mm), #9 (0-150mm), #13 (0-300mm) and #17 (0-150mm) reported exceedance of the NES residential standards of 210 mg/kg for lead. This corresponds with the area to the north and west of the dwelling, and in one sample location on the eastern side of the dwelling. All other samples reported concentrations of metals within the NES standards.
- Sample location #6 exceeds the Landcare Updated Development of Soil Guideline Values for Protection of Ecological Receptors (Eco-SGVs) for lead (900mg/kg), reporting a concentration of 990 mg/kg
- Sample locations #4, #5, #6, #7, #8, #9 and #13, exceed the Landcare Updated Development of Soil Guideline Values for Protection of Ecological Receptors (Eco-SGVs)

for zinc (300mg/kg), at varying depths. Concentrations above the SGV's range from 560mg/kg to 320mg/kg.
- The RPD results were reported within the data quality objective reporting mean RPDs for the five duplicate pairs of 38%, 1%, 7%, 8% and 13%.

Elevated metals of lead are above NES residential standards, thus there is a human health risk unless addressed through remediation. We would expect remediation to be possible and for the site to be redeveloped for residential purposes.

Based on the exceedance of background soil concentrations, and ecological soil guideline values, off-site disposal options, should they be required as part of development will require planning, consideration, and possible resource consent approval.

Any soils exceeding uncontaminated background values, have a degree of anthropogenic contamination. Should offsite disposal be required, this can only be through resource consent for an alternative land use; or disposed to appropriate landfill facility. Soils may be required to go to a licenced A Class landfill facility.

The best option is for excavated soils to be retained on site, in either noise bund, or garden areas, however we appreciate that due to the density of development, this option is unlikely. Options to enable soils to remain on site would be to pile foundations for the new buildings rather than excavate for concrete rafts. Alternatively, topsoil could be geotechnically engineered to create structurally compliant building platforms.

This investigation confirms that the site is highly likely to pose a risk to human health, and remediation will be required to ensure its suitability for the proposed development.

18 PROPOSED DEVELOPMENT AND REMEDIATION

Site soils at 99a Stanley Road exhibit soil metal concentrations which exceed NES standard for Residential (10% produce) land use. Exceedance is present largely in the area to the north of the dwelling, along the western side of the dwelling, and in one location to the east of the dwelling. In the northern area of the site, and along the western boundary, contamination above NES is deep, extending to at least 400mm depth in the areas surrounding sample locations #2, #4, #5 and #6, and slightly shallower to 300mm in sample locations #7, #8 and #13. Shallow exceedance was reported to a depth of 150mm in sample locations #9 and #17.

To remediate the site to NES residential, options could include excavation to landfill or an alternate use (via resource consent), soil mixing to dilute concentrations, encapsulation beneath permanent structures, or building up the site to a level which provides sufficient clearance between underlying contamination and the finished ground surface.

At present, the proposed foundation design has not yet been confirmed and will be completed at the detailed design stage. If the foundation type allows for the contaminated material to be capped, then this will be a suitable option as it will allow contaminated material to remain on site and not take up valuable space in landfill.

Soil mixing may be adopted as part of this process to reduce soil concentrations to acceptable standards, and the soil retained on site.

Capping of contaminated material will need to be approved by geotechnical engineers. If capping cannot be adopted, then methods such as excavation and disposal to landfill, or an alternative land use may be required.

Encapsulation of contaminated material above residential standards within a containment cell could be viable based on the volume of contaminated material generated.

A detailed assessment of potential remedial options has been completed and is presented in Appendix E. A final Remedial Action Plan will be prepared as a condition of resource consent, confirming the proposed remedial action for the development, based on finalised foundation.

19 REFERENCES

MfE 2021 Contaminated Land Management Guidelines No.1 Reporting on Contaminated Sites in New Zealand. Ministry for the Environment.

MfE 2012 Users' Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Ministry for the Environment.

MfE 2021 Contaminated Land Management Guidelines No.5; Site Investigation and Analysis of Soil. Ministry for the Environment.

Hawkes Bay Region: Background Soil Concentrations for Managing Soil Quality, Landcare Research, 2014.

https://soils-maps.landcareresearch.co.nz (2020)

NZGS. (2005). New Zealand Geotechnical Society December 2005 - Guidelines for the classification and description of soil and rock for engineering purposes.

APPENDIX A-FIGURES

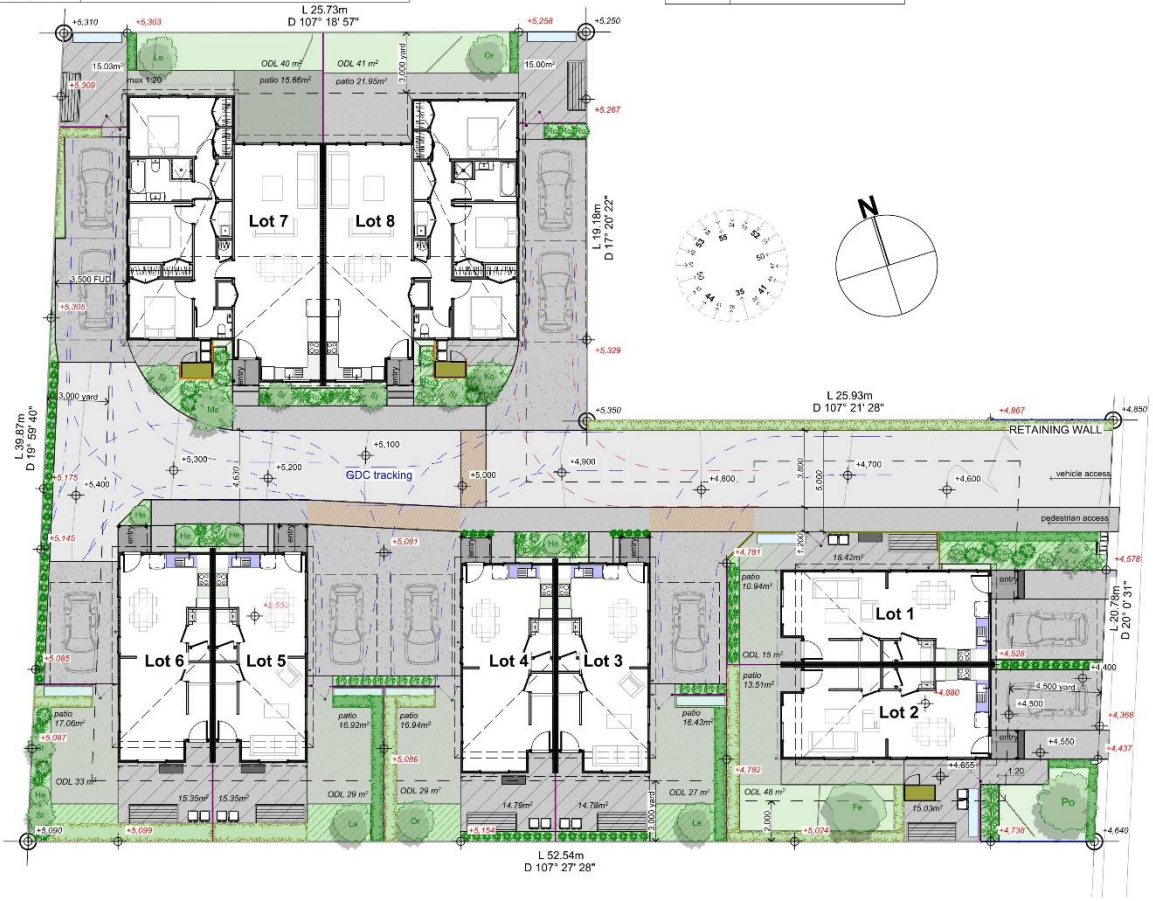
FIGURE 1. SITE LAY OUT PLAN FOR 99a STANLEY ROAD, GISBORNE

FIGURE 2. DRAFT SCHEME PLAN FOR DEVELOPMENT

Fence Key	
2D Plan Preview	Element ID
	#1. 1.2m Timber Batten Fence 50% visually permeable
	#2 1.2m Timber Pailing Fence
	#2 1.5m Fentec Colourwall Slat-Top Panel
	#3 . 1.5m Timber Fence with visually permeable upper section
	#4 1.8m Timber Pailing Fence
	#5. 1.8m Timber Fence with visually permeable upper section
	Existing Boundary Fence
	Gate - 1.2m Aluminium
	Gate - 1.8m Timber Paling on Metal frame

Site Works	
2D Plan	Element ID
	Concrete Paving (Broom Finish with 4% Oxide)
	Concrete Private Carpark (Broom Finished with Sawcuts)
	Concrete Service Court (Broom Finish)
	Garden Bed with Mulch
	Shared Driveway - refer Civil

Site Features	
2D Plan Preview	Element ID
	28m Washing Line
	2000L Thin Tank
	Garden Master Shed 1.53 x 0.785
	Garden Storage Box
	Misc: Letter Box
	Rubbish Bins



SITE INFORAMTION
Site Address: 99a Stanley Road
Gisborne
New Zealand
Site Legal: Lot 1 DP 5799
ZONE
General Residential
WIND ZONE
Medium
EXPOSURE ZONE
Zone C
EARTHQUAKE ZONE
Zone 3
SOIL TYPE
Refer Geotech
RAINFALL INTENSITY
60 - 70
SITE AREA
1,590m²
PERMITTED COVERAGE
35% of NET

ATKINSON HARWOOD ARCHITECTURE

Typologies		
ID	Typology	GF Area (m²)
Lot 1	I2 Two-story Duplex	90.2
Lot 2	I2 Two-story Duplex	90.2
Lot 3	I2 Two-story Duplex	90.2
Lot 4	I2 Two-story Duplex	90.2
Lot 5	I2 Two-story Duplex	90.2
Lot 6	I2 Two-story Duplex	90.2
Lot 7	Z3 Duplex FUD	113.7
Lot 8	Z3 Duplex	112.8

Outdoor Living Space		
ID	KO M-255	Area Achieved (m²)
Lot 1 ODL	20m²	15.47
Lot 2 ODL	20m²	47.64
Lot 3 ODL	20m²	27.06
Lot 4 ODL	20m²	28.56
Lot 5 ODL	20m²	28.55
Lot 6 ODL	20m²	32.87
Lot 7 ODL	35m²	39.95
Lot 8 ODL	35m²	41.02

Rev	Revision	Date

Proposed Site Plan

15% Design Review

NZHG Stanley Road
99a Stanley Road
Revision:
Scale at A3: 1:200
Date Issued: 9/08/2023

e: sol@atkinsonharwood.co.nz
p: 027 465 9236

04

FIGURE 3. SAMPLE LOCATIONS 0-150mm DEPTH

FIGURE 4. SAMPLE LOCATIONS 150-300mm DEPTH

FIGURE 5. SAMPLE LOCATIONS 400mm DEPTH

FIGURE 6. SAMPLE LOCATIONS 500mm DEPTH

APPENDIX B- AERIAL PHOTOGRAPHY

1942- Source, Retrolens

1948- Source, Retrolens

1951- Source, Retrolens

1966- Source, Retrolens

1977- Source, Retrolens

1988- Source, Retrolens

2007- Source, Google Earth

2011- Source, Google Earth

2022- Source, GDC

APPENDIX C- SITE PHOTOGRAPHS

Top. Front yard and eastern facing side of dwelling. **Middle.** Southern boundary. **Bottom.** Western boundary of site behind dwelling.

Top. Asbestos construction on porch **Middle.** Northern side of property. **Bottom.** North facing side of house.

APPENDIX D- LABORATORY ANALYSIS AND REPORTS

TABLE 1. SOIL METAL RESULTS (mg/kg)

Sample Name:	Arsenic mg/kg	Cadmium mg/kg	Chromium mg/kg	Copper mg/kg	Lead mg/kg	Nickel mg/kg	Zinc mg/kg
#1 0-150 08-Feb-2024	6	0.12	4	7	88	4	77
#1 150-300 08-Feb-2024	4	< 0.10	3	6	44	3	46
#1 400 08-Feb-2024	5	< 0.10	5	< 2	9.1	4	24
#1 500 08-Feb-2024	6	< 0.10	5	< 2	10.1	6	24
#1a 0-150 08-Feb-2024	7	0.17	6	12	148	5	130
#2 0-150 08-Feb-2024	9	0.22	7	9	250	7	170
#2 150-300 08-Feb-2024	9	0.19	7	12	400	7	162
#2 400 08-Feb-2024	7	0.11	5	9	530	5	100
#2 500 08-Feb-2024	7	< 0.10	6	3	51	6	33
#3 0-150 08-Feb-2024	7	0.16	9	23	79	10	156
#3 150-300 08-Feb-2024	8	0.14	11	21	53	13	94
#3 400 08-Feb-2024	8	< 0.10	13	13	29	16	65
#3 500 08-Feb-2024	7	< 0.10	7	7	17.5	10	39
#4 0-150 08-Feb-2024	7	0.17	8	10	145	7	170
#4 150-300 08-Feb-2024	9	0.23	10	18	220	9	210
#4 400 08-Feb-2024	9	0.27	9	22	780	8	240
#4 500 08-Feb-2024	11	0.64	11	123	220	23	370
#5 0-150 08-Feb-2024	15	0.67	20	48	620	10	500
#5 150-300 08-Feb-2024	13	0.73	14	43	650	13	560
#5 400 08-Feb-2024	13	0.45	11	38	320	11	380
#5 500 08-Feb-2024	13	0.37	10	23	210	11	290
#5a 0-150 08-Feb-2024	14	0.7	19	49	590	11	500
#6 0-150 08-Feb-2024	10	0.62	16	50	990	9	550
#6 150-300 08-Feb-2024	10	0.52	16	32	700	9	510
#6 400 08-Feb-2024	10	0.28	10	20	320	8	270
#6 500 08-Feb-2024	10	< 0.10	8	5	43	10	58
#7 0-150 08-Feb-2024	7	0.6	14	48	850	9	450
#7 150-300 08-Feb-2024	7	0.48	12	28	580	8	340
#7 400 08-Feb-2024	6	0.13	7	12	184	6	117
#7 500 08-Feb-2024	7	< 0.10	7	5	58	7	43
#8 0-150 08-Feb-2024	9	0.41	9	22	560	9	380
#8 150-300 08-Feb-2024	7	0.34	7	15	390	7	280
#8 400 08-Feb-2024	5	0.12	5	7	150	5	108
#8 500 08-Feb-2024	7	< 0.10	6	4	49	7	53
#9 0-150 08-Feb-2024	9	0.61	14	33	600	13	440
#9 150-300 08-Feb-2024	5	0.17	5	16	103	6	117
#9 400 08-Feb-2024	6	< 0.10	6	7	56	7	66
#9 500 08-Feb-2024	7	< 0.10	6	3	21	8	34
#10 0-150 08-Feb-2024	9	0.38	11	16	150	12	260
#10 150-300 08-Feb-2024	11	0.37	7	15	69	7	270
#10 400 08-Feb-2024	11	0.29	6	11	50	7	240
#10 500 08-Feb-2024	11	0.1	7	6	24	7	92
#10a 0-150 08-Feb-2024	8	0.36	11	14	129	13	230
#11 0-150 08-Feb-2024	7	0.17	7	8	90	7	129
#11 150-300 08-Feb-2024	6	0.23	6	12	140	7	196
#11 400 08-Feb-2024	4	0.2	5	11	88	5	141
#11 500 08-Feb-2024	4	< 0.10	4	3	18	5	41
#12 0-150 08-Feb-2024	9	0.24	10	18	200	9	260
#12 150-300 08-Feb-2024	8	0.14	7	13	162	8	184
#12 400 08-Feb-2024	8	< 0.10	6	6	126	6	86
#12 500 08-Feb-2024	8	< 0.10	6	5	90	7	78
#13 0-150 08-Feb-2024	8	0.2	7	7	330	8	290
#13 150-300 08-Feb-2024	9	0.2	7	6	340	8	320
#13 400 08-Feb-2024	9	0.1	7	5	148	8	171
#13 500 08-Feb-2024	9	0.15	6	5	189	8	190
#14 0-150 08-Feb-2024	13	< 0.10	11	12	78	11	120
#14 150-300 08-Feb-2024	13	< 0.10	8	4	16.4	9	35
#14 400 08-Feb-2024	12	< 0.10	7	4	12.9	9	32

#15 0-150 08-Feb-2024	9	0.11	7	6	110	8	106
#15 150-300 08-Feb-2024	9	< 0.10	6	3	110	7	39
#15 400 08-Feb-2024	8	< 0.10	6	3	17.9	7	34
#15 500 08-Feb-2024	9	< 0.10	6	2	20	8	32
#15a 0-150 08-Feb-2024	8	0.14	7	7	114	8	138
#16 0-150 08-Feb-2024	7	0.13	8	7	200	9	120
#16 150-300 08-Feb-2024	8	< 0.10	7	3	32	9	36
#16 400 08-Feb-2024	7	< 0.10	6	3	31	8	36
#16 500 08-Feb-2024	7	< 0.10	5	3	17.1	7	29
#17 0-150 08-Feb-2024	8	0.19	10	10	360	9	184
#17 150-300 08-Feb-2024	7	0.2	8	10	170	10	124
#17 400 08-Feb-2024	8	0.15	8	8	180	10	102
#17 500 08-Feb-2024	9	< 0.10	7	4	35	10	40
#18 0-150 08-Feb-2024	6	< 0.10	6	5	42	7	54
#18 150-300 08-Feb-2024	7	< 0.10	7	3	18.9	8	35
#18 400 08-Feb-2024	8	< 0.10	7	2	7.3	8	23
#18 500 08-Feb-2024	8	< 0.10	7	2	8.3	9	24
#19 0-150 08-Feb-2024	6	0.12	5	5	58	5	53
#19 150-300 08-Feb-2024	3	< 0.10	3	2	14.3	3	25
#19 400 08-Feb-2024	6	< 0.10	5	< 2	7.9	5	21
#19 500 08-Feb-2024	7	< 0.10	5	< 2	7.5	6	22
#20 0-150 08-Feb-2024	8	< 0.10	8	4	79	7	84
#20 150-300 08-Feb-2024	6	< 0.10	5	< 2	12.2	6	29
#20 400 08-Feb-2024	7	< 0.10	6	< 2	10.1	6	28
#20 500 08-Feb-2024	7	< 0.10	5	< 2	11.4	7	28
#20a 0-150 08-Feb-2024	8	< 0.10	7	4	50	8	58
#21 0-150 08-Feb-2024	8	0.13	7	6	110	7	88
#21 150-300 08-Feb-2024	8	< 0.10	6	2	15	7	28
#21 400 08-Feb-2024	8	< 0.10	6	< 2	7	8	19
#21 500 08-Feb-2024	11	< 0.10	6	< 2	8.6	7	21
#22 0-150 08-Feb-2024	7	< 0.10	6	4	37	6	50
#22 150-300 08-Feb-2024	7	< 0.10	7	3	24	7	37
#22 400 08-Feb-2024	7	< 0.10	7	3	16.6	8	32
#23 0-150 08-Feb-2024	8	< 0.10	6	4	27	7	32
#23 150-300 08-Feb-2024	9	< 0.10	6	2	9.1	8	21
#23 400 08-Feb-2024	9	< 0.10	5	< 2	6.2	8	20
#23 500 08-Feb-2024	10	< 0.10	6	2	8.8	8	24
Gisborne Uncontaminated Background Soil [1]	4	0.21	8	9	38	7	56
NES Residential [2]	20	3	460	>10,000	210		
NEPM Residential [3]						400	7400
Landcare Eco SGV's [4]	60	12	390	240	900	NGV	300

Exceeds Gisborne Uncontaminated Background Soil, Control sample collected Gisborne A & P Showgrounds.

123 Exceeds Ecological SGV's

RED Exceeds NES Residential

[1]-Gisborne Control sample. Collected from Gisborne A & P showgrounds in an undeveloped area.

[2] -MfE, June 2011. Resource Management (National Environmental Standard for Assessing and managing contaminants in Soil to Protect Human Health) Regulations 2011

[3]-National Environmental Protection (Assessment of Site Contamination) Measure, 1999.

[4] Landcare updated Development of Soil Guideline Values for Protection of Ecological Receptors (Eco SGVs). Assumes residential/recreational area, aged source, typical soil

TABLE 2. RELATIVE PERCENTILE DIFFERENCES

Sample Name:	Arsenic mg/kg	Cadmium mg/kg	Chromium mg/kg	Copper mg/kg	Lead mg/kg	Nickel mg/kg	Zinc mg/kg
#1 0-150 08-Feb-2024	6	0.12	4	7	88	4	77
#1a 0-150 08-Feb-2024	7	0.17	6	12	148	5	130
Mean	6.5	0.1	5.0	9.5	118.0	4.5	103.5
RPD %	-15.4	-34.5	-40.0	-52.6	-50.8	-22.2	-51.2
#5 0-150 08-Feb-2024	15	0.67	20	48	620	10	500
#5a 0-150 08-Feb-2024	14	0.7	19	49	590	11	500
Mean	14.5	0.7	19.5	48.5	605.0	10.5	500.0
RPD %	6.9	-4.4	5.1	-2.1	5.0	-9.5	0.0
#10 0-150 08-Feb-2024	9	0.38	11	16	150	12	260
#10a 0-150 08-Feb-2024	8	0.36	11	14	129	13	230
Mean	8.5	0.4	11.0	15.0	139.5	12.5	245.0
RPD %	11.8	5.4	0.0	13.3	15.1	-8.0	12.2
#15 0-150 08-Feb-2024	9	0.11	7	6	110	8	106
#15a 0-150 08-Feb-2024	8	0.14	7	7	114	8	138
Mean	8.5	0.1	7.0	6.5	112.0	8.0	122.0
RPD %	11.8	-24.0	0.0	-15.4	-3.6	0.0	-26.2
#20 0-150 08-Feb-2024	8	< 0.10	8	4	79	7	84
#20a 0-150 08-Feb-2024	8	< 0.10	7	4	50	8	58
Mean	8.0	<0.10	7.5	4.0	64.5	7.5	71.0
RPD %	0.0	<0.10	13.3	0.0	45.0	-13.3	36.6

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:	EAM NZ Limited	**Lab No:**	3464565	SPv3
Contact:	Karen Toulmin	**Date Received:**	13-Feb-2024	
	C/- EAM NZ Limited	**Date Reported:**	26-Feb-2024	**(Amended)**
	233B Thompson Road	**Quote No:**	72316	
	RD 10	**Order No:**		
	Hastings 4180	**Client Reference:**	99a Stanley Road	
		Submitted By:	Karen Toulmin	

Sample Type: Soil

	Sample Name:	#1 0-150 08-Feb-2024	#1 150-300 08-Feb-2024	#1 400 08-Feb-2024	#1 500 08-Feb-2024	#1a 0-150 08-Feb-2024
	Lab Number:	3464565.1	3464565.2	3464565.3	3464565.4	3464565.5
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	6	4	5	6	7
Total Recoverable Cadmium	mg/kg dry wt	0.12	< 0.10	< 0.10	< 0.10	0.17
Total Recoverable Chromium	mg/kg dry wt	4	3	5	5	6
Total Recoverable Copper	mg/kg dry wt	7	6	< 2	< 2	12
Total Recoverable Lead	mg/kg dry wt	88	44	9.1	10.1	148
Total Recoverable Nickel	mg/kg dry wt	4	3	4	6	5
Total Recoverable Zinc	mg/kg dry wt	77	46	24	24	130

	Sample Name:	#2 0-150 08-Feb-2024	#2 150-300 08-Feb-2024	#2 400 08-Feb-2024	#2 500 08-Feb-2024	#3 0-150 08-Feb-2024
	Lab Number:	3464565.6	3464565.7	3464565.8	3464565.9	3464565.10
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	9	9	7	7	7
Total Recoverable Cadmium	mg/kg dry wt	0.22	0.19	0.11	< 0.10	0.16
Total Recoverable Chromium	mg/kg dry wt	7	7	5	6	9
Total Recoverable Copper	mg/kg dry wt	9	12	9	3	23
Total Recoverable Lead	mg/kg dry wt	250	400	530	51	79
Total Recoverable Nickel	mg/kg dry wt	7	7	5	6	10
Total Recoverable Zinc	mg/kg dry wt	170	162	100	33	156

	Sample Name:	#3 150-300 08-Feb-2024	#3 400 08-Feb-2024	#3 500 08-Feb-2024	#4 0-150 08-Feb-2024	#4 150-300 08-Feb-2024
	Lab Number:	3464565.11	3464565.12	3464565.13	3464565.14	3464565.15
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	8	8	7	7	9
Total Recoverable Cadmium	mg/kg dry wt	0.14	< 0.10	< 0.10	0.17	0.23
Total Recoverable Chromium	mg/kg dry wt	11	13	7	8	10
Total Recoverable Copper	mg/kg dry wt	21	13	7	10	18
Total Recoverable Lead	mg/kg dry wt	53	29	17.5	145	220
Total Recoverable Nickel	mg/kg dry wt	13	16	10	7	9
Total Recoverable Zinc	mg/kg dry wt	94	65	39	170	210

	Sample Name:	#4 400 08-Feb-2024	#4 500 08-Feb-2024	#5 0-150 08-Feb-2024	#5 150-300 08-Feb-2024	#5 400 08-Feb-2024
	Lab Number:	3464565.16	3464565.17	3464565.18	3464565.19	3464565.20
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	9	11	15	13	13
Total Recoverable Cadmium	mg/kg dry wt	0.27	0.64	0.67	0.73	0.45
Total Recoverable Chromium	mg/kg dry wt	9	11	20	14	11
Total Recoverable Copper	mg/kg dry wt	22	123	48	43	38
Total Recoverable Lead	mg/kg dry wt	780	220	620	650	320

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil						
	Sample Name:	#4 400 08-Feb-2024	#4 500 08-Feb-2024	#5 0-150 08-Feb-2024	#5 150-300 08-Feb-2024	#5 400 08-Feb-2024
	Lab Number:	3464565.16	3464565.17	3464565.18	3464565.19	3464565.20
Heavy Metals, Screen Level						
Total Recoverable Nickel	mg/kg dry wt	8	23	10	13	11
Total Recoverable Zinc	mg/kg dry wt	240	370	500	560	380

	Sample Name:	#5 500 08-Feb-2024	#5a 0-150 08-Feb-2024	#6 0-150 08-Feb-2024	#6 150-300 08-Feb-2024	#6 400 08-Feb-2024
	Lab Number:	3464565.21	3464565.22	3464565.23	3464565.24	3464565.25
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	13	14	10	10	10
Total Recoverable Cadmium	mg/kg dry wt	0.37	0.70	0.62	0.52	0.28
Total Recoverable Chromium	mg/kg dry wt	10	19	16	16	10
Total Recoverable Copper	mg/kg dry wt	23	49	50	32	20
Total Recoverable Lead	mg/kg dry wt	210	590	990	700	320
Total Recoverable Nickel	mg/kg dry wt	11	11	9	9	8
Total Recoverable Zinc	mg/kg dry wt	290	500	550	510	270

	Sample Name:	#6 500 08-Feb-2024	#7 0-150 08-Feb-2024	#7 150-300 08-Feb-2024	#7 400 08-Feb-2024	#7 500 08-Feb-2024
	Lab Number:	3464565.26	3464565.27	3464565.28	3464565.29	3464565.30
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	10	7	7	6	7
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.60	0.48	0.13	< 0.10
Total Recoverable Chromium	mg/kg dry wt	8	14	12	7	7
Total Recoverable Copper	mg/kg dry wt	5	48	28	12	5
Total Recoverable Lead	mg/kg dry wt	43	850	580	184	58
Total Recoverable Nickel	mg/kg dry wt	10	9	8	6	7
Total Recoverable Zinc	mg/kg dry wt	58	450	340	117	43

	Sample Name:	#8 0-150 08-Feb-2024	#8 150-300 08-Feb-2024	#8 400 08-Feb-2024	#8 500 08-Feb-2024	#9 0-150 08-Feb-2024
	Lab Number:	3464565.31	3464565.32	3464565.33	3464565.34	3464565.35
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	9	7	5	7	9
Total Recoverable Cadmium	mg/kg dry wt	0.41	0.34	0.12	< 0.10	0.61
Total Recoverable Chromium	mg/kg dry wt	9	7	5	6	14
Total Recoverable Copper	mg/kg dry wt	22	15	7	4	33
Total Recoverable Lead	mg/kg dry wt	560	390	150	49	600
Total Recoverable Nickel	mg/kg dry wt	9	7	5	7	13
Total Recoverable Zinc	mg/kg dry wt	380	280	108	53	440

	Sample Name:	#9 150-300 08-Feb-2024	#9 400 08-Feb-2024	#9 500 08-Feb-2024	#10 0-150 08-Feb-2024	#10 150-300 08-Feb-2024
	Lab Number:	3464565.36	3464565.37	3464565.38	3464565.39	3464565.40
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	5	6	7	9	11
Total Recoverable Cadmium	mg/kg dry wt	0.17	< 0.10	< 0.10	0.38	0.37
Total Recoverable Chromium	mg/kg dry wt	5	6	6	11	7
Total Recoverable Copper	mg/kg dry wt	16	7	3	16	15
Total Recoverable Lead	mg/kg dry wt	103	56	21	150	69
Total Recoverable Nickel	mg/kg dry wt	6	7	8	12	7
Total Recoverable Zinc	mg/kg dry wt	117	66	34	260	270

	Sample Name:	#10 400 08-Feb-2024	#10 500 08-Feb-2024	#10a 0-150 08-Feb-2024	#11 0-150 08-Feb-2024	#11 150-300 08-Feb-2024
	Lab Number:	3464565.41	3464565.42	3464565.43	3464565.44	3464565.45
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	11	11	8	7	6
Total Recoverable Cadmium	mg/kg dry wt	0.29	0.10	0.36	0.17	0.23
Total Recoverable Chromium	mg/kg dry wt	6	7	11	7	6
Total Recoverable Copper	mg/kg dry wt	11	6	14	8	12

Sample Type: Soil						
	Sample Name:	#10 400 08-Feb-2024	#10 500 08-Feb-2024	#10a 0-150 08-Feb-2024	#11 0-150 08-Feb-2024	#11 150-300 08-Feb-2024
	Lab Number:	3464565.41	3464565.42	3464565.43	3464565.44	3464565.45
Heavy Metals, Screen Level						
Total Recoverable Lead	mg/kg dry wt	50	24	129	90	140
Total Recoverable Nickel	mg/kg dry wt	7	7	13	7	7
Total Recoverable Zinc	mg/kg dry wt	240	92	230	129	196

	Sample Name:	#11 400 08-Feb-2024	#11 500 08-Feb-2024	#12 0-150 08-Feb-2024	#12 150-300 08-Feb-2024	#12 400 08-Feb-2024
	Lab Number:	3464565.46	3464565.47	3464565.48	3464565.49	3464565.50
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	4	9	8	8
Total Recoverable Cadmium	mg/kg dry wt	0.20	< 0.10	0.24	0.14	< 0.10
Total Recoverable Chromium	mg/kg dry wt	5	4	10	7	6
Total Recoverable Copper	mg/kg dry wt	11	3	18	13	6
Total Recoverable Lead	mg/kg dry wt	88	18.0	200	162	126
Total Recoverable Nickel	mg/kg dry wt	5	5	9	8	6
Total Recoverable Zinc	mg/kg dry wt	141	41	260	184	86

	Sample Name:	#12 500 08-Feb-2024	#13 0-150 08-Feb-2024	#13 150-300 08-Feb-2024	#13 400 08-Feb-2024	#13 500 08-Feb-2024
	Lab Number:	3464565.51	3464565.52	3464565.53	3464565.54	3464565.55
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	8	8	9	9	9
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.20	0.20	0.10	0.15
Total Recoverable Chromium	mg/kg dry wt	6	7	7	7	6
Total Recoverable Copper	mg/kg dry wt	5	7	6	5	5
Total Recoverable Lead	mg/kg dry wt	90	330	340	148	189
Total Recoverable Nickel	mg/kg dry wt	7	8	8	8	8
Total Recoverable Zinc	mg/kg dry wt	78	290	320	171	190

	Sample Name:	#14 0-150 08-Feb-2024	#14 150-300 08-Feb-2024	#14 400 08-Feb-2024	#15 0-150 08-Feb-2024	#15 150-300 08-Feb-2024
	Lab Number:	3464565.56	3464565.57	3464565.58	3464565.59	3464565.60
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	13	13	12	9	9
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	0.11	< 0.10
Total Recoverable Chromium	mg/kg dry wt	11	8	7	7	6
Total Recoverable Copper	mg/kg dry wt	12	4	4	6	3
Total Recoverable Lead	mg/kg dry wt	78	16.4	12.9	110	110
Total Recoverable Nickel	mg/kg dry wt	11	9	9	8	7
Total Recoverable Zinc	mg/kg dry wt	120	35	32	106	39

	Sample Name:	#15 400 08-Feb-2024	#15 500 08-Feb-2024	#15a 0-150 08-Feb-2024	#16 0-150 08-Feb-2024	#16 150-300 08-Feb-2024
	Lab Number:	3464565.61	3464565.62	3464565.63	3464565.64	3464565.65
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	8	9	8	7	8
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.14	0.13	< 0.10
Total Recoverable Chromium	mg/kg dry wt	6	6	7	8	7
Total Recoverable Copper	mg/kg dry wt	3	2	7	7	3
Total Recoverable Lead	mg/kg dry wt	17.9	20	114	200	32
Total Recoverable Nickel	mg/kg dry wt	7	8	8	9	9
Total Recoverable Zinc	mg/kg dry wt	34	32	138	120	36

	Sample Name:	#16 400 08-Feb-2024	#16 500 08-Feb-2024	#17 0-150 08-Feb-2024	#17 150-300 08-Feb-2024	#17 400 08-Feb-2024
	Lab Number:	3464565.66	3464565.67	3464565.68	3464565.69	3464565.70
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	7	7	8	7	8
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.19	0.20	0.15
Total Recoverable Chromium	mg/kg dry wt	6	5	10	8	8

Sample Type: Soil						
	Sample Name:	#16 400 08-Feb-2024	#16 500 08-Feb-2024	#17 0-150 08-Feb-2024	#17 150-300 08-Feb-2024	#17 400 08-Feb-2024
	Lab Number:	3464565.66	3464565.67	3464565.68	3464565.69	3464565.70
Heavy Metals, Screen Level						
Total Recoverable Copper	mg/kg dry wt	3	3	10	10	8
Total Recoverable Lead	mg/kg dry wt	31	17.1	360	170	180
Total Recoverable Nickel	mg/kg dry wt	8	7	9	10	10
Total Recoverable Zinc	mg/kg dry wt	36	29	184	124	102

	Sample Name:	#17 500 08-Feb-2024	#18 0-150 08-Feb-2024	#18 150-300 08-Feb-2024	#18 400 08-Feb-2024	#18 500 08-Feb-2024
	Lab Number:	3464565.71	3464565.72	3464565.73	3464565.74	3464565.75
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	9	6	7	8	8
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	7	6	7	7	7
Total Recoverable Copper	mg/kg dry wt	4	5	3	2	2
Total Recoverable Lead	mg/kg dry wt	35	42	18.9	7.3	8.3
Total Recoverable Nickel	mg/kg dry wt	10	7	8	8	9
Total Recoverable Zinc	mg/kg dry wt	40	54	35	23	24

	Sample Name:	#19 0-150 08-Feb-2024	#19 150-300 08-Feb-2024	#19 400 08-Feb-2024	#19 500 08-Feb-2024	#20 0-150 08-Feb-2024
	Lab Number:	3464565.76	3464565.77	3464565.78	3464565.79	3464565.80
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	6	3	6	7	8
Total Recoverable Cadmium	mg/kg dry wt	0.12	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	5	3	5	5	8
Total Recoverable Copper	mg/kg dry wt	5	2	< 2	< 2	4
Total Recoverable Lead	mg/kg dry wt	58	14.3	7.9	7.5	79
Total Recoverable Nickel	mg/kg dry wt	5	3	5	6	7
Total Recoverable Zinc	mg/kg dry wt	53	25	21	22	84

	Sample Name:	#20 150-300 08-Feb-2024	#20 400 08-Feb-2024	#20 500 08-Feb-2024	#20a 0-150 08-Feb-2024	#21 0-150 08-Feb-2024
	Lab Number:	3464565.81	3464565.82	3464565.83	3464565.84	3464565.85
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	6	7	7	8	8
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	0.13
Total Recoverable Chromium	mg/kg dry wt	5	6	5	7	7
Total Recoverable Copper	mg/kg dry wt	< 2	< 2	< 2	4	6
Total Recoverable Lead	mg/kg dry wt	12.2	10.1	11.4	50	110
Total Recoverable Nickel	mg/kg dry wt	6	6	7	8	7
Total Recoverable Zinc	mg/kg dry wt	29	28	28	58	88

	Sample Name:	#21 150-300 08-Feb-2024	#21 400 08-Feb-2024	#21 500 08-Feb-2024	#22 0-150 08-Feb-2024	#22 150-300 08-Feb-2024
	Lab Number:	3464565.86	3464565.87	3464565.88	3464565.89	3464565.90
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	8	8	11	7	7
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	6	6	6	6	7
Total Recoverable Copper	mg/kg dry wt	2	< 2	< 2	4	3
Total Recoverable Lead	mg/kg dry wt	15.0	7.0	8.6	37	24
Total Recoverable Nickel	mg/kg dry wt	7	8	7	6	7
Total Recoverable Zinc	mg/kg dry wt	28	19	21	50	37

	Sample Name:	#22 400 08-Feb-2024	#23 0-150 08-Feb-2024	#23 150-300 08-Feb-2024	#23 400 08-Feb-2024	#23 500 08-Feb-2024
	Lab Number:	3464565.91	3464565.92	3464565.93	3464565.94	3464565.95
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	7	8	9	9	10
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Sample Type: Soil						
Sample Name:		#22 400 08-Feb-2024	#23 0-150 08-Feb-2024	#23 150-300 08-Feb-2024	#23 400 08-Feb-2024	#23 500 08-Feb-2024
Lab Number:		3464565.91	3464565.92	3464565.93	3464565.94	3464565.95
Heavy Metals, Screen Level						
Total Recoverable Chromium	mg/kg dry wt	7	6	6	5	6
Total Recoverable Copper	mg/kg dry wt	3	4	2	< 2	2
Total Recoverable Lead	mg/kg dry wt	16.6	27	9.1	6.2	8.8
Total Recoverable Nickel	mg/kg dry wt	8	7	8	8	8
Total Recoverable Zinc	mg/kg dry wt	32	32	21	20	24

Sample Name:		TCLP Stanley 08-Feb-2024
Lab Number:		3464565.96
Individual Tests		
TCLP Weight of Sample Taken	g	100
TCLP Initial Sample pH	pH Units	7.4
TCLP Acid Adjusted Sample pH	pH Units	1.5
TCLP Extractant Type*		NaOH/Acetic acid at pH 4.93 +/- 0.05
TCLP Extraction Fluid pH	pH Units	4.9
TCLP Post Extraction Sample pH	pH Units	5.0

Sample Type: Aqueous		
Sample Name:		TCLP Stanley [TCLP extract]
Lab Number:		3464565.97
Heavy metals, totals, screen As,Cd,Cr,Cu,Ni,Pb,Zn, for TCLP samples		
Total Arsenic	g/m³	< 0.021
Total Cadmium	g/m³	< 0.0011
Total Chromium	g/m³	< 0.011
Total Copper	g/m³	< 0.011
Total Lead	g/m³	0.0092
Total Nickel	g/m³	< 0.011
Total Zinc	g/m³	0.183

Analyst's Comments

Amended Report: This certificate of analysis replaces report '3464565-SPv2' issued on 21-Feb-2024 at 11:09 am.
Reason for amendment: Further 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%.	-	1-95
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-95
TCLP Profile*	Extraction at 30 +/- 2 rpm for 18 +/- 2 hours, (Ratio 1g sample : 20g extraction fluid). US EPA 1311.	-	96
TCLP Profile			
TCLP Weight of Sample Taken	Gravimetric. US EPA 1311.	0.1 g	96
TCLP Initial Sample pH	pH meter. US EPA 1311.	0.1 pH Units	96
TCLP Acid Adjusted Sample pH	pH meter. US EPA 1311.	0.1 pH Units	96
TCLP Extractant Type*	US EPA 1311.	-	96
TCLP Extraction Fluid pH	pH meter. US EPA 1311.	0.1 pH Units	96
TCLP Post Extraction Sample pH	pH meter. US EPA 1311.	0.1 pH Units	96

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.	-	97
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	97

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

Testing was completed between 13-Feb-2024 and 26-Feb-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.

Kim Harrison MSc
Client Services Manager - Environmental

APPENDIX E- REMEDIAL OPTIONS ASSESSMENT

REMEDIAL ACTION PLAN OPTIONS ASSESSMENT

BACKGROUND

TW Group engaged EAM NZ LTD to undertake a Detailed Site Investigation (DSI) at the site to assess potential risks to human health and the environment from former site activities. Based on information reviewed, EAM considered that the site had likely been subject to Hazardous Activities and Industries List (HAIL) activities, in the form of lead -based paint, (Section I).

Lead concentrations exceed the soil contamination standards for residential (10% produce) SCS in many areas of the site.

This Remediation Options Assessment (ROA) has been developed to support the proposed development. The purpose of the POA is to document the procedures that could take place to remedy the site to within SCS, to minimise potential risks to human health and the environment, and to prepare management procedures and options.

OBJECTIVES

This report should be used as a guideline for site remediation practices. All site work should be conducted in accordance with the requirements of the Health and Safety at Work (Hazardous Substances) Regulations Act, 2017.

In accordance with the requirements of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect human Health) Regulations 2011, the person overseeing site remediation should be a Suitably Qualified and Experienced Practitioner (SQEP).

BACKGROUND

EAM completed a DSI at the site in February 2024. The site is a residential section with a single-story dwelling and single garage. The site is large and has grassed spaces and surrounding gardens. Aerial imagery indicates that from 1942, the site has been a residential section with a dwelling, garage, and small sheds. By 1977, the site was redeveloped and split, with a new dwelling and garage erected within the smaller site. The site has remained in this configuration until the present day.

Comprehensive soil analysis was conducted as part of the DSI, with samples collected from twenty-three locations across the site, up to 500mm depth. Sample locations were systematically spread, with much of the site reporting exceedance of NES SCS for residential (10% produce) land use. Most of the site soil samples were found to exceed Gisborne background values, when compared to a control sample.

REMEDIATION OPTIONS ASSESSMENT

This section presents an initial range of generic remedial options and recommendations.

EXCAVATION TO LANDFILL

Disposal of contaminated soils to an appropriate facility is considered an appropriate option providing soil results are within the landfill waste Acceptance Criteria. However, based on significant costs for excavation, the significant volume of contaminated soil, transport and haulage costs, and disposal, this is an expensive exercise. Successful removal of all contaminated material would result in a clean, uncontaminated site, however landfilling results in consuming limited landfill space, and environmental impacts from transporting to the disposal facility. There are presently no landfilling facilities within the Gisborne region taking contaminated soil, and the closest available location is Wairoa Landfill. Further, as the site development plan is to use piled footings, there is no need to remove soil from within the site.

SOIL MIXING

As a rule of thumb, soil mixing is only considered feasible providing soil concentrations are within 2-3 times the acceptable SCS set out by the NES. Soil mixing is an effective way of reducing soil concentrations, providing the soil, and mixing medium do not include clay materials which do not mix.

Soils at the site comprise topsoil to a depth of approximately 400mm, overlying silty sand.

Soil mixing involves mixing contaminated soils with cleaner, or less concentrated soils to create a dilution and spreading of concentration effect. It is considered that soils in the eastern third of the site would meet this criterion as an appropriate mixing medium.

ENCAPSULATION OF SOILS BENEATH PERMANENT STRUCTURES

Encapsulation of contaminated soils is a common method for preventing contact with contaminants. Encapsulation describes capping of contaminated soils with a hard and permanent structure, such as concrete or asphalt, or a soft cover of clean soil and hardfill. It can also include covering of contaminated soils with a building structure, in this case beneath building footprints.

As construction plans for site buildings are piled footings, geotechnical issues are unlikely to pose problems with limited bearing capacity. Providing soil concentrations of the contaminated soils are within the SCS for Commercial/Industrial land use, risk to site development workers, and persons involved with ongoing site and underground maintenance, would be low risk.

Contaminated soil would remain in place, wherever appropriate permanent coverings, such as buildings or driveways are present.

Encapsulation of contaminated soil will result in a long-term site management plan being necessary for the site, imposing ongoing management obligations and constraints on future site uses. This protects future workers against any future soil disturbance required within the site.

REMEDIATION ACTION PLAN

Following the completion of the foundation design for the site, a site-specific Remedial Action Plan will be developed and submitted to GDC, detailing the confirmed remediation process that is proposed.