Remedial Action Plan

Faringdon Oval

East Maddisons and Dunns Crossing Road

Rolleston

Submitted to:

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1 Introduction

ENGEO Ltd was requested by Hughes Developments Ltd to undertake a remedial action plan of the property at Faringdon Oval, East Maddisons and Dunns Crossing Road, Rolleston (herein referred to as 'the site'). This RAP was produced in order to manage the excavation, handling and disposal of potentially contaminated soils during the redevelopment of the site. At the time of writing, ENGEO has not been provided with information regarding potential resource consents for the disturbance and removal of soil from the site; however, this RAP can be used for resource consent applications if required.

ENGEO understands that the following addresses are to be redeveloped as one block of land and that environmental site works are undertaken as one redevelopment area / site. The below individual sites are included into the one block / site for redevelopment.

- 3/144 Dunns Crossing Road;
- 130 Dunns Crossing Road;
- 108 Dunns Crossing Road;
- 92 Dunns Crossing Road; and
- 597 East Maddisons Road.

This RAP has been produced in general accordance with the Ministry for the Environment (MfE) guidance document *Contaminated Land Management Guidelines (CLMG) No.1: Reporting on Contaminated Sites in New Zealand* and should be read in conjunction with previous reports completed for the site.

1.1 Background

A detailed site investigation (DSI) was undertaken at the site by ENGEO to identify the potential risks to the on-site development workers, disposal options of soil to be excavated during the redevelopment works and for the suitability of the site for the proposed commercial land use.

The majority of the site was found to be suitable for the proposed end use. Isolated areas were identified which had the following Hazardous Activities and Industries List (HAIL) activities historically been associated with them:

- A8: Livestock dip or spray race operations;
- A10: Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds;
- A17: Storage tanks or drums for fuel, chemicals or liquid waste;
- G5: Waste disposal to land; and
- 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 (lead paint).

ENGEO's DSI reports highlighted concentrations of contaminants of concern above the applicable NES residential land use criteria in a number of small isolated locations; therefore remediation of these areas are required prior to redevelopment of the site.

The areas that require remedial work are outlined in the table below.

Table 1: Areas of Remedial Work Required

Address	Area	Work Required
3/144 Dunns Crossing Road	-	Heavy metals reported above regional background levels. Site management during development works required.
130 Dunns Crossing Road	-	No areas of concern identified. No remedial works required.
108 Dunns Crossing Road	-	No areas of concern identified. No remedial works required.
92 Dunns Crossing Road	Area 1 Former sheep dip area	Heavy metals reported above NES residential land use criteria. Removal and disposal off-site required.
92 Dunns Crossing Road	Area 2 Waste pit	Asbestos reported above NES residential land use criteria. Removal and disposal off-site required.
92 Dunns Crossing Road	Area 3 Above ground storage tank	TPH reported above NES residential land use criteria. Removal and disposal off-site required.
92 Dunns Crossing Road	Area 4 Burn drum	Heavy metals reported above NES residential land use criteria. Removal and disposal off-site required.
92 Dunns Crossing Road	Phone / radio tower	Area unable to be investigated due to *in situ* radio tower. This area is not planned to be disturbed during redevelopment works, therefore remedial works have not been outlined in this RAP.
597 East Maddisons Road	Area 5 Burn pile	Asbestos and heavy metals reported above NES residential land use criteria. Removal and disposal off-site required.
597 East Maddisons Road	Area 6 Lead based paints on southern shed	Lead reported above NES residential land use criteria. Removal and disposal off-site required.

1.2 Objectives and Scope of Works

The remediation of a contaminated site is a Controlled Activity under the Resource Management Regulations (NES, 2012) where the Permitted Activity criteria is not met. The objective of this document is to present supporting information for resource consent applications whilst also providing procedures for the excavation, handling and disposal of impacted soil.

The scope of this report is to provide procedures for managing the following:

- Earthworks and exposure to potentially impacted soil;
- Stockpiling;
- Soil disposal;
- Stormwater and sediment control; and
- Health and safety procedures during the works, including the correct personal protective equipment (PPE) and decontamination procedures.

1.3 Requirement for Site Management

ENGEO understands that, due to the location of the identified impacted soils, disturbance and excavation of this material is required as part of the redevelopment works. As contaminants of concern in the site soils were identified, management of the soil removal process is required during the redevelopment works.

This RAP has been completed in order to provide suitable mitigation controls related to the identified contaminants so that Hughes Developments Limited, and its appointed contractors, can minimise the potential for significant adverse environmental or human health effects to arise from the works. This RAP, and other contractor documentation, will assist in Hughes Developments Limited in meeting its duties under the Health and Safety at Work Act 2015 but should be supplemented by site specific safety plans.

2 Site Description and Setting

The approximately 51.22 ha, is located between East Maddisons Road and Dunns Crossing Road in the southwest of Rolleston. During the time of the investigation, the sites were being used as mixed agricultural residential use. The use of the site is to be changed from rural residential to residential 10% produce.

A summary of the site information is provided in Table 2.

Table 2: Site Information

Item	Description
Location	3/144 Dunns Crossing Road 130 Dunns Crossing Road 108 Dunns Crossing Road 92 Dunns Crossing Road 597 East Maddisons Road
Legal Description	LOT 3 DP 70352 BLK III LEESTON SD-INT IN R/W EASEMENT DP 72978 OVER LOT 4 DP 7 0352 LOT 1 DP 70352 BLK III LEESTON SD LOT 2 DP 61278 BLK III LEESTON SD LOT 1 DP 61278 BLK III LEESTON SD LOT 3 DP 57004 BLK III LEESTON SD LOT 1 DP 57004 BLK III LEESTON SD
Current Land Use	Agricultural and residential
Proposed Land Use	Residential 10%
Site Area	Approximately 51.22 ha
Territorial Authority	Selwyn District Council

3 Conceptual Site Model

A conceptual site model consists of four primary components. For contaminants to present a risk to human health or an environmental receptor, all four components are required to be present and connected. The four components of a conceptual site model are:

- Source of contamination;
- Pathway(s) in which contamination could potentially mobilise along (e.g. vapour or groundwater migration);
- Sensitive receptor(s) which may be exposed to the contaminants; and
- An exposure route, where the sensitive receptors and contaminants come into contact (e.g. ingestion, inhalation, dermal contact).

The potential source, pathway, receptor linkages at this subject site are provided in Table 3.

Table 3: Conceptual Site Model

Potential Sources	Contaminants of Concern	Exposure Route and Pathways	Receptors	Acceptance Risk?
Area 1 92 Dunns Crossing Road Former sheep dip	Heavy metals, ONPs and OCPs	Dermal contact with the impacted soil, incidental ingestion and inhalation of dust during earthworks	On-site redevelopment workers Future subsurface maintenance workers Future land users – residents	**No.** One exceedance (HA08) was reported above the applicable NES residential land use guidelines
Area 2 92 Dunns Crossing Road Area of land disturbance (potential waste pit or offal pit)	Heavy metal, PAHs and asbestos containing material	Dermal contact with the impacted soil, incidental ingestion and inhalation of dust during earthworks	On-site redevelopment workers Future subsurface maintenance workers Future land users – residents	**No.** Asbestos samples returned results above the BRANZ guidelines
Area 3 92 Dunns Crossing Road Above ground storage tank	TPH and heavy metals	Dermal contact with the impacted soil, incidental ingestion and inhalation of dust during earthworks	On-site redevelopment workers Future subsurface maintenance workers Future land users – residents	**No.** An exceedance of TPH was reported above the applicable NES residential land use guidelines
Area 4 92 Dunns Crossing Road Burn drum	Heavy metals	Dermal contact with the impacted soil, incidental ingestion and inhalation of dust during earthworks	On-site redevelopment workers Future subsurface maintenance workers Future land users – residents	**No.** One exceedance (SS02) was reported above the applicable NES residential land use guidelines
Area 5 597 East Maddisons Road Burn pile	Heavy metals PAHs Asbestos	Dermal contact with the impacted soil, incidental ingestion and inhalation of dust during earthworks	On-site redevelopment workers Future subsurface maintenance workers Future site users	**No.** Asbestos was detected above BRANZ guidelines and arsenic and lead are reported above the NES residential land use criteria

Potential Sources	Contaminants of Concern	Exposure Route and Pathways	Receptors	Acceptance Risk?
Area 6 597 East Maddisons Road Lead based paint on southern shed	Lead	Dermal contact with the impacted soil, incidental ingestion and inhalation of dust during earthworks	On-site redevelopment workers Future subsurface maintenance workers Future site users	**No.** A sample collected from the soils around the shed are reported above the NES residential land use criteria

4 Regulatory Framework and Assessment Criteria

The regulatory frameworks and rules relating to the management and control of contaminated sites in the Canterbury Region are specified in two documents; the NES (2012) and the Canterbury Regional Council Regional Plan. A summary of each and its implications for the site are provided in Sections 5.1 and 5.2.

4.1 NES

The Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES) came into effect on 1 January 2012.

The NES introduced 12 soil contaminant standards (SCSs) for priority contaminants for the protection of human health at a variety of land use scenarios. The NES requires that the Contaminated Land Management Guideline No.2 – Hierarchy and Application in New Zealand of Environmental Guideline Values be used where an NES SCS is not available. The NES does not consider environmental receptors; accordingly, the application of guidelines relevant to environmental receptors shall be implemented according to the MfE Contaminated Land Management Guideline No.2 and any relevant rules in Regional Plans.

According to the NES regulations (8.3), disturbing soil of the piece of land is a permitted activity while certain requirements are met. Due to the concentrations of contaminants observed and the land disturbance and removal volumes, the site is considered to be a permitted activity under NES. However, as a number of activities on the HAIL have been identified and the site is to be subdivided it is likely that an NES consent will still be required.

4.2 Proposed Earthworks Scale

A summary of the soil disturbance volumes anticipated for the earthworks is provided in Table 4. The total estimated volume of soils to be excavated from the remedial area is likely to be 150 m^3. This initial volume is below NES soil disturbance permitted volume.

Please note that the below soil volumes are estimates only and on-site XRF screening is to be undertaken prior to remedial works to better determine the extent of the contamination.

Table 4: Comparison of Proposed Earthworks Volumes to NES

NES Regulation			Site Area	Permitted Site Disturbance / Removal Volumes	Proposed Earthwork Volumes
Clause	Description	Permitted Volume			
92 Dunns Crossing Road – Area 1 Sheep Dip					
8.3c	Soil disturbance	25 m^3 per 500 m^2	10,120 m^2	506 m^3	5 m^3
8.3d	Soil removal	5 m^3 per 500 m^2 (per year)	10,120 m^2	101.2 m^3	5 m^3
92 Dunns Crossing Road – Area 2 Waste Pit					
8.3c	Soil disturbance	25 m^3 per 500 m^2	10,120 m^2	506 m^3	45 m^3
8.3d	Soil removal	5 m^3 per 500 m^2 (per year)	10,120 m^2	101.2 m^3	45 m^3
92 Dunns Crossing Road – Area 3 AGST					
8.3c	Soil disturbance	25 m^3 per 500 m^2	10,120 m^2	506 m^3	5 m^3
8.3d	Soil removal	5 m^3 per 500 m^2 (per year)	10,120 m^2	101.2 m^3	5 m^3
92 Dunns Crossing Road – Area 4 Burn Drum					
8.3c	Soil disturbance	25 m^3 per 500 m^2	10,120 m^2	506 m^3	5 m^3
8.3d	Soil removal	5 m^3 per 500 m^2 (per year)	10,120 m^2	101.2 m^3	5 m^3
597 East Maddisons Road – Area 5 Burn Pile					
8.3c	Soil disturbance	25 m^3 per 500 m^2	20,380 m^2	1019 m^3	30 m^3
8.3d	Soil removal	5 m^3 per 500 m^2 (per year)	20,380 m^2	203.8 m^3	30 m^3
597 East Maddisons Road – Area 6 Lead					
8.3c	Soil disturbance	25 m^3 per 500 m^2	20,380 m^2	1019 m^3	60 m^3

NES Regulation			Site Area	Permitted Site Disturbance / Removal Volumes	Proposed Earthwork Volumes
Clause	Description	Permitted Volume			
8.3d	Soil removal	5 m^3 per 500 m^2 (per year)	20,380 m^2	203.8 m^3	60 m^3

4.3 Environmental Canterbury Regional Plan

Under the Canterbury Land and Water Regional Plan (LWRP) Rule 5.187, the passive discharge of contaminants from a contaminated land onto or into land in circumstances where those contaminants may enter water is a permitted activity provided the following conditions are met:

1. Site investigation report in accordance with Rule 5.185.
2. The discharge does not result in the concentration of contaminants:
    a. In groundwater at the property boundary, or at any existing groundwater bore (excluding any monitoring bore located on the property), breaching the limits for groundwater set out in Schedule 8 (one half of MAVs).
    b. At any point where groundwater exits to surface water breaching the water quality standards in Schedule 5 for 90% of species.

This is considered to be a permitted activity under the LWRP due to meeting the above requirements.

5 Assessment of Risks

A Tier 1 risk assessment has been conducted in general accordance with the MfE CLMG No.2 to establish likely effects from the impacted soil on human health and environmental receptors. A summary of source, pathways, and receptors considered in the risk assessment is discussed below.

5.1 Identified Sources of Contamination

Identified sources of contamination at the site include heavy metals associated with the former land uses. The areas of investigation, sampling rationale, proposed land use and Tier 1 exceedances are summarised in Table 5.

Table 5: Tier 1 Exceedances

Area of Investigation and Approximate Size	Sample Name(s)	Proposed Land Use	Tier 1 Exceedances
Area 1 Sheep dip area 5 m^3	HA08	Residential	Lead

Area of Investigation and Approximate Size	Sample Name(s)	Proposed Land Use	Tier 1 Exceedances
Area 2 Waste pit 40 m^3	WP03		Asbestos
Area 3 AGST 5 m^3	SS01		TPH
Area 4 Burn Drum 5 m^3	SS02		Arsenic, cadmium and chromium
Area 5 Waste pile 30 m^3	S7, S8, S9 and S10 AS1, AS5 and AS7		Arsenic and / or heavy metals
Area 6 Lead 60 m^3	S12		Lead

5.2 Volume of Contaminated Material

From the DSI soil sampling, we have provided an estimate of the volume of soil that is considered to contain concentrations above the SCS for the protection of human health for residential land end use. A 25% margin of error has also been provided in the estimation to allow for unforeseen variations (isolated hotspots in the contaminant distribution), this is discussed further in Section 6. It should be noted that the numbers quoted are all approximate volumes only and volumes may alter during excavations at the site.

Table 6: Remedial Volume Estimations

Area of Investigation and Size	SCS Exceedances	Estimated Area of Impact, m^2	Estimated Depth of Impact, m	Estimated Soil Volume Exceeding SCS, m^3	Estimated Soil Volume plus 25% Margin, m^3	Disposal Location
Area 1	Lead	3 x 3 m	0.5	5 m^3	6.25 m^3	Kate Valley
Area 2	Asbestos	10 x 3	1.5	45 m^3	56.25 m^3	Kate Valley under asbestos controls

Area of Investigation and Size	SCS Exceedances	Estimated Area of Impact, m^2	Estimated Depth of Impact, m	Estimated Soil Volume Exceeding SCS, m^3	Estimated Soil Volume plus 25% Margin, m^3	Disposal Location
Area 3	TPH	3 x 3 m	0.5	5 m^3	6.25 m^3	Kate Valley
Area 4	Arsenic, cadmium and chromium	3 x 3 m	0.5	5 m^3	6.25 m^3	Kate Valley under asbestos controls
Area 5	Arsenic and / or heavy metals	10 x 10	0.3	30 m^3	37.5 m^3	Kate Valley
Area 6	Lead	Unknown Estimated 180 m^2	0.3	60 m^3	85.6 m^3	Kate Valley

5.3 Exposure Pathways

According to the MfE *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health* (MfE 2011), the controlling pathway for heavy metals is produce and / or soil ingestion.

Therefore, the primary exposure pathways considered are:

- Incidental ingestion during on-site subsurface excavation or maintenance works, or long term site users, following dermal contact with the site soils; and
- Ingestion of impacted soil and consumption of home-grown produce.

5.4 Receptors

The receptors considered in the risk assessment were:

- Future site users (residents);
- Future commercial / industrial site users; and
- On-site subsurface excavation or maintenance workers.

6 Preferred Remedial Option

ENGEO understands that the preferred remedial option at the site is:

- Excavation, transportation and disposal of impacted soil above the MfE SCSs for residential 10% produce land use criteria to a suitable landfill.

The option is considered relatively low cost when compared to other remedial options that use physical or chemical treatment which often require pilot studies and require specialised equipment and chemical supplies. Off-site disposal is likely to result in the least amount of foreseeable land use restrictions and controls post remediation.

Remediation could involve the use of a portable X-ray Fluorescence Spectrometer (XRF) to provide on-site semi-quantitative readings for heavy metals during the remedial work. This may reduce the volume of soil to be remediated if heavy metal concentrations meet the remedial goals at shallower depths.

The soil remaining after remediation would require validation to confirm its suitability for residential use. This would be achieved by the collection of validation samples and analysis of those samples by an accredited laboratory (R J Hill Laboratories and Terra Scientific).

7 Remediation Action Plan

7.1 Site Establishment

Prior to the remedial works commencing at the site, the remediation supervisor will outline all relevant Health and Safety requirements to personnel working on-site during the remediation works.

Such requirements should be documented within a detailed Health and Safety Plan (HASP). In general the following procedures will be adhered to, to ensure that the health and safety, and environmental measures are achieved:

- Security fencing will be placed around the excavation (remedial zone) and will be maintained throughout the remedial works to prevent unauthorised personnel from entering the earth working area;
- Signage will be erected outlining health and safety information; and
- The identification and marking out of the proposed remediation areas should be completed by the remediation supervisor prior to commencement of the remediation program.

7.2 Site Supervision

To provide control and validation of the proposed remedial works it is recommended that a designated, suitably trained site supervisor is present to oversee the works. The site supervisor would address field changes as necessary should unanticipated conditions arise and be present to use the XRF and delineate the areas of impact therefore possibly reducing the volume of soil to be removed.

7.3 Excavation Works

7.3.1 Methodology

It can be a requirement for excavated soil from different parts of the site (animal race, persistent pesticide bulk storage) to be blended prior to disposal. The purpose is to achieve homogenisation of the soil in order to reduce the highest concentrations of heavy metals. Additionally, the material from the identified areas can be disposed of individually.

Validation of the remaining soil will be required as specified in Section 8.

Lead Areas (Area 1 and 6)

When the material has been removed from the identified area, it is recommended that an XRF is used to screen the soil at the sides and base of the excavation so that all impacted material can be removed. Additional material will be removed until XRF estimates of lead concentrations are below a set of pre-selected conservative screening criteria to ensure that remaining soil is suitable for residential land use.

Waste Pit, Burn Pile and Burn Drum (Area 2, 4 and 5)

When the material has been removed from the identified area, it is recommended that an XRF is used to screen the soil at the sides and base of the excavation so that all impacted material can be removed. Additional material will be removed until XRF estimates of heavy metal concentrations are below a set of pre-selected conservative screening criteria to ensure that remaining soil is suitable for residential land use. Where applicable, asbestos soil samples will be collected from Area 2 and 5 after remedial works have been completed.

AGST (Area 4)

When the material has been removed from the identified area, it is recommended that an XRF and PID is used to screen the soil at the sides and base of the excavation so that impacted material can be removed.

Additional material will be removed until XRF and PID estimates of heavy metal concentrations are below a set of pre-selected conservative screening criteria to ensure that remaining soil is suitable for residential land use.

7.3.2 Dust

In addition to the standard dust control practices implemented by the contractor to conform to relevant regulations, the contractor shall:

- Limit vehicle / machinery access onto the excavation areas;
- Use a water truck or portable water sprays to dampen surface soil if the material is dry and it is windy;
- If dust migration from stockpiles cannot be controlled through wetting during the workday (e.g. during times of high wind), the stockpiles shall be covered, for example, with plastic;
- Use wind screens or avoid work during windy conditions; and
- Ensure the application of water does not induce soil erosion.

When utilising water to control dust, the appointed contractor shall ensure that the volume of water used for dust suppression does not cause surface ponding or runoff, that could discharge into natural bodies or stormwater drains.

7.3.3 Machinery

It is important not to track potentially impacted soils around the site and off-site. Any machinery used on-site shall be cleaned of loose soil prior to leaving site. Loose soil can be removed by washing with a high-pressure washer unless asbestos is considered the contaminant of concern.

Machinery cleaning shall be conducted in a dedicated 'wash down' area adjacent to the site boundary or other designated 'clean area' (e.g. base course area or imported rock / soil) so once loose soil has been removed, the cleaned item can be moved to the clean area. Any wastewater generated should not be discharged off-site and should be allowed to drain back into the site.

7.3.4 Odour

In the unlikely event that excavated material is odorous, odour control measures shall be put in place. This would include covering the material with cleanfill, a polythene cover or instituting a deodoriser system.

7.3.5 Stockpiling

Material on-site should not be stockpiled unless absolutely necessary. If stockpiling is required, the stockpile should be covered with HDPE in wet and windy conditions as a temporary measure and removed as soon as possible.

Stockpiles shall be located on an impermeable surface or over-excavated when moved, and be in an area protected by erosion and sediment controls.

7.3.6 Soil Disposal

All soil should be disposed of at a disposal location suitable for accepting the identified material – Kate Valley Landfill. Soils must not be disposed of to a cleanfill dump unless a suitably qualified person confirms it is suitable to do so. A copy of all landfill waste disposal dockets and receipts shall be submitted to Selwyn District Council within the Site Validation Report at the conclusion of the remedial earthworks.

7.3.7 Imported Fill

If required, all fill imported to the site for backfilling the excavated voids will meet the description outlined in the publication Waste Management Institute of New Zealand Technical Guidelines for Disposal to Land (August 2018) definition of cleanfill which states:

"Virgin excavated natural materials (VENM) such as clay, soil and rock that are free of:

- Combustible, putrescible, degradable or leachable components;
- Hazardous substances or material (such as municipal solid waste) likely to create leachate by means of biological breakdown;
- Products or materials derived from hazardous waste treatment, stabilisation or disposal practices;
- Materials such as medical and veterinary waste, asbestos or radioactive substances that may present a risk to human health if excavated;
- Contaminated soil and other contaminated materials; and
- Liquid waste."

All material imported to site as cleanfill should have a quarry certificate or analysis results and a statement from a suitably qualified and experienced practitioner that the material is free of contaminants above background concentrations. Evidence should be provided in the soil validation report.

7.4 Stormwater and Sediment Control

To ensure potential environmental discharges are minimised during the remedial works the following shall be undertaken. These measures shall remain in place until the area has been reinstated:

- If the remediation area is adjacent to a property boundary, surface water or in an identified sensitive area, silt socks should be established during periods of heavy rainfall along the proposed excavation boundaries to restrict sediment and stormwater flow away from the remediation zone;
- Any wash water or stormwater from the truck loading areas will be directed back into the excavation to ensure that contaminated stormwater and wash water is captured by the excavation; and
- Inspect above measures after every period of rainfall for erosion or breach. Any repairs required will be carried out immediately.

7.5 Personal Protective Equipment (PPE)

The contaminants which have been identified at the site are known to be hazardous to health. It is therefore important that exposure to potential hazards be minimised to the maximum practicable extent. Therefore, the wearing of the following additional PPE will be mandatory for all personnel who are physically coming into contact with the contaminated soils:

- Disposable coveralls;
- Impermeable gloves, for example nitrile;
- Safety glasses with side shields; and
- Additional requirements such as dust masks and / or half mask respirators with organic filters may be required depending on the scale and location of the works. The additional PPE requirements shall be documented in the SHE plan.

The above PPE should be utilised in addition to PPE requirements to meet legislative requirements for undertaking the relevant activity under normal environmental conditions, i.e. non contaminated sites.

7.6 Decontamination

Decontamination of personnel and portable equipment must be carried out to reduce health, safety, and environmental risks and limit the migration of contaminants (from waste material, soil, equipment and PPE) around, and outside, the site. All personnel and equipment involved in controlled activities must therefore undertake decontamination procedures before leaving the site.

The following steps must be taken for decontamination of all personnel and equipment:

- All equipment, including heavy earthmoving equipment, shall be decontaminated at a suitable off-site facility with the ability to capture wash down water and convey it for treatment or waste water disposal;
- Truck and trailer units are to be parked outside each exclusion zone. This area is to be decontaminated following completion of the earthworks to ensure that any contaminated soil spilt during loading is removed. This will involve sweeping, and if required, pressure washing the loading area;

- Once all equipment has been decontaminated all personnel will undergo personal decontamination comprising:
    - Rinsing and / or scrubbing of boots, gloves and other PPE to remove dirt and dust residues;
    - Removal of all PPE with disposable items such as gloves and dust masks (if worn) placed in a plastic bag for waste collection; and
    - Thorough washing of hands and face with soap and water.

All personnel need to complete the decontamination procedures whenever they stop work, i.e. for meal breaks, toilet breaks etc. Decontamination should be undertaken immediately in the event of any body parts coming in direct contact with any soil and / or groundwater.

The work area shall be decontaminated at the completion of works within that area. This shall consist of removal of all soil and dust from the ground surface by sweeping, scraping and / or washing down as appropriate.

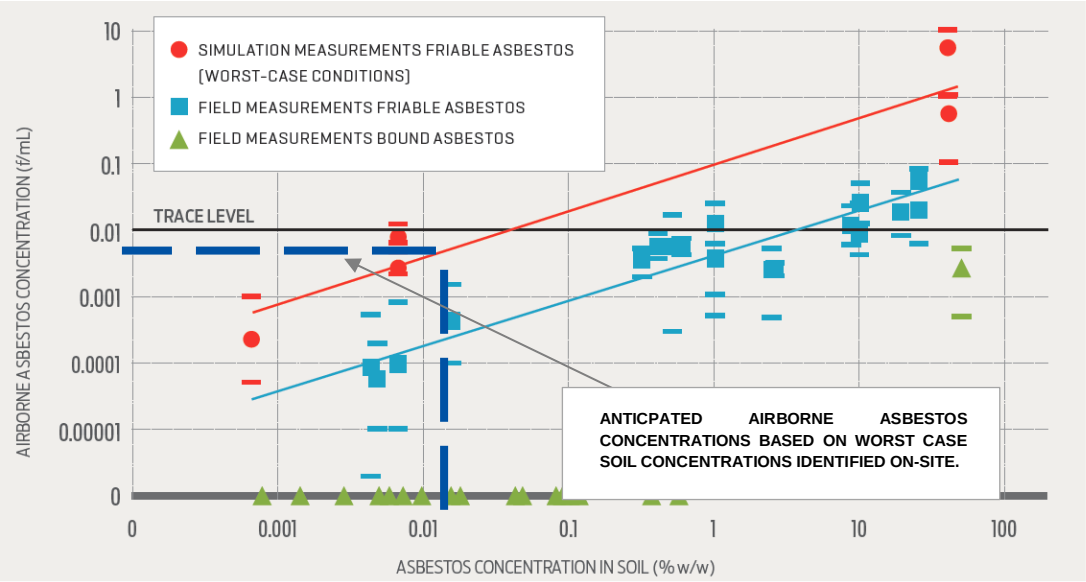
8 Asbestos Controls

The objective of the asbestos controls is to eliminate personal exposure to airborne asbestos on and off-site, so far as reasonably practicable. In accordance with the WorkSafe Approved Code of Practise (herein referred to as 'the ACOP'; WorkSafe, 2016), if it is not reasonably practicable to eliminate personal exposure to airborne asbestos, exposure must be minimised, so far as is reasonably practicable through such controls as described in this section of the RAP.

The scope of works covered by this RAP includes the excavation, management and disposal of soil impacted with asbestos and has been designed to meet the Safe Work Practices specified in the ACOP (WorkSafe, 2016), and the BRANZ guideline (BRANZ, 2017), and include the requirements of an asbestos removal plan.

Given the low concentrations of asbestos fibres detected in the soil (maximum concentration 0.07776 % w/w), and with suitable controls, we anticipate that fibre concentrations within air will not exceed trace levels (Figure 1). Trace level is defined in the ACOP as an average concentration over any eight-hour period of less than 0.01 asbestos fibres per millilitre of air (< 0.01 f/ml).

Figure 1: Anticipated Asbestos Airborne Concentrations



Source: Modified from BRANZ (2017).

Based on the maximum concentrations of asbestos fibres detected, in accordance with the BRANZ guideline (BRANZ, 2017), remedial earthworks in asbestos-impacted areas are likely to be considered as 'Class B: non-friable'.

The BRANZ guideline (BRANZ, 2017) introduces varying controls commensurate with the risk level based on the amount of asbestos identified in soil, and if applicable, air. Table 7 below summarises the BRANZ guideline site classification "Class B works", and Tables 6 and 7 of the BRANZ guidelines summarise the controls recommended. As the BRANZ Guideline is referenced in the WorkSafe ACOP, the BRANZ guideline or higher level of controls are required to be adhered to.

Table 7: Asbestos Controls

Scenario	Asbestos-related Work	Class B: Non-friable Relevant Controls for Asbestos Contaminated Soils at Faringdon Oval
Asbestos in air	< 0.01 f/mL in air	≥ 0.01 f/mL in air
FA/AF % w/w in soil	> 0.001	> 0.01
ACM % w/w	> 0.01	> 1
Scale, soil volume	> NES-CS	-
REMOVAL WORKS RESPONSIBILITIES		
WorkSafe Notification	Not required.	Notification five days before earthworks are to be undertaken.
Removal Contractor	Unlicensed Removalists.	Licensed Class B Removalist.
Contractor Competency	Non-certified training in asbestos identification, safe handling and suitable controls. A copy of the training shall be kept on record. Competent workers.	Certified training for workers. Certified, competent supervisors.
Remedial Works Supervision / Oversight	A person competent at managing asbestos in soil (e.g. SQEP).	Class B Supervisor.

SITE SET-UP		
Boundary Controls	Security fences around the asbestos work areas to prevent unauthorised access. Warning notices stating “ASBESTOS HAZARD AREA – KEEP OUT” at all entrances to the site or to areas containing asbestos in soil.	
Personal Decontamination Facilities	Dedicated decontamination area.	Basic disposable decontamination tent and foot wash.
Dust / Asbestos Fibre Suppression	Water via localised points. Water is sprayed on using standard pressure (not high pressure) to reduce the potential to liberate asbestos fibres. Temporary cover of contaminated area awaiting remediation.	
OCCUPATIONAL HEALTH AND SAFETY		
Personal Protective Equipment	No asbestos-specific PPE if workers are not in contact with potentially impacted soils. For workers potentially in contact with asbestos impacted soils: • Each worker is required to wear a Type 5 disposable coverall in either in orange or white with a disposable Hi-Viz vest. • Chemical resistant disposable gloves, such as nitrile gloves, shall be worn at all times when contact with the soil is likely. • Rubber Safety gumboots should be worn in preference over those safety boots with laces.	PPE shall include the following: • Each worker is required to wear a Type 5 disposable coverall in either in orange or white with a disposable Hi-Viz vest. • Chemical resistant disposable gloves, such as nitrile gloves, shall be worn at all times when contact with the sediment is likely. • Rubber Safety gumboots should be worn in preference over those safety boots with laces.

OCCUPATIONAL HEALTH AND SAFETY			
Respiratory Protective Equipment		Disposable P2 dust mask for workers within asbestos remedial areas.	Half-face P3 respirator with particulate filter.
Contractor Health Monitoring		There is no specific requirement for worker health monitoring under the Asbestos Regulations for Unlicensed Asbestos Works or Asbestos-Related Works (as defined in the BRANZ guidelines).	Refer to Asbestos Regulations Clauses 15 and 16 for health monitoring requirements for workers involved in Class A and B works.
MONITORING PROCEDURES			
Air Monitoring	**Responsibility**	SQEP (refer to Table 8).	Independent Asbestos Assessor
	Requirement	Given the low concentrations of asbestos fibres detected in the soil, and with suitable controls, we anticipate that fibre concentrations within air will not exceed trace levels. Air monitoring shall be conducted if the SQEP or the independent asbestos assessor considers that the trace level of fibres in air could be exceeded.	

MONITORING PROCEDURES

Air Monitoring	**Compliance**	If air monitoring is undertaken, all results shall be below 0.01 fibres / ml. If a result exceeds this level then additional controls will be required (dust suppression misting systems installed around perimeter or the use of a surface retardant). WorkSafe are to be notified if the recorded respirable fibre levels within the removal area are at or above 0.02 fibres / ml (HSWA Regulation 45). The results of air monitoring should be compared to the action levels and exposure limit of 0.01 f / ml presented below:

Action level (fibres/ml)	Control	Action
< 0.01 (trace level)	No new control measures are necessary	Continue with existing control, clearance exposure limit measures
≥ 0.01 < 0.02	Investigate, Implement, Prevent	Investigate the cause Put controls in place to prevent exposure
≥ 0.02	Stop Work	Stop work and investigate (Notify WorkSafe)
≥ 0.1 Workplace Exposure Standard	Remedial works required	Remedial works required. PCBUs with management or control of workplace to ensure that exposure of a person at the workplace to airborne asbestos is eliminated so far as is reasonably practicable.

SITE CONTROLS			
Vehicle Decontamination	**Vehicle Assessment before Demobilisation from Site**	Visual assessment.	Visual (plus swab samples if friable ACM is elsewhere on-site – lagging, insulation, etc.).
	Vehicle Assessment Completed by	Competent person or SQEP.	Independent assessor or independent competent person (meeting the requirements of regulation 41(3) under the Asbestos Regulations).
	Vehicle (Truck) Protection	Truck lining/soil wrapping depends on the receiving landfill. All trucks shall be covered.	200 µm heavy-gauge polythene wrapped soil / lined trays and truck covered.
	Truck / Excavator Air Conditioning	Standard air conditioning.	HEPA filter system fitted for all occupied vehicles where friable ACM on-site (lagging, insulation, etc.).
Temporary Stockpiling		The storage of asbestos at an unapproved location is not permitted by asbestos regulations. Therefore, the temporary stockpiling of asbestos containing soil shall be avoided where possible. All temporary stockpiled asbestos contaminated material which is created and left in place overnight shall be covered (e.g. with 200 um plastic). All uncovered stockpiles of soil are to be kept damp. Stockpiles shall be located on an impermeable surface or over-excavated when moved, and be in an area protected by erosion and sediment controls.	

MANAGEMENT OF CONTAMINATED MATERIAL	
Used PPE	All waste disposable PPE used during remediation of asbestos impacted soil should be placed in a 200 micron HDPE plastic bag within the decontamination area. The bag should be taped closed (in a goose neck fashion) after each item is added and kept damp via the addition of water. Once full, the bag should be added to a second HDPE bag labelled “Asbestos hazard – wear respirator and protective clothing while handling contents”.
Contaminated Soil	Special waste bins / skips or trucks, approved for the transport of ACM to the appointed licensed landfill facility shall be placed on-site. The need for lining of the bins shall be confirmed with the receiving facility prior to transport. Once full, the material shall be sealed in the plastic liner (if used) and covered for transport. The bins / skips or trucks shall be loaded within the site where runoff and possible spills during loading will be controlled and contained. All loads must be securely covered during off-site transport of material. The Hazardous Substances and Noxious Organisms (HSNO) Regulations regulates hazardous substances in all parts of the lifecycle, including transport. Asbestos containing waste and soil would be considered as hazardous to health and therefore controlled by the Land Transport Rule: Dangerous Goods 2005. The Land Transport Rule: Dangerous Goods 2005, which is based on classifications in the United Nations (UN) Recommendations on the transport of dangerous goods – model regulations notes asbestos (chrysotile, amosite and crocidolite) as a Class 9 Miscellaneous Dangerous Substance. The Land Transport Rule: Dangerous Goods 2005 and Land Transport Rule: Dangerous Goods Amendment 2010 therefore applies to the transport of asbestos. It is recommended that any soil which contains asbestos in concentrations >0.001% w/w is considered hazardous and the controls stated in the Land Transport Rules adopted. For asbestos soil waste in significant quantities, hazard label signage should be displayed on the vehicles transporting the soil for disposal.
MANAGEMENT OF CONTAMINATED MATERIAL	
Contaminated Water	Water used for cleaning asbestos-contaminated equipment (including vehicles) shall be placed into a plastic lined drum or skip, and disposed of at an appropriately licensed facility. If excessive water is applied, ponding or runoff may occur which could permit the transport and accumulation of asbestos fines outside of the site. Water from the work area shall be retained inside the boundary of the site and wash water directed back into excavations and the site.

9 Monitoring and Validation Sampling

As noted above, validation sampling will be undertaken following removal of soil from the site. The purpose of the validation sampling will be to determine the effectiveness of the remediation, and to confirm whether the site is suitable for redevelopment for commercial / industrial land uses. The extent of soil removal and this RAP should be agreeable to all parties prior to remedial works commencing.

9.1 Selection of Remedial Goals

The proposed remedial goals have been derived from the NES and following the MfE Hierarchy.

The remediation values selected are the NES SCS for Residential 10 % produce land use criteria. This is so the exposure pathways and receptors are consistent with the proposed land use and protects future users of the site.

Table 8: Remedial Goals

Contaminant of Concern	Heavy Metal Analyte	Remedial Goals	Remedial Goal Source
Heavy Metals	Arsenic	20 mg/kg	NES SCS for Residential Land Use
	Cadmium	3 mg/kg	
	Chromium	460 mg/kg	
	Copper	10,000 mg/kg	
	Lead	210 mg/kg	
	Nickel	400 mg/kg	
	Zinc	7,400 mg/kg	
Total Petroleum Hydrocarbons	C7-C9	1,600	NES SCS for Residential Land Use
	C10-C14	2,400	
	C15-C30	NA	
Asbestos	Asbestos	Asbestos not detected	All land uses

9.2 Validation Methodology

Following the removal of contaminated soil from the identified areas, a number of validation samples will be collected from the base and walls of the excavation areas for laboratory analysis, to confirm that the remediation works have been successful and remaining soils meet criteria for the protection of human health for commercial / industrial land use.

The proposed validation sampling programme is comprised of the collection of soil samples from every 10 m^2 of the base and sides of the excavated areas. The samples will be analysed for the contaminant of concern which was previously above the guideline criteria. The samples will be analysed by an accredited laboratory (RJ Hill Laboratories and Terra Scientific).

All validation sampling shall be conducted in accordance with ENGEO's quality assurance / quality control procedures to avoid cross contamination (e.g. using and changing disposable nitrile gloves between sample locations, decontamination of sampling tools) and use of appropriate sample containers provided by the laboratory. All validation sample locations will be logged with GPS to allow verification at a later date is required.

Once confirmation has been received (laboratory certificates) indicating remnant soil quality in each area is below the remedial goals, the excavations will be backfilled with suitable soil, or re-graded. All imported soil shall meet the requirements outlined in Section 7.3.4.

9.3 Site Validation Report

At the completion of the validation works, a Site Validation Report will be prepared outlining the remediation works undertaken and the results of the validation investigation. The report will be prepared in accordance with the MfE CLMG No.1 and submitted to all relevant parties for review and approval to seek acknowledgement that the contaminants of concern relating to the site are below the relevant land use standards. Following acknowledgement and confirmation that the contamination has successfully been remediated to the appropriate level, it is anticipated that the subdivision can proceed.

10 Contingency Measures

The following contingency measures have been developed if significant, potentially contaminated material is encountered during the excavation. Work in the area of concern shall cease until ENGEO has assessed and identified the material.

The presence of contaminants in high concentrations, or other unexpected contaminants, may dictate further controls be implemented and additional or different containment / disposal required.

Should testing indicate that unexpected contamination conditions may present an ongoing risk to human health or the environment, a remediation strategy will be developed by ENGEO in consultation with SDC and the on-site contractor.

It is anticipated that over-excavation and removal of impacted soils to an appropriate off-site disposal facility will provide the most likely method for addressing localised hotspots of unexpected contaminants. However, the final remedial strategy will be dependent on factors such as the nature and extent of the contaminants encountered and implications for the redevelopment.

In the event that significant contamination is identified, the excavation will be isolated with barriers and warning signs to restrict access. Access to the area will occur under the supervision of ENGEO until a revised management / remediation methodology has been developed and appropriate controls implemented. All personnel accessing the area shall wear appropriate PPE equipment, including disposable coveralls and an approved respirator.

If the impacted material is identified as suitable to be disposed off-site, the excavation and disposal of the material shall be in accordance with the procedures outlined in this document. Validation samples shall be collected if remediation is required to demonstrate that no unacceptable risks to human health or the environment remain following the remedial works.

11 Unanticipated Conditions

Available data indicate the key contaminants on-site are heavy metals, asbestos and TPH. Identified contaminants are present within the material to be removed from the site and in some instances will exhibit little or no indication of their presence.

Given the timing of the DSI sample analysis and long lead time for settlement of the properties to Hughes Developments, the presence of higher concentrations of contamination and / or other contaminants, albeit likely localised, cannot be excluded at this time. Typical indicators of contamination include but are not limited to:

- Buried drums or tanks with unknown liquid;
- Odour (petroleum hydrocarbons, oil);
- Discoloured soil (black, purple, or green staining most common);
- Asbestos containing materials (ACM), as fragments are visible with the naked eye; and
- Inclusions of deleterious materials.

Examples of the typical indicators are shown below.

Table 9: Examples of Contamination

Photo	Description
	Buried Waste Look out for: • Visual indicators of waste • Staining of surrounding soils • May be mixed with imported gravels
	Hydrocarbon Staining Look out for: • Visual indicators of contamination • Staining of surrounding soils • Hydrocarbon odour in soils and water • Visible hydrocarbon sheen on water

Photo	Description
	Asbestos Containing Material Look out for: • Visual indicators of Asbestos Containing Material • May be mixed in with other waste and / or fill material • May be intact sheets or broken into smaller pieces
	Gas Works Waste / 'Blue Billy' Look out for: • Blue / Green staining of soils • May be mixed in with other fill material • Likely to be present under roadways, driveways and paving

Photo	Description
	Uncontrolled Fill Material Look out for: • Visual indicators of fill material • Staining of surrounding soils

12 Assessment of Environmental Effects

Based on the requirement of Section 88 of the Resource Management Act (RMA) and the framework set out in the Fourth Schedule of the RMA, the actual and potential environmental effects associated with the proposed works are summarised in Table 10 below.

The environmental effects of the proposed works are expected to have a no more than minor effect on the environment if the controls are put in place. This is due to the likely limited extent of earthworks and the limited hazardous nature of the soils required to be excavated including concentrations of asbestos. The potential for contaminants to impact on identified receptors is considered low given the site controls to be employed.

Additional controls are to be employed during the earthworks to assist with preventing exposure of contaminants to site workers, in particular excavation workers.

In summary, it is concluded that the potential environmental effects associated with the proposed relatively short term programme of excavation works will be no more than minor as long as the controls outlined in this document are implemented.

Table 10: AEE from Redevelopment Works

Schedule Four Item	Assessment of Environmental Effects
Description of the proposal	Excavate contaminated material of approximately 150 m^3 over an area of approximately 51.22 ha.
Where the activity is likely to result in significant adverse effects, **a description of the alternatives**	Actual or potential effects on the environment are likely to be no more than minor.
An assessment of the **actual potential effects** on the environment	Earthworks would be conducted in line with consent conditions in addition to the proposed mitigation measures detailed in the RAP. Potential for removal works to generate minor amounts of dust during the excavation and removal of impacted soil. Mitigation will involve utilising water to suppress dust and covering soil stockpiled on-site as well as all truckloads leaving the site. Potential for stormwater run-off to be contaminated if it encounters the impacted soil. Potential for noise generation from excavators. Contribution of site generated noise is unlikely to be significant and will be completed within typical working hours.
Where the activity includes the discharge of any contaminants, a description of: - Nature of the discharge - Sensitivity of the receiving environment Alternative methods of discharge	No planned discharges. The site redevelopment will involve the removal of the identified contaminants of concern. Impacted soils are to be removed from the isolated areas therefore the earthworks are likely to have a no more than minor impact on groundwater.
Any effects on ecosystems, including plants or animals, physical disturbance of habitats in the vicinity	In accordance with the MfE (1999) Guidelines a Tier 1 ecological risk assessment has been conducted. No significant ecological receptors have been identified within close proximity of the site.
Any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual or cultural, or other special values for present or future generation	No effects anticipated.
Description of the mitigation measures (safeguards and contingency plans) where relevant to be undertaken to help prevent or reduce actual or potential effect	See RAP controls for short term mitigation measures to be undertaken during the earthworks.
Where the scale or significance of the activity's effect are such that monitoring is required, a description of how, once the proposal is approved, effects will be monitored and by whom	Monitoring of site conditions and soil volumes is proposed.

13 Limitations

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

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

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

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

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

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by

Natalie Flatman

Environmental Scientist

Report reviewed by

Dave Robotham, CEnvP SC

Principal Environmental Consultant

14 References

MfE, 2011a. Ministry for the Environment. (2011). Contaminated Land Management Guidelines No.1: Reporting on Contaminated Sites in New Zealand

MfE, 2011b. Ministry for the Environment. (2011). Contaminated Land Management Guidelines No.2: Hierarchy and Application in New Zealand of environmental guideline values.

MBIE, 2015. Ministry of Business, Innovation & Employment. (2015). Health and Safety at Work Act.

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

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

Waste Management Institute New Zealand. (2016). Technical Guidelines for Disposal to Land.

FIGURES

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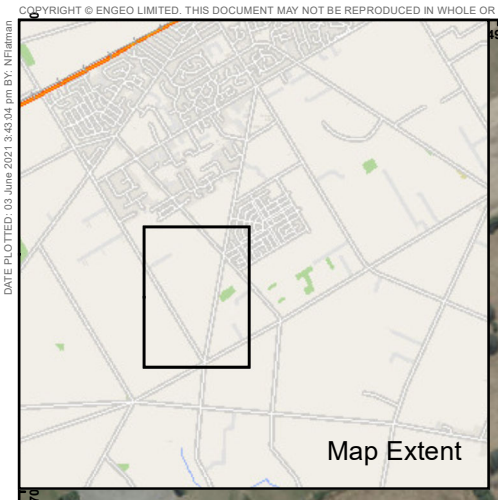

3/144
Dunns Crossing Road

130
Dunns Crossing Road

108
Dunns Crossing Road

597
East Maddisons Road

92
Dunns Crossing Road

Legend

Site boundary

Aerial: LINZ and Eagle Technology, CC BY 4.0.
Map image: Eagle Technology.

0 50 100
Metres

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

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ENGEO

Tauranga Office
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Title: Faringdon Oval - Site Location Plan

Client: Hughes Developments Ltd

Project: Faringdon Oval

Designed: NF
Drawn: NF
Checked: DR
Date: Jun 21

Proj No: 12903.000.000

Scale: 1:5,000

Figure No: 1

Size: A3

Revision: A

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Faringdon Oval - Remedial Areas 1, 2 and 4

Client: Hughes Developments Ltd

Project: Faringdon Oval

Designed: NF
Drawn: NF
Checked: DR
Date: Jun 21

Proj No: 12903.000.000

Scale: 1:300

Figure No: **2**

Size: A3

Revision: A

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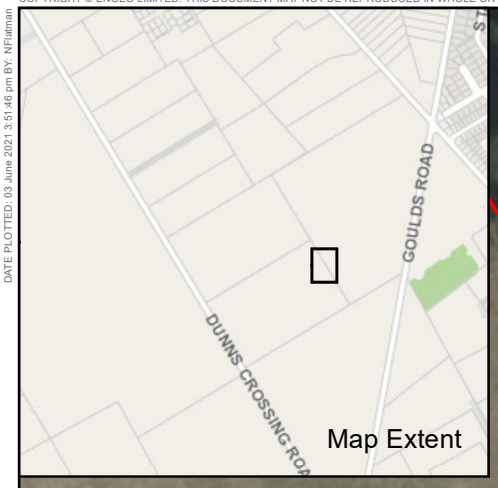

1549750

5169650

5169600

Area 3

Legend

Remedial Area

Site boundary

Aerial: LINZ and Eagle Technology, CC BY 4.0.
Map image: Eagle Technology.

0 10 20
Metres

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

1549700

1549750

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Faringdon Oval - Remedial Areas 3

Client: Hughes Developments Ltd

Project: Faringdon Oval

Designed: NF
Drawn: NF
Checked: DR
Date: Jun 21

Proj No: 12903.000.000

Scale: 1:300

Figure No: 3

Size: A3

Revision: A

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Title: Faringdon Oval - Remedial Areas 5 and 6

Client: Hughes Developments Ltd

Project: Faringdon Oval

Designed: NF
Drawn: NF
Checked: DR
Date: Jun 21

Proj No: 12903.000.000

Scale: 1:250

Figure No: 4

Size: A3

Revision: A

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