SITE MANAGEMENT PLAN (SMP)

69 TRIG ROAD 149-151 & 155-157 BRIGHAM CREEK ROAD,

WHENUAPAI, AUCKLAND

Reference Number: REP-1475A/SMP/JUN20(REV1)

PREPARED FOR: NEIL CONSTRUCTION LIMITED

16 JUNE 2020

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STATEMENT

This plan has been prepared in acknowledgement of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. It has been authorised by a suitably qualified and experienced practitioner (SQEP); and has been prepared with the intention of providing practices and procedures for the management of potentially contaminated land that meets the criteria of the NES, the MfE guidelines and the requirements of Neil Construction Ltd.'s development plans.

Report prepared on behalf of GSL by:	Report and authorised on behalf of GSL by:
David Wilkinson Environmental Scientist Geosciences Ltd	Carl O'Brien General Manager Geosciences Ltd

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1 INTRODUCTION

The properties at 69 Trig Road, 149-151, and 155-157 Brigham Creek Road (hereafter collectively referred to as 'the site') are legally described as Lot 3, Lot 4 and ½ Lot 5 DP 101583 and Lot 2 DP 334953 and encompass a total area of 15.46 Ha.

Neil Construction Ltd intend to develop the site through the demolition of the existing site infrastructure, undertake bulk site wide earthworks and subdivide the titles creating up to 60 new lots with mixed use residential and commercial / industrial landuses proposed. Preliminary plans indicate a split of 36 proposed residential lots and 24 commercial lots alongside associated access lots and infrastructure.

Earthworks plans indicated in a geotechnical investigation provided to GSL show bulk developmental earthworks proposed across the site including some 48,200 m^3 of cut to fill operations including a cut of up to 2 m through the central portion of the site and fill of up to 3.0 m in the northern portion of the site and up to 5.0 m in the southeast portion. A copy of the proposed scheme plans, and earthworks drawings are included as Appendix A.

As a result of Geosciences Ltd (GSL) previous investigations, and in accordance with the *National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health* (NES), this site management plan (SMP) is required document the practises and procedures to be in place and effective during soil disturbance activities to ensure any risks that could arise from potential mobilisation of contaminants are managed to an acceptably low level.

2 GSL DETAILED SITE INVESTIGATION - JUNE 2020

Geosciences Ltd (GSL) undertook a detailed site investigation (DSI) of the site in June 2020 which included a review of a previous environmental due diligence investigation prepared by GSL in 2019 and a review of a geotechnical investigation prepared by CMW Geosciences in 2019. Previous investigations noted that the site has been the location of horticultural activities and the unconsented importation of fill material during its discernible history and as such contained activities encompassed under the MfE Hazardous Activities and Industries List (HAIL).

GSL also identified the potential for hotspots of horticultural contaminants surrounding storage sheds on site where persistent pesticides may have been stored or mixed while two domestic septic tanks and associated effluent disposal fields were noted on the property files for the site.

The bulk storage and use of persistent pesticides in included on the MfE HAIL under Item A.10, septic tanks and wastewater disposal are encompassed by Item G.5 on the HAIL while unverified fill can be encompassed under Item I on the HAIL where a risk to human or environmental health is present.

The geotechnical investigation mapped the extent of the unverified fill to be an area of approximately 11,380 m^2 in the southeast portion of 69 Trig Road, and noted fill to depths of up to 5.5 m in a former gully in the centre of the fill, tapering out to less than 300 mm at the edges.

Based on the review of the previous environmental and geotechnical investigations, GSL undertook a targeted intrusive soil sampling regime which included the collection of 29 discrete soil samples from 12 test pits in the unverified fill, the collection of eleven discrete surface soil samples from

around sheds on site and the collection of a further three composite soil samples from cropped areas on site. Analysis of the soil samples revealed:

- No soil sample returned a concentration of any contaminant of concern in excess of the NES residential soil contaminant standard or the AUP(OP) permitted activity soil acceptance standards;
- soil samples from within the unverified fill returned detectable concentrations of OCPs and PAHs well within the applicable human health and environmental acceptance criteria;
- one soil sample from within the fill returned detectable asbestos fibres below the BRANZ Tier 1 human health threshold for AF/FA for all site users;
- discrete soil samples from potential hotspots returned one concentration of arsenic marginally above the expected background range; and
- one composite soil samples returned a trace detection of ∑DDT

3 STATUTORY REQUIREMENTS

As a result of the findings of the DSI, a site management plan is required that will provide procedures to be followed during the earthworks to ensure the protection of human health and the environment and to ensure that impacted soil from the site is either screened for reuse on site where suitable, or disposed of at a facility that is licensed to accept material of this nature.

3.1 NATIONAL ENVIRONMENTAL STANDARDS

As a result of the detection of contaminants of concern in excess of the expected naturally occurring background concentration ranges, the proposed development will require resource consent as a Controlled Activity under Regulation 9 of the NES. The following SMP has been prepared to document the controls to be in place during site development works in order to mitigate any potential human health risks associated with the potential mobilisation of contaminants in soil.

The SMP must be submitted to Auckland Council for approval prior to the commencement of works on site.

4 SITE MANAGEMENT PLAN

This site-specific management plan (SMP) provides procedures for the handling of excavated soil material with detectable organic compounds and heavy metals above the expected naturally occurring background ranges because of the proposed development at 69 Trig Road, 149-151 & 155-157 Brigham Creek Road, Whenuapai. It is to be submitted to Auckland Council for approval before works commence on site.

This SMP also documents the process and controls for the decommissioning and removal for offsite disposal of domestic septic tanks and effluent disposal infrastructure during demolition works on site.

The practices and procedures in this plan are intended to ensure that health, safety and environmental risks associated with the proposed earthworks activities at the site are managed to

an acceptably low level. It is not intended that this SMP should replace the contractor's site-specific health and safety plan or earthworks and sediment control plan, but should be enacted in conjunction with these documents.

4.1 RESPONSIBILITIES AND SITE MANAGEMENT

Neil Construction Ltd or the appointed earthworks contractor will assign a 'site manager' to the project that will be responsible for the implementation of this SMP for the proposed works at the site.

4.1.1 ENGAGEMENT OF CONTAMINATED LAND ADVISOR

Geosciences Ltd will be available on-call as Contaminated Land Advisor (CLA) to provide direction in relation to contamination / disposal issues for the project. GSL are a professional advisor, suitably qualified and experienced in the investigation, reporting, remediation, and validation of contaminated land.

GSL's main functions as the CLA are to:

- Assist in inspecting / screening potentially contaminated material;
- Assess the effectiveness of environmental control measures;
- Manage the collection and analysis of any soil samples (if required) in accordance with the Ministry for the Environment's (MfE) Contaminated Land Management Guideline No 1, (Reference 5);
- Provide assessments of the investigation;
- Make recommendations based on findings; and
- Maintain regular liaison with the authorities if necessary.

4.1.2 BRIEFING SESSIONS

The site manager is to commission a briefing session for relevant staff and subcontractors prior to the commencement of works. The briefing session will include as a minimum:

- Known areas of impacted soil material;
- Appropriate PPE and safety measures;
- Familiarisation with the requirements of the SMP;
- Guidance for identifying contaminated material as works progress (Appendix B); and
- Procedures to be followed should contaminated material be encountered (Appendix B).

4.2 HEALTH AND SAFETY PROCEDURES

While this SMP provides steps that are required because of detectable PAH and OCP concentrations identified during the DSI, the earthworks contractor is ultimately responsible for the H&S procedures related to the earthworks.

No concentrations of contaminants exceed the human health standards for site workers, as outlined in the soil contaminant health standards ($SCS_{(HEALTH)}$) of the NES, nor did any concentrations exceed the residential landuse thresholds. Consequently, the soil on site is not considered to present a distinct risk to the health of workers on site. Additionally, the majority of soil disturbance will be undertaken through mechanical excavation techniques limiting the potential for direct exposure of workers on site.

The above notwithstanding, as a conservative assessment inhalation would be considered the most important exposure risk related to airborne contaminants in dust while sediment laden run off could present environmental implications if uncontrolled. Management of dust and sediment through provisions within this SMP are therefore the primary management requirements to mitigate risk.

4.2.1 Personal Protective Equipment

The minimum Personal Protective Equipment (PPE) which should be available on-site will be in accordance with the contractor's specific health and safety plan. While no specific PPE is required as a result of the detected concentrations of contaminants on site, additional PPE that may be available include:

- Protective leather or rubber gloves
- Safety glasses
- Dust masks

The site manager will use his discretion with regard to the use of the additional PPE and might call on the CLA for advice on this matter.

4.3 Dust Control

Dust controls are required to minimise pollutants becoming airborne and reduce stormwater sediment loads. If the proposed earthworks are undertaken in dry conditions, dust can be controlled by light frequent water spraying. Water spraying should be frequent enough to suppress the generation of dust but not as heavy as to generate sediment laden water run-off.

The site manager will use his discretion with regard to dust suppression and will be ultimately responsible for ensuring the control of dust during earthworks on site

4.4 Erosion and Sediment Controls

To prevent generation of contaminated sediment laden run-off, stormwater protection measures shall be incorporated around the perimeter of the proposed works in accordance with Auckland Council Guidance Document GD05 *"Erosion and Sediment Control Guide for Land Disturbing Activities in New Zealand, June 2016"* shall be sufficient to ensure compliance with these requirements.

5 Proposed Development Works

Site development works to which this SMP encompass can be broken down as follows:

- Septic tanks and effluent disposal fields
- excavation and controlled removal or screening and reuse of Trig Road Fill material
- site wide development earthworks

For all phases of earthworks, the controls set out in Section 5.3 alongside dust controls and erosion and sediment controls set in Sections 4.3 and 4.4 respectively will be in place and effective until the site is returned to an erosion resistant state.

Specific additional controls for specific aspects of works on site are set in the following sections.

5.1 CONTROLS FOR EFFLUENT DISPOSAL DECOMMISSIONING

While Auckland Council identify effluent disposal fields as potentially contaminating activities, GSL considers that domestic wastewater treatment systems can generally be considered low risk for soil contamination. Due to the low lever of risk and small scale of works required in order to decommission and remove the septic tanks and disposal fields, GSL considers that the works can Readily be undertaken as part of site wide development works utilising the same controls required for other HAIL areas without issue. Removal works should be completed and validated in accordance with the provisions of Sections 5.1.1 and 5.1.2 below prior to the commencement of bulk cut to fill earthworks to ensure risks are appropriately managed.

5.1.1 TANK AND FIELD REMOVAL

Prior to the excavation of the septic tank and disposal field, the site manager / contractor will arrange for the tank to be emptied through the use of an approved waste removal company utilising a suction truck specifically designed for this purpose. The waste will be disposed of by the appointed contractor to an approved liquid effluent receiving facility.

Once empty, the tank will be carefully excavated and removed from site. Excavations will commence on the sides to expose the tank construction and layout, carefully advancing to allow the full tank to be lifted out for disposal of site and to expose the disposal field infrastructure.

Depending on the construction material and condition of the tank, it will either be disposed of to an appropriately licensed facility (e.g. landfill) or sent to a location for recycling under approved conditions.

After the tank has been pulled, the associated disposal infrastructure (overflow / dripper lines) will be excavated alongside a small volume of soil and disposed of to an appropriately licensed landfill facility. The effluent disposal pipes should be 'chased out' using an excavator starting at the septic tank through to termination.

The use of experienced contractors and licensed disposal locations will provide the primary controls in managing any actual or potential adverse effects associated with the decommissioning process.

Section 5.3 contains further general earthworks procedures for the disturbance of actually or potentially contaminated soil which should be followed during the soil disturbance activities

5.1.2 VALIDATION OF EFFLUENT DISPOSAL SYSTEM

Following the completion of removal works for the septic tank and disposal system, GSL as the appointed Contaminated Land Advisor will visually inspect the full extent of all excavations to confirm that all disposal infrastructure has been removed from the site. In conjunction with the visual assessment, validation soil samples will be collected on the basis of:

- One soil sample from the base of the septic tank pit;
- One soil sample from the base of disposal infrastructure / dripper lines per 10 lineal metres.

Soil samples will target the base of the tank pit and soil directly underlying disposal infrastructure being the worst-case scenario for long-term discharge. Validation soil samples will be submitted for the analysis of a suite of heavy metals. Analytical results will be compared against the NES soil contaminant standards for rural residential landuse with 10% homegrown produce as a suitably conservative remediation goal.

In the event that any soil samples return concentrations that exceed the remedial goal, the CLA in discussion with the landowner will determine the extent of any further remedial excavations that may be required, and further validation soil sampling will follow until such a time as validation samples comply with the remedial goal.

5.2 69 TRIG ROAD UNVERIFIED FILL

Previous investigation of the fill has estimated that approximately 14,000 m^3 of fill material was emplaced to a depth of up to 5.5 m on the southeast portion of 69 Trig Road, the area of filling is approximately 11,380 m^2 on the southeast corner of the site.

As set out in the DSI, analysis of the fill identified concentrations of priority contaminants in excess of the expected naturally occurring background ranges, but not at levels considered to present a risk to human health or the environment. Consequently, fill can be re-used on site should it meet geotechnical requirements.

GSL understands that the proposed earthworks plans have identified re-use of a portion of this fill following screening to remove unsuitable materials (buried topsoil / organic material at the base of the fill, building rubble and minor rubbish) which in turn will be subject to controlled disposal offsite. Appropriate controls are set out in turn below for this approach.

5.2.1 PREPARATORY WORKS

As the first stage in soil disturbance in this footprint, the existing topsoil layer will be stripped and stockpiled within an appropriate location on site for reuse as topcover. As part of this work, a staging area will be set up to allow for:

- Screening of excavated fill;
- Stockpiling for offsite disposal; and
- Stockpiling for consolidated loadout.

Following preparatory works, earthworks will be undertaken in stages as set out in Sections 5.2.2 and 5.2.3 below.

5.2.2 ASBESTOS RELATED WORKS – TP11

As identified in the DSI, fill material in the vicinity of TP11 contains detectable concentrations of asbestos below the BRANZ Tier 1 threshold. While this material can remain on site, GSL recommends that it is subject to targeted excavation and disposal to minimise potential cross contamination of the residual fill and to minimise the volume of soil that is considered 'asbestos impacted' should large swathes of the emplaced fill not be considered geotechnically suitable.

The location and extent of TP11 should therefore be marked out and subject to targeted excavation and disposal under the following controls for 'asbestos related work':

- A suitably competent contractor should be engaged for the removal works, experienced in identification of asbestos should further unexpected asbestos be encountered;
- The contractor will pre-arrange for disposal of this material at a suitably licensed landfill facility;
- Dust controls will be in place and effective for the duration of disturbance through light and frequent water spraying;
- A spotter will be utilised when progressing earthworks to identify any further fragments within the fill during targeted excavations;
- The site manager will keep disposal manifests of all soil removed from site; and
- Should any unexpected contamination be encountered, the site manager will cease works and implement the contingency measures set out in Section 6 below.

5.2.3 SCREENING, REUSE AND DISPOSAL OF RESIDUAL FILL

Fill will then be progressively excavated and where suitable, stockpiled for reuse during sitewide contouring. Any unsuitable fill materials will be separately loaded out for offsite disposal under the controls set below.

The procedures below will be followed to ensure that potentially contaminated soil and unsuitable fill materials are adequately handled and if required disposed of off-site.

- prior to earthworks commencing, the contractor will arrange for the disposal of soil and excavated material at a managed-fill facility that is licenced to accept soil of this nature;
- an area on site will be prepared for suitable fill material for reuse during sitewide earthworks;
- unsuitable material will be loaded directly into trucks / truck and trailer units and covered for transport directly to a prearranged disposal facility
- an area on site will be prepared for the temporarily stockpiling of material of suspicious nature that might be encountered during the earthworks;
- temporary stockpiles will be managed (kept damp) to ensure that there is no excess dust generated from the stockpiles;
- silt fencing will be placed around the temporary stockpiles to ensure that there is no excess sediment run-off from the stockpiles;

- the CLA will be notified and inspect any suspicious or noxious material that might be encountered during the earthworks. If necessary, the CLA will take soil samples for analysis of any foreign material that is discovered. The CLA will advise on the disposal of any such material;
- upon completion of the excavation the site manager shall ensure that plant and equipment are cleaned and decontaminated appropriately; and
- A landfill manifest or weigh bridge dockets of all material disposed of at a managed fill or landfill facility will be kept

5.3 BULK DEVELOPMENT EARTHWORKS PROCEDURES

The estimated volume of soil material to be disturbed because of the sitewide earthworks based on the preliminary earthworks plans earthworks is some 48,200 m^3 of cut to fill. This material will consist mostly of natural clay material with some topsoil. Analysis of surface soil samples from across the site indicates that the majority of topsoil and subgrade, aside from those areas described in the above sections, meets the MfE and AUP(OP) definition of cleanfill.

The procedures below will be followed to ensure that potentially contaminated soil is appropriately handled and, where necessary, disposed of off-site.

- An area on site will be prepared for the temporarily stockpiling of material of suspicious nature that might be encountered during the earthworks. This quarantine area will be established on an impermeable surface and subject to erosion and sediment controls in accordance with GD05;
- All required erosion and sediment controls will be in place and effective prior to commencement of bulk cut and fill activities;
- Earthworks will be undertaken in a staged manner in direct accordance with all geotechnical requirements for excavation, emplacement and compaction;
- Topsoil will be stockpiled in accordance with the testing characterisation as cleanfill or managed fill to mitigate cross contamination of soil qualities should offsite disposal be required;
- Temporary stockpiles will be managed (kept damp) to ensure that there is no excess dust generated from the stockpiles;
- Silt fencing will be placed around the temporary stockpiles to ensure that there is no excess sediment run-off from the stockpiles;
- Excavations and emplaced fill will be progressively stabilised as final levels are achieved in accordance with geotechnical requirements and GD05;
- The CLA will be notified and inspect any suspicious or noxious material that might be encountered during the earthworks and contingencies as set out in Section 6 will be implemented. If necessary, the CLA will take soil samples for analysis of any foreign material that is discovered. The CLA will advise on the disposal of any such material;
- Upon completion of the excavation the site manager shall ensure that plant and equipment are cleaned and decontaminated appropriately; and

- A landfill manifest or weigh bridge dockets of all material disposed of at a managed fill or landfill facility will be kept.

6 CONTINGENCIES

In the event that other contamination is encountered on the site during the works, the site manager, in consultation with the CLA, will either:

- Identify the material in situ if possible (staining, odour, visible fibres or refuse etc.); or
- Excavate the material to a suitable leak proof and covered skip-bin or truck and take representative samples for analysis, placing the material on hold for appropriate disposal; or
- Halt excavations in the immediate vicinity of the discovery while the material is sampled in-situ, and removal / disposal options explored once the analytical results are returned.

An appropriate log will be kept by the site manager of any unidentified contamination encountered during the excavations.

GSL has produced a contaminated soil discovery guideline (CSDG) document that outlines the signs, risks, and remedial actions required for contamination scenarios that may be encountered during remedial earthworks (Appendix B).

Suspicious material will be investigated by the CLA and laboratory analysed if deemed necessary. The CLA will advise on the disposal options of any uncertain materials. Disposal options can include:

- remove to an appropriate temporary stockpile area for further testing and analysis; or
- disposal at a cleanfill, managed fill or landfill facility.

The appointed contractor might have their own discovery procedures based upon their specific experiences in working with contaminated land of various natures (urban to rural). Contractor specific documents may be used alongside or in conjunction with this SMP.

If any staff, contractors, or consultants discover contamination, they should notify the site manager immediately, who should enact the provisions of the plan.

6.1 FIBROUS MATERIAL (ASBESTOS)

While asbestos containing material was identified in one discrete portion of the emplaced fill on 69 Trig Road, it is not anticipated that any further asbestos materials will be encountered on the site. However, where asbestos containing materials (ACM) are identified in the soil matrix, all works shall cease (including the excavation and disposal of affected materials) until the provisions of the *Health and Safety at Work (Asbestos) Regulations* are exercised.

ACM identification will primarily be through visual identification by a suitably competent person. Any fibrous material observed during excavations will be visually inspected, photographed and representative sample submitted to an accredited laboratory for analysis. Following receipt of results, the site manager in conjunction with the CLA shall determine what, if any, further remedial steps may be required, including the provisions of asbestos removal control plans, semi-

quantitative analysis, or site assessment under the WorkSafe endorsed *BRANZ New Zealand Guidelines for Assessing and Managing Asbestos in Soils* (November 2017).

7 SITE VALIDATION REPORT

Upon completion of the works, and specifically septic tank removal works a site validation report (SVR) will be completed and provided to Auckland Council. The SVR will include:

- The quantity of soil material removed from site, including copies of the disposal manifests;
- A description of any unforeseen contaminated soil material encountered during the remedial works;
- Laboratory analytical results from any soil testing that occurred during the remedial works; and

Any incidences or complaints that occurred during the earthworks.

8 REFERENCES

1. Ministry for the Environment (2011) - Draft Users Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health. Ministry for the Environment, Wellington, New Zealand.
2. Ministry for the Environment (2011) – *Methodology for Deriving Standards for contaminants in Soil to Protect Human Health.* Ministry for the Environment, Wellington, New Zealand.
3. Ministry for the Environment (2011) — *Contaminated Land Management Guidelines No.1: Reporting on contaminated Sites in New Zealand*. Ministry for the Environment, Wellington, New Zealand.
4. Ministry for the Environment (2003) — *Contaminated Land Management Guidelines No.5: Site Investigation and Analysis of Soils*. Ministry for the Environment, Wellington, New Zealand.
5. Department of Labour (1999) — *Health and Safety Guidelines on the Cleanup of Contaminated Sites.* Occupational Safety and Health Services. Department of Labour. Wellington. ISBN 0-477-03546-9.

FIGURES

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Figure 1 - Site Locality

69 Trig Road, 149-151 & 155-157 Brigham Creek Road, Whenuapai

Reference:	J1475
Date:	12/06/2020
Drawn:	DW
Approved:	COB

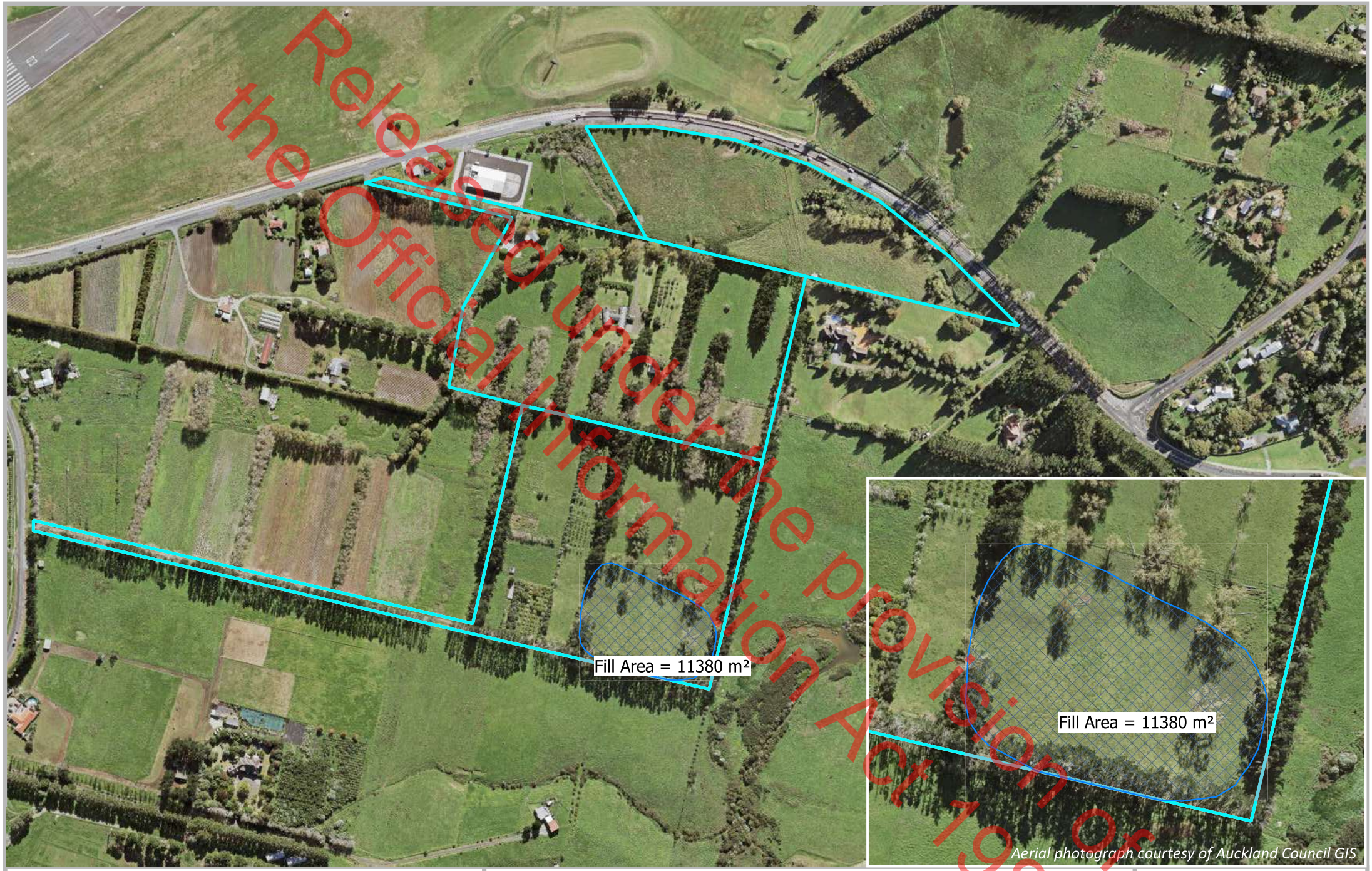

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Figure 2 -Extent of Fill

69 Trig Road, 149-151 & 155-157 Brigham Creek Road, Whenuapai

Reference:	J1475
Date:	16/6/2020
Drawn:	DW
Approved:	COB

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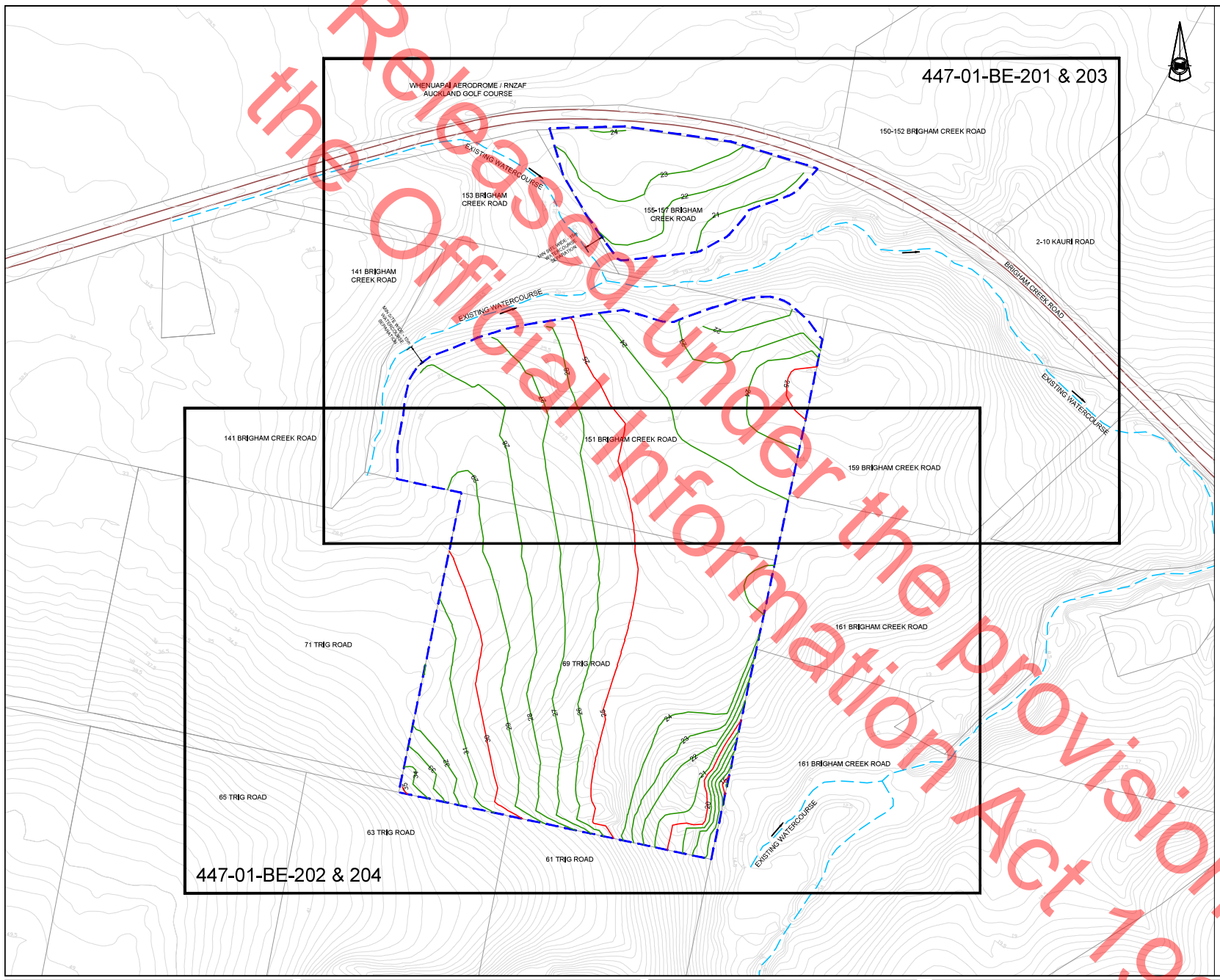
Figure 3 - Septic Tank and Disposal Field Locations

69 Trig Road, 149-151 & 155-157 Bridgham Creek Road, Whenuapai

Reference:	J1475
Date:	12/06/2020
Drawn:	DW
Approved:	COB

APPENDIX A: PROPOSED EARTHWORKS PLANS



EARTHWORKS

STAGE / AREA (ha)	CUT (m3)	FILL (m3)	BALANCE (m3)
155-157 BRIGHAM CREEK RD			
1.29ha	2,100	2,100	-
SITE ALSO HAS AREA OF REWORKED HISTORICAL EARTHWORKS.			
151 BRIGHAM CREEK AND 69 TRIG RD			
10.40ha	46,100	46,100	-
SITE ALSO HAS AREA OF REWORKED HISTORICAL EARTHWORKS.			
TOTAL SITE EARTHWORKS AREA			
11.69ha	48,200	48,200	-
SITE ALSO HAS AREA OF REWORKED HISTORICAL EARTHWORKS.			

NOTE:
1. ABOVE VOLUMES ARE RAW SURFACE TO SURFACE AND DO NOT REPRESENT TOPSOIL, UNSUITABLE, SHRINKAGE OR CIVIL SPOIL ADJUSTED VOLUMES.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS, SPECIFICATIONS AND REPORTS.
2. ALL WORKS AND MATERIALS TO COMPLY WITH THE RELEVANT COUNCIL ENGINEERING STANDARDS AND IN ACCORDANCE WITH THE BUILDING CODE.
3. THE CONTRACTOR IS TO LOCATE AND CONFIRM THE LOCATION OF ALL UTILITY SERVICES ON SITE, PRIOR TO ANY WORKS COMMENCING, INCLUDING PROTECTION OF THE SAME THROUGHOUT THE DURATION OF THE WORKS.
4. THE CONTRACTOR IS TO ENSURE THEY HAVE READ THE RESOURCE CONSENT, INCLUDING CONDITIONS, AND COMPLY FULLY.
5. THE CONTRACTOR IS TO ENSURE THE HAVE READ THE GOETECHNICAL INVESTIGATION REPORT.
6. REFER TO THE ABOVE REFERENCED G.I.R. FOR FULL DETAILS OF COUNTERFORT DRAINAGE, UNDERFILL DRAINAGE, SEEPAGE BARRIER KEYS & ALL OTHER GEOTECHNICAL REQUIREMENTS.
7. VOLUMES SHOULD NOT BE USED FOR CONTRACTOR COSTING.
8. EXISTING CONTOURS FROM SITE SURVEY AND COUNCIL GIS.

LEGEND

- PROPOSED CONTOUR MINOR (1m)
- PROPOSED CONTOUR MAJOR (5m)
- EXISTING CONTOURS (0.5m)
- PROPOSED CUT CONTOUR (1m)
- PROPOSED FILL CONTOUR (1m)
- PROPOSED ZERO CONTOUR
- EXTENT OF EARTHWORKS

Rev	Description	By	Date
A	FOR BULK EARTHWORKS APPROVAL	CK	11/19

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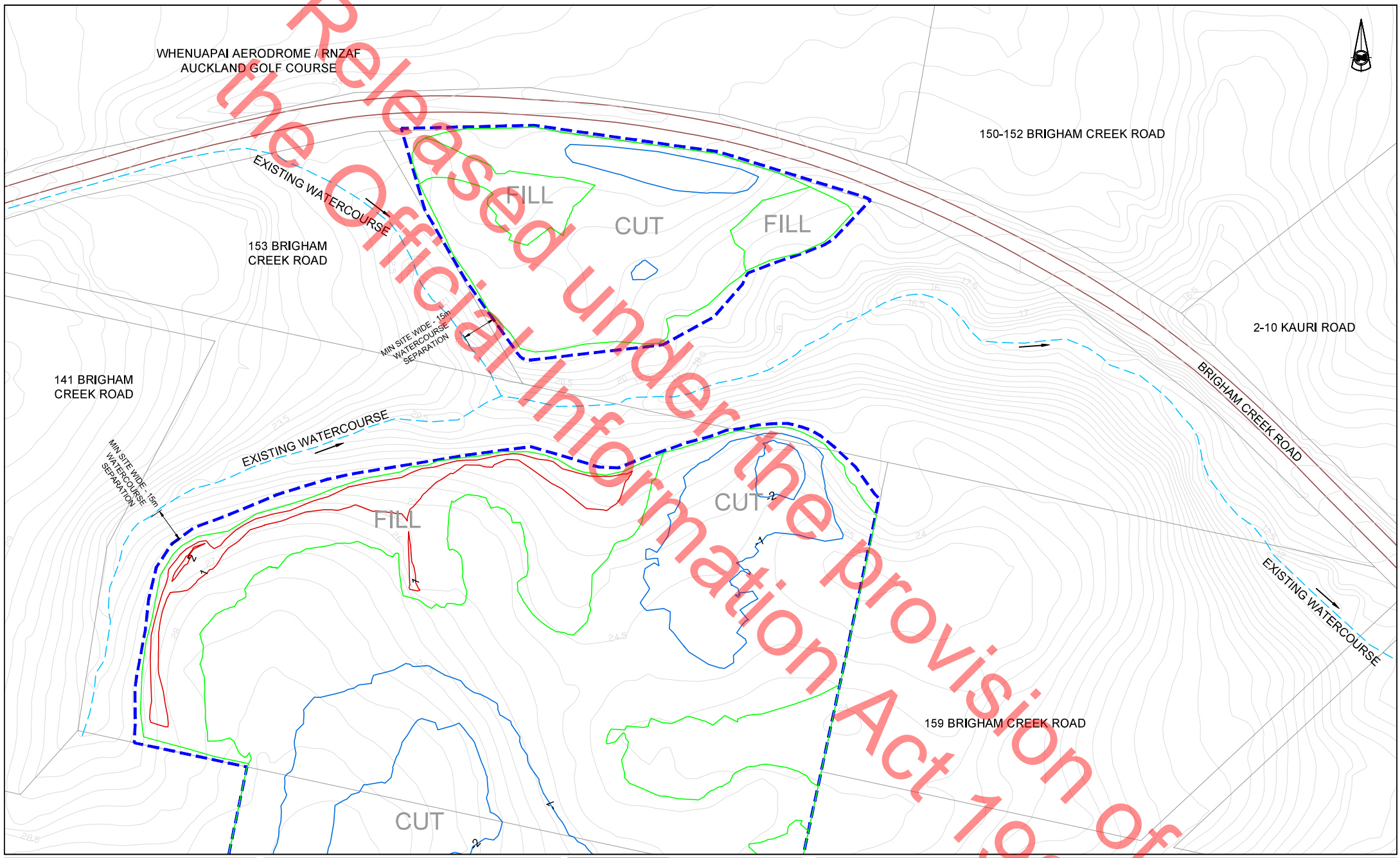
Job Title
BRIGHAM CREEK & TRIG ROAD
WHENUAPAI

Drawing Title
BULK EARTHWORKS
FINISHED CONTOURS
LOCATION PLAN

	By	Date
Surveyed:	DS	
Designed:	CK	
Drawn:	CK	11/19
Approved:	CK	

Scale: 1:1500@A3
Job No.
Drawing No.: 447-01-BE-200
Rev: A
CAD FILE: F:_PROJECTS\BRIGHAM CREEK TRIGG\DWG\ENG\BULK EW\447-01-EW-200.dwg



Rev	Description	By	Date
A	FOR BULK EARTHWORKS APPROVAL	CK	11/19

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Job Title
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Drawing Title
BULK EARTHWORKS
FINISHED CONTOURS
CUT FILL

	By	Date
Surveyed:	DS	
Designed:	CK	
Drawn:	CK	11/19
Approved:	CK	
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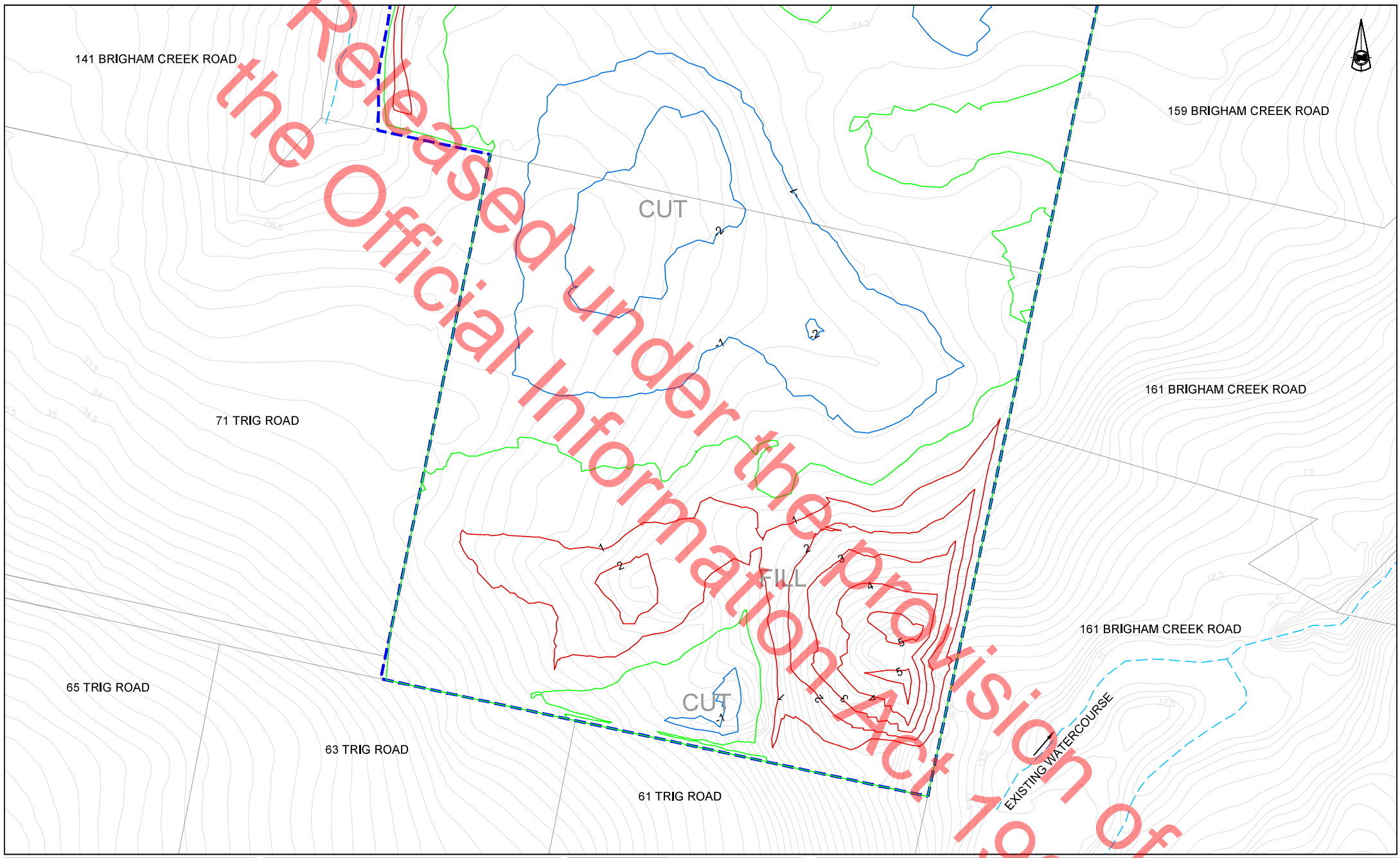
Scale: 1:1500@A3

Job No.

Drawing No.: 447-01-BE-203

Rev: A



Rev	Description	By	Date
A	FOR BULK EARTHWORKS APPROVAL	CK	11/19

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APPENDIX B: CONTAMINATED SOIL DISCOVERY GUIDELINES

CONTAMINATED SOIL DISCOVERY GUIDELINES (CSDG)

Reference Number: GSL/CSDG

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STATEMENT

These guidelines have been prepared in acknowledgement of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. They have been authorised by a suitably qualified and experienced practitioner (SQEP); and have been prepared with the intention of providing practices and procedures for the management of potentially contaminated land which meets the criteria of the NES and the MfE guidelines.

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1 INTRODUCTION

Contaminated land can be defined as, '*any land that has been adversely affected through the impact of human activity that has resulted in a significant alteration to the chemical, inorganic or organic characteristics of the naturally occurring soil material of the land*'.

Such a definition leaves a broad spectrum of potential physico-chemical characteristics which may apply. It is not the purpose of these guidelines to attempt to define all of the possible activities, characteristics, processes, or chemical compounds which may have an adverse impact upon naturally occurring soil material.

However, in the current field of contaminated soil investigation, disturbance, remediation and validation, and within the context of the *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health* (NES) there are situations that may be uncovered, or may present themselves in other ways, where the impact of man-made activities are both hazardous, in terms of human risk, and significant, in terms of environmental risk.

It should be noted that not all hazardous and significant contamination sources can be discerned by the eye, the ear or the nose and that any suspected occurrence of soil contamination should be scientifically investigated through the most appropriate means available.

It is hoped that this document can provide some additional guidance, examples, and discussion points around the investigation and assessment of particularly 'gross' or visually, olfactory and auditory significant contamination events, sources or plumes. It should not be taken that this document can replace suitable qualifications and experience, but rather can be used as general guide to the field practical methods used to immediately assess, prepare, and undertake the safe handling and immediate containment or excavation of contaminated soil materials.

2 PURPOSE

The practices and procedures in this report are intended to provide a field-practical process for the identification, assessment and management of grossly contaminated soil that may be encountered during earth breaking activities or other sub surface soil disturbance. These processes are intended to provide guidance on health, safety and environmental risks and risk management associated with earth breaking activities when gross evidence of contamination is encountered.

The practices and procedures outlined provide for first layer risk control and are one of many stages in the applicable health, safety and environmental risk management process. It is not intended to replace site specific health and safety plans, nor can it provide for every possible eventuality encountered in the field and cannot be reasonably expected to replace significant relevant on-the-job experience.

The *Health and Safety Guidelines on the Clean-up of Contaminated Sites* developed by Occupational Safety and Health Services (OSH) provides reference to appropriate H&S measures that can be adopted for contaminated sites and this is a key reference document when dealing with contaminated materials. These guidelines do not intend to replace the

guidance provided in that document and, if in doubt, it is the more preferable guidance document on provisions for Health and Safety when operating on contaminated soil sites.

3 INADVERTENT DISCOVERY OF CONTAMINATION

It is assumed that a site which has already been identified as 'contaminated' has been assessed with respect of the inorganic or organic characteristics which exceed the applicable criteria or threshold values as defined by the relevant legislation, rules, or plans. Identified contaminated sites will therefore already have appropriate protocols in place for the ongoing assessment, investigation, remediation and validation of the areas that have been defined as contaminated and have plans and procedures in place to protect both human health and the environment.

It still remains possible however, that unknown, unidentified or even identified but under-estimated, contamination may exist on such a site, or on a supposed 'non-contaminated' site. Such unknown contamination may be encountered as underground lenses (conglomerates of contamination in a localised zone), layers (widespread zone of contamination occurring along a stratified zone), hotspots (individual occurrences in a single location not otherwise connected), columns (vertical bands of contamination) or a plume (a zone of contamination moving along or through an aquifer / underground flow path and usually associated with seasonal or permanent groundwater flow).

In the event that 'unknown contamination' is encountered then it is advisable to have available some form of reference documentation that can provide insight to the frontline staff on the immediate signs, symptoms and actions that should be identified, assessed or considered while further advice is sought.

In all events encountering unknown soil contamination, a suitably qualified and experienced practitioner (SQEP) should be contacted for further advice, assessment and investigation.

4 GENERAL PROCEDURES

Below is a summarized guide of applicable steps which should be considered if any grossly contaminated material is encountered. The contaminated soil discovery guideline factsheets at the back of the report provide further details on the explicit health, safety and environmental risks associated with particular contamination scenarios, and the procedures to follow, however, in all instances the following general procedures summarized within the headings below should be considered. The steps highlighted below should not be considered exhaustive nor considered solely in step-by-step fashion, it may be necessary to conduct one or more actions at the same time or in differing order as a result of changing circumstances 'on the ground'.

4.1. STOP

- Stop working immediately and exclude others from working in the immediate area.
- Switch off machinery, generators etc., and establish a safe zone around the area dependent upon the assumed risk.

- For example, a gas release from an old landfill can be considered potentially toxic and / or explosive and a zone of approximately 10m may be considered appropriate depending upon the scale of the event.
- A series of dark red, brown or black stains in a pit with no odorous or free liquid discharges is unlikely to be immediately hazardous and the safe zone may extend to only the excavation edges.

- Prevent ingress or egress of stormwater, rainwater or wash water and stop all further activity immediately associated with the area.
- At this stage the extent, type and risk to health as a result of contamination is unknown – proceed with care and caution.

4.2. ADVISE THE SITE MANAGER

The site manager (or designated person) is the person principally in charge of health and safety on the site. They should also be familiar with these guidelines. The following steps are generally completed by the site manager or completed on the manager's delegation.

4.3. CONTAIN

If the contamination is leaving the site, or has the potential to leave the work site, then it should be contained. At this stage, the exact nature and risk of the contamination may not be known, so appropriate care and caution should be exercised. Some or all of the following methods may be used to contain the contamination:

- Sediment fences and straw bales;
- drain covers and sandbags;
- absorbent booms, spill mats, 'kitty litter' etc. can all be utilized to protect the environment from further release; and
- If containment is not possible, immediately contact:
  - ***Auckland Pollution Hotline*** **(09) 377 3107**.

4.4. ASSESS THE RISK

Not all contaminants, or all instances of contamination, will require special provisions or procedures. Similarly, an instance of contamination may be falsely or incorrectly reported. Not all stains are contamination, or all apparent plumes of oil on a liquid surface, are man-made occurrences.

- Refer to the factsheets at the back of these guidelines.
- Make a note of any or all of the following. It may be necessary to document and record some or all of the findings, for forwarding to the SQEP, as odours may dissipate and water may dry up or soak back into the soil:
  - Appearance – staining, trickling, flowing, bubbling (gas escape), thick, sticking to tools and equipment, sliding off tools etc.

- Odour – sweet, sour, petrol-like, tar-like, sharp etc.
- Colour or colours
- Miscibility i.e. does it or does not mix with water. Oil / solvents etc. do not mix with water and creates a coloured sheen on the water surface.

- If gross contamination is confirmed (or strongly suspected) then the appropriate measures should be put in place, dependent upon the risks concerned as defined in the factsheets. A half buried rusted drum of waste batteries will require different safety procedures to the discovery of a buried pile of asbestos cement board, for example.

4.5. CONTACT THE CLA (SQEP)

Contact the on-call contaminated land advisor – provide digital photographs if safely possible to do so. Talk to the CLA. They may advise additional steps to follow; they may be required to come to site.

4.6. RESTRICT ACCESS

Following the assessment of the risk, the safety zone can now be better defined.

- With reference to the factsheets, restrict access to the safe zone to only those members of the team that need to be there. It may be necessary in the case of potentially explosive vapour release, to cordon off a significant sized area and prevent working, or vehicular access, within that area.
- Consider the potential flow paths of vapours along trenches, down slopes, through drains etc.
- Access can be restricted through purely visual means, e.g. warning sings, via fencing or by staff management (security guard for example) or a mixture of all three based upon the site manager's assessment and the extent of the contamination.

4.7. ESTABLISH A WORKING TEAM AND PROVIDE WITH APPROPRIATE PPE

Before continuing, establish a team of competent trained individuals who can deal with the matter and ensure that they have, and are correctly wearing, the appropriate PPE for the situation at hand as defined in the factsheets. Consider the following when establishing the team:

- Experience – have they handled such a situation before?
- Competence – are they familiar with the tools, equipment, PPE and procedures that will be employed?
- Comfort – not all staff are comfortable with unknown situations. Will they be comfortable in this situation?

4.8. EXCAVATE

At some point, the contamination is likely to be removed. This may not be the case in every instance and the regulations allow for other actions such as in-situ remediation, stabilisation, encapsulation etc. and the SQEP will advise on the specific methodologies required. In certain circumstances a more detailed remedial plan may have to be compiled which will document specific goals, validations and disposal actions. The SQEP will advise on the requirements of the regulations. In most cases of localised acute instances of gross contamination, they can be safely managed immediately in the interests of protecting human health and the environment. In this case, some or all of the following processes should be followed:

- Excavation / Isolation – solid contaminants, soil, drums, refuse etc. can be excavated, by machine or by hand, directly into a covered truck or sealed skip, preventing further potential spread and isolating the contaminants for assessment and disposal;
- Vacuum extraction – contaminated water may be sucked up into a vacuum tanker, provided that there is no risk of reaction or explosion, where it can be isolated for assessment and disposal. DO NOT MIX water / liquid from more than one event in a vacuum truck;
- Separation – large separate items, such as asbestos sheet fragments, can be collected by hand, separated from the soil matrix and placed in double skinned plastic bags for appropriate disposal; and
- Absorbance – contaminated water, hydrocarbons and chemicals can all be absorbed through the use of contaminated pads, pillows and booms which can then be placed in sealed skips or bags and isolated for appropriate disposal.

4.9. DOCUMENT

Keep written documents, including digital photographs, of all measures used to contain or cleanup the contamination. This might include some or all of the following:

- Assessment measures used e.g. laboratory analysis, in-situ analysis (e.g. XRF), smell, behaviour in water (miscibility etc.), pH indicator test etc.;
- Staff involved in clean-up and experience;
- Methods used, problems encountered, discussions with SQEP;
- Complaints by third parties (e.g. odours, colour changes to local waterways etc.);
- Excavation or separation methods used, names of contractors etc.;
- Volumes extracted;
- Conditions of cartage, e.g. skip bin, covered truck, closed wheelie bins etc.
- Location of final disposal and disposal documentation e.g. tip dockets, weighbridge receipts etc.

4.10. DISPOSE

In order to ensure that all material is disposed of correctly, ensure the safe and licensed disposal of the material in accordance with the requirements outlined by the SQEP. In the majority of cases, examples of gross contamination are likely to require disposal at a licensed landfill facility e.g. Redvale Landfill or Hampton Downs Landfill. Other licensed facilities may exist that can handle potentially contaminated material, that may also be able to provide assistance.

- Contaminated liquids will not be received at landfill for disposal and must go to a licensed liquid disposal facility. Sewerage contaminated liquids can probably go directly to the nearest local sewer treatment facility, but chemical contaminated liquid will be required to go to an appropriate liquid treatment plant.
- Drums of unknown or unidentified waste may have to go to a solid / liquid hazardous waste handling plant.
- Contaminated PPE will also require appropriate disposal.
- In all instances, the receiving facility will be unlikely to receive and handle the material without some form of analysis or assessment of the composition of the waste.
- Keep all transport and disposal dockets for the final report.

4.11. REPORT

Communications and documentation will be kept during the procedures but a final report should be provided to the project manager detailing all of the steps, communications and records as required.

This report provides assurance to the regulatory authority that all the necessary steps have been followed and the matter has been adequately and professionally dealt with.

5 FACTSHEETS

5.1. PETROLEUM HYDROCARBONS

ACTIVITY

- Petroleum service station
- Vehicle workshop
- Gasworks sites

POTENTIAL CONTAMINATION

- Total Petroleum Hydrocarbons (TPHs)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Benzene, Toluene, Ethylxylene, and Xylenes (BTEX)
- Heavy Metals

DESCRIPTION

Petroleum-contaminated soils have a brown / black discolouration and an 'oily' consistency. Petroleum products, such as diesel and petrol, are insoluble in water and can form oil slicks in excavated areas such as trenches. Petroleum products in soil can be detected by the characteristic odour of petrol and diesel. BTEX produces a much 'sweeter' odour similar to that of paint-thinners.

HUMAN HEALTH AND ENVIRONMENTAL RISKS

Adverse reactions to strong hydrocarbon odours are possible, e.g. headaches, blurred vision, nausea. Contaminants can be absorbed into body via inhalation of dust, contact with skin, or ingestion. Leaked fuels can migrate into groundwater, potentially contaminating drinking water.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical / oil resistant steel-capped boots; (2) disposable coveralls; (3) chemical-resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face respirator.

HANDLING AND DISPOSAL

Pooled hydrocarbon spills can be removed using suitable absorbent materials or collected by a suitably rated vacuum tanker. Spills can also be transferred to a sealed container by an appropriately rated vacuum pump or similar. Hydrocarbon contaminated soil can be placed in a sealed leak proof skip bin or truck for disposal at a facility authorised to receive material of that kind.

5.2. HEAVY METALS

ACTIVITY

- Metal workshop
- Metallisation works
- Electroplating industries
- Timber treatment facilities

POTENTIAL CONTAMINATION

- Heavy Metals

DESCRIPTION

Gross contamination of heavy metals in soils can cause bands of discolouration within the soil profile. Pools of discoloured water (yellow, blue, red, orange) in excavated areas, such as trenches, are indicative heavy metal contamination. Solvents used for metal preparation, like BTEX, can form 'sheen' on the surface of water and produce a 'sweet' odour similar to that of paint-thinners.

HUMAN HEALTH AND ENVIRONMENTAL RISKS

Contaminants can be absorbed into body via inhalation of dust, contact with skin, or ingestion. Heavy metals have the ability to leach further into soil and eventually into groundwater, potentially contaminating drinking water. A consideration should be given to the potential of pH alteration as metal finishing plants often employ acidic solutions for metal preparation.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical / oil resistant steel-capped boots; (2) disposable coveralls; (3) chemical resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face mask or respirator.

HANDLING AND DISPOSAL

Heavy metal-contaminated soil can be placed in a truck and covered with tarpaulin for disposal at a facility authorised to receive material of that kind.

5.3. DRY CLEANERS

ACTIVITY

- Dry-cleaners

POTENTIAL CONTAMINATION

- Volatile hydrocarbons (trichloroethylene, tetrachloroethylene, carbon tetrachloride)

DESCRIPTION

It is difficult to distinguish soil contamination by solvents used for dry-cleaning. However, the solvents can form a bilayer with water they are less dense than water. The odours associated with dry-cleaning agents are very distinctive and can be described as 'sickly sweet', causing dizziness and nausea.

HUMAN HEALTH AND ENVIRONMENTAL RISKS

Contaminants can be absorbed into body via inhalation of vapours, contact with skin, or ingestion. Depending on atmospheric conditions, dry-cleaning agents may readily evaporate. Extended exposure to dry-cleaning agents can affect the central nervous system. Gross contamination of dry-cleaning agents in soil can migrate past the water table, making remediation complex.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical / oil resistant steel-capped boots; (2) disposable coveralls; (3) chemical-resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face respirator.

HANDLING AND DISPOSAL

Pooled hydrocarbon spills can be removed using suitable absorbent materials or collected by a suitably rated vacuum tanker. Spills can also be transferred to a sealed container by a suitably rated vacuum pump or similar. Solvent contaminated soil, including drums or containers, can be placed in a sealed leak proof skip bin for disposal at a facility authorised to receive material of that kind.

5.4. TANNERY / LEATHER PROCESSING

ACTIVITY

- Leather manufacture / treating facility

POTENTIAL CONTAMINATION

- Heavy Metals (particularly chromium)
- Solvents
- Pesticides
- Bleaching agents

DESCRIPTION

Gross contamination of chromium in soils, caused in the tanning stage of treating leather, can cause orange and blue bands of discolouration within the soil profile. Pools of discoloured water (orange, blue, green) in excavated areas, such as trenches, are indicative chromium and metal contamination.

HUMAN HEALTH AND ENVIRONMENTAL RISKS

Contaminants can be absorbed into body via inhalation of vapours and dust, contact with skin, or ingestion. Wastewater produced from the tanning process can have excessive levels of chromium and sulphides which can cause gross soil contamination if inadequately handled.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical / oil resistant steel-capped boots; (2) disposable coveralls; (3) chemical-resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face mask or respirator.

HANDLING AND DISPOSAL

Pooled liquid spills can be removed by using tailor-designed absorbent materials and via tanker or pump. Contaminated soil can be placed in a sealed skip bin or covered truck for disposal at a facility authorised to receive material of that kind.

5.5. ASBESTOS

ACTIVITY

- Improper disposal of asbestos-containing building materials

POTENTIAL CONTAMINATION

- Asbestos (fibres)

DESCRIPTION

Asbestos in soil is most likely due to burial of building materials. Asbestos fibres are usually entrained in a substrate material, making identification difficult. Broken cement, floor tiles, roof shingles, insulation, heat shields, and textured ceiling tiles manufactured between the 1950s and 1980s are likely to contain asbestos.

HUMAN HEALTH AND ENVIRONMENTAL RISKS

Asbestos can be absorbed into the lungs via inhalation of fibres. A significant acute or chronic exposure can lead to mesothelioma, asbestosis and lung cancer. Buried asbestos is relatively stable; however, disturbing asbestos during excavations could lead to the production of harmful fibres.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) disposable coveralls; (2) washable PVC gloves; (4) safety glasses; (5) suitably graded full face or half face P3 respirator.

HANDLING AND DISPOSAL

KEEP DAMP to suppress fibre generation. Large fragments may be collected by hand and place in double skinned plastic bags. Asbestos-contaminated soil can be placed in a sealed skip bin for disposal at a facility authorised to receive material of that kind. Soil of this kind can also be transported via sealed doubled bags or a sealed skip bin.

5.6. REFUSE

ACTIVITY

- Inorganic / Organic refuse disposal

POTENTIAL CONTAMINATION

- Variable, dependant on the type of refuse
- Contaminants could arise from liquid waste, putrid organic waste, and any material that would normally be sent to a licensed landfill

DESCRIPTION

Refuse in soil is most likely due to burial of waste materials that should have normally been sent to landfill. Waste could include, but not limited to, paint cans, oil / hydrocarbon containers, and putrid household waste. The odour of buried refuse is likely to be extremely pungent.

HUMAN HEALTH AND ENVIRONMENTAL RISKS

Due to the variability of types of refuse and waste, it is difficult to distinguish human health and environmental risks. Individual assessment of the risks will be required.

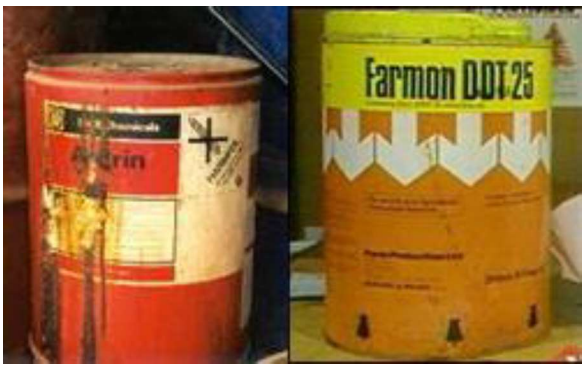
PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical-resistant steel-capped boots; (2) disposable coveralls; (3) chemical-resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face mask or respirator.

HANDLING AND DISPOSAL

Handling and disposal of refuse will be dependent upon the waste material identified.

5.7. PESTICIDES



ACTIVITY

- Horticultural activity
- Pesticide manufacture

POTENTIAL CONTAMINATION

- Pesticides, including DDT, dieldrin, and other organochloride pesticides (OCPs)

DESCRIPTION

Persistent use and storage of pesticides associated with horticultural activities are the main contributors to pesticide-related contamination in soil. Illegal burial of pesticide drums and containers may be encountered on production and agricultural sites. Pesticides are often found as fine, white powders.

HUMAN HEALTH AND ENVIRONMENTAL RISKS

Pesticide contaminants can be absorbed into body via inhalation of dust, contact with skin, or ingestion. Extended exposure to organochloride pesticides can disrupt the endocrine system as well as affecting DNA. DDT and its breakdown products, DDD and DDE, are highly persistent and do not breakdown easily in soil. DDT and its isomers have the ability to magnify through the food chain (bioaccumulate).

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical-resistant steel-capped boots; (2) disposable coveralls; (3) chemical-resistant gloves; (4) safety glasses; (5) suitably graded half-face or full face mask or respirator.

HANDLING AND DISPOSAL

If bulk pesticide storage containers are found, the site manager must be advised. Pesticide-contaminated soil can be placed in a truck and covered with tarpaulin for disposal at a facility authorised to receive material of that kind.

5.8. SEWAGE

ACTIVITY

- Underground sewage tanks / pipelines

POTENTIAL CONTAMINATION

- Raw sewage
- Bacteria / pathogens (*Escherichia coli*, *Vibrio cholerae*, etc.)

DESCRIPTION

Sewage in soil is most likely due to leaking underground septic tanks and / or sewer pipelines. The odour of sewage is likely to be extremely pungent.

HUMAN HEALTH AND ENVIRONMENTAL RISKS

Pathogens in sewage-contaminated soil can be absorbed into body via contact with skin or ingestion. Exposure to raw sewage can infect a person with an array of harmful pathogens, such as E. coli, which originate from faecal matter in wastewater. Gross contamination of raw sewage can lead to eutrophication of lakes, rivers, and other receiving bodies of water.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Required PPE for handling soil of this kind: (1) chemical-resistant steel-capped boots; (2) disposable / liquid repellent coveralls; (3) chemical-resistant / waterproof gloves; (4) safety glasses; (5) suitably full face mask or face shield.

HANDLING AND DISPOSAL

If raw sewage is encountered, the site manager must be advised. Sewage-contaminated soil can be placed in a truck and covered with tarpaulin for disposal at a facility authorised to receive material of that kind.