



GEOTECHNIQUE®
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REMEDIAL ACTION PLAN FINAL

PROPOSED RESIDENTIAL SUBDIVISION

**Lot 1 DP153167, Lot 6 DP1031236 and Lot 200 DP1288388
REDMOND PLACE, ORANGE**

REPORT NO 20674/2-AAR1 19 FEBRUARY 2026

Job No: 20674/2
Our Ref: 20674/2-AAR1
19 February 2025

Landcom
Level 14, 60 Station Street
PARRAMATTA NSW 2150
Email: swang@landcom.nsw.gov.au

Attention: Ms Stephanie Wang

Dear Stephanie

re: **Proposed Residential Subdivision
Lot 1 DP153167, Lot 6 DP1031236 and Lot 200 DP1288388
Redmond Place, Orange
Remedial Action Plan**

This report presents a remedial action plan (RAP), which once implemented and validated will render the above site suitable for the proposed subdivision development.

Reference should be made to the Executive Summary of this report.

If you have any questions, please do not hesitate to contact the undersigned.

Yours faithfully
GEOTECHNIQUE PTY LTD



LAN YE
Senior Environmental Engineer
B.E (Civil), MEng (Civil & Enviro)

EXECUTIVE SUMMARY

Geotechnique Pty Ltd (Geotechnique) was commissioned by Landcom to prepare a Remedial Action Plan (RAP) for a parcel of land currently registered as Lot 1 DP153167, Lot 6 DP1031236 and Lot 200 DP1288388, located at 154 Lone Pine Avenue, 3 Redmond Place and 5255 Mitchell Highway, Orange NSW.

It is understood that the proposed development will involve new subdivision including low to medium density residential lots, low rise apartments, local parks, stormwater basins, wetland and sewer pump station.

A detailed site investigation (DSI) report (Our Ref: 20674/1-AA dated 30 May 2025) conducted by Geotechnique had identified bonded asbestos containing material (ACM), lead, copper and zinc in test pit locations, as indicated and tabulated on Drawing No 20674/1-AA2.

The objectives of the RAP are to provide methods of remediation that can be implemented and validated so that a statement can be made declaring the site environmentally suitable for the proposed land use being residential development; to ensure all remediation works are carried out with due regard to the protection of the environment; to ensure all remediation works comply with current regulations and guidelines; and to provide details of the validation processes to be adopted during and at completion of remediation.

Remediation Strategy and Stages

The remedial works concern:

- Removal of demolition waste stockpile in the northwestern portion of the site;
- Excavation and off-site disposal of ACM-impacted fill soils from the vicinity of TP157;
- Characterisation of soils at the footprint of the stockpile after removal.

The preferred remediation strategy is excavation and off-site disposal. Where required, all wastes shall be transported to EPA-licensed facilities, after formal classification.

It is envisaged that the remediation works will be implemented in stages, as follows:

- **Stage 1** – Preliminaries and site establishment;
- **Stage 2** – Data gap closure;
- **Stage 3** – Remedial excavation of asbestos-impacted soils;
- **Stage 4** – Bulk excavation and waste classification;
- **Stage 5** – Final surface inspection;
- **Stage 6** – Validation report preparation.

Contingent Action

Should an unexpected find be discovered during the course of the remediation, or additional impacted soils be encountered, then the procedures described under the Unexpected Find Protocol (**Appendix C**) and/or the Validation Strategy (**Section 8**) will be implemented, until the remediation goals have been achieved and the site is deemed suitable for the intended land use.

In conclusion, Geotechnique considers that the site can be made suitable for the proposed land use through implementation of the processes described in this RAP.

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APPENDIX B	Supporting Information from the Investigation Phase
APPENDIX C	Unexpected Finds Management Protocol
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1.0 INTRODUCTION

Geotechnique Pty Ltd (Geotechnique) was commissioned by Landcom to prepare a Remedial Action Plan (RAP) for a parcel of land currently registered as Lot 1 DP153167, Lot 6 DP1031236 and Lot 200 DP1288388, located at 154 Lone Pine Avenue, 3 Redmond Place and 5255 Mitchell Highway, Orange NSW (hereby referred to as the site), as indicated on Figure 1 below:

FIGURE 1



Map Data ©2025 Google

It is understood that the proposed development will involve new subdivision including low to medium density residential lots, low rise apartments, local parks, stormwater basins, wetland and sewer pump station (**Appendix A**).

A detailed site investigation (DSI) report (Our Ref: 20674/1-AA dated 17 June 2025) conducted by Geotechnique had identified bonded asbestos containing material (ACM), lead, copper and zinc in test pit locations, as indicated and tabulated on Drawing No 20674/1-AA2.

The objectives of the RAP are to provide methods of remediation that can be implemented and validated so that a statement can be made declaring the site environmentally suitable for the proposed land use; to ensure all remediation works are carried out with due regard to the protection of the environment; to ensure

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all remediation works comply with current regulations and guidelines; and to provide details of the validation processes to be adopted during and at completion of remediation.

During the course of the program, it may become necessary to vary the sequence and/or details of the site remediation and validation works to meet site constraints. If so, any deviation from the methodology specified in this RAP is to be properly documented and approved, as required under the *Consultants Reporting on Contaminated Land* (EPA, 2020).

Performing remedial works without the supervision of a qualified environmental engineer/scientist may lead to project delays and extra costs, due to additional investigation requirements imposed by an independent consultant to confirm the environmental status of the site.

In worst case scenarios, waste materials removed from the site without proper characterisation and/or tracking, may lead to regulatory action and potential penalties, as described under the *Waste Regulation 2014* and the *Contaminated Land Management Act 1997*.

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2.0 SITE DESCRIPTION

2.1 Property Identification, Location and Physical Setting

Pertinent information regarding the site setting is presented in **Table 2-1**.

Table 2-1 Site Identification, Location and Zoning

Attribute	Description
Street Address	154 Lone Pine Avenue, 3 Redmond Place and 5255 Mitchell Highway, Orange NSW
Location Description	To the north: Rural Residential and Commercial To the east: Rural Residential and Mitchell Highway To the south: Rural Residential and Dairy Creek Road To the west: Low Density Residential and Lone Pine Avenue
Site Area	24.23 hectares
Lot and Deposited Plan (DP)	Lot 1 DP153167, Lot 6 DP1031236 and Lot 200 DP1288388
Local Government Authority	Orange City Council
Parish	Orange
Current Zoning	R1 General Residential, RE1 Public Recreation and SP2 Infrastructure Sewerage System (Orange Local Environmental Plan 2011)
Current Land Uses	The site consists of rural open grass land that is utilised for livestock grazing in the northern / northwestern portion of the site.

2.2 Regional Setting

Local topography, (hydro)geology and soil landscape information is summarised in **Table 2-2**.

Attribute	Description
Topography	The site slopes from the northwest to the southeast.
Regional Geology	The Geological Map of Orange (Geological Series Sheet 9030-1, Scale 1:50,000, Edition 1, 1967), published by the Geological Survey of New South Wales indicates the alluvial soils within the site to be Cainozoic units from the Tertiary period, comprising of pyroxene olivine basalt, plagioclase basalt, alkali basalt, trachybasalt and trachyandesite.
Soil Landscape	Soil and Landscape of Central and Eastern NSW eSPADE v2.2 (Online Dataset, 2025), prepared by the NSW Department of Planning, Industry and Environment indicates that the site is located within the North Orange Landscape area, typically consisting of undulating to rolling low hills on upper slopes with brown and yellow solodic soils in drainage depressions and non-calcic brown and red / brown podzolic soils in other areas.
Acid Sulfate Soil Risk	With reference to eSPADE v2.2 (Online Dataset, 2025), prepared by the NSW Department of Planning, Industry and Environment indicates the subject land lies within the map class description of No Known Occurrence, for which acid sulfate soils are not known or expected to occur in these environments.
Nearest Surface Water Feature	There are no named water courses located within the site. There are two wetlands connected by a creek located in the southeastern portion of the site. The closest water course is Dairy Creek, which is approximately 200m to the east of the site.

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3.0 SITE CHARACTERISATION

3.1 Previous Investigation

Previous investigation completed at the site were documented under the following report:

- Geotechnique (2025), *Detailed Site Investigation, Lot 1 DP153167, Lot 6 DP1031236 and Lot 200 DP1288388, Redmond Place, Orange NSW*, Report Ref. 20674/2-AA, dated 30 May 2025.

A summary of the findings provided by this report, relevant to the subject site, is presented in **Table 3-1**.

Table 3-1 Summary of Previous Investigation

Project Task	Findings
Detailed Site Investigation (Geotechnique, 2025)	
Objectives	The objectives of the assessment were to ascertain whether the site potentially presents a risk of harm to human health and the environment, and to determine the suitability of the site for the proposed residential subdivision project, in consideration of State Environmental Planning Policy (Resilience and Hazards, 2021-Chapter 4 Remediation of Land) under the Environmental Planning and Assessment Act 1979.
Scope of Works	▪ Review of previous contamination investigations. ▪ Scanning of sample locations by a services locator. ▪ An inspection of accessible open area by an Environmental Scientist to determine current site conditions and identification of any environmental concerns based on visual and olfactory indicators of potential contamination. ▪ In accordance with the NSW EPA (2022) Contaminated Land Guidelines - Sampling Design part 1 – Application, for a site of about 24.23 hectares, 271 sampling points are required. However, to gain an “indication” of potential site contamination, limited samples were recovered from sixty-nine (69) locations. ▪ Re-instatement of the test pits after sampling. ▪ Forwarding the soil and quality assurance (QA) / Quality Control (QC) samples to National Association of Testing Authorities (NATA) accredited laboratories for testing of potential contaminants of concern (PCOC). ▪ Assessment of the laboratory analytical results. ▪ Assessment of the field and laboratory QA/QC. ▪ Assessment of the contamination status of soil at the sampling locations.
Data Gap	The condition of soil within the footprint of the stockpile after removal.
Findings	The findings of this DSI are summarised as follows: ▪ The site consists of rural open grass land that is utilised for livestock grazing in the northern / northwestern portion of the site. A stockpile was noted in the northwestern portion of the site. ▪ Based on the site history and site inspection, several areas of concern and potential contaminants were identified within the site as summarised in the table presented in Section 7.0. ▪ The general soil profile encountered during the soil investigation was a layer of topsoil / filling (to the depths of up to 0.2 mBGL), overlying natural silty clay. ▪ No contaminants of concern (primary metals, BTEX compounds, PAHs, OCPs, OPPs, PCBs, Phenols and PFAS) were reported at concentrations above adopted health-based

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Project Task	Findings
	criteria with exception of Lead in sample TP151 (0.0-0.3) as indicated in Drawing No. 20674/1-AA2. ▪ Bonded ACM (>7mm) in soil sample TP157 (0.0-0.15) exceeded the HSL A. Five fibro-cement piece samples tested positive as ACM - FCP150 (surface sample), FCP151 (0.0-0.3), FCP152 (0.0-0.3), FCP152 (0.5-0.8) and FCP157 (0.0-0.15). ▪ Exceedances of the EIL were present for copper and zinc in sample TP151 (0.0-0.3) and zinc in sample TP151 (0.5-0.8). ▪ Data gaps were identified in the current conceptual site model.
Recommendations	▪ Preparation and implementation of a Remedial Action Plan (RAP). ▪ Undertake supplementary investigations, and subsequent remediation and validation works for the site, as outlined in the RAP. ▪ Preparation of a final site validation report by a suitably qualified environmental consultant, certifying site suitability of soils for the proposed land use.

3.2 Conceptual Site Model

In accordance with NEPC (2013) Schedule B2 - Guideline on Site Characterisation, Geotechnique developed a conceptual site model (CSM) as part of the investigation phase. The CSM assessed plausible linkages between potential contamination sources, migration pathways and receptors.

3.2.1 Sub Surface Conditions

Majority of the site was covered by topsoil (approximately 0.2m below the EGL) underlain by natural silty clay. Fill materials were encountered in TP113, TP130, TP141, TP142, TP143, TP148, TP151, TP152, TP153, TP154, TP155, TP157 and TP162, generally comprising Silty Clay, low to medium plasticity, orange to brown, with gravel/rootlets with inclusions of concrete, pavers, metal wire, bricks and tiles fragments at depths ranging from approximately 0.2m to about 1.5m below the EGL.

More details are provided in **Appendix B**.

3.2.2 Updated Potential Contamination Sources

Based on the review of previous DSI (Geotechnique, 2025), the primary potential contaminant sources at the site are outlined in **Table 3-2**.

Table 3-2 Contaminant Sources

Potential Contaminant Source	Contaminants of Potential Concern (COPCs)
Stockpile in the northwestern portion of the site	▪ Lead, copper, zinc; and ▪ Asbestos
Surface ACM fragments in the vicinity of TP150	▪ Asbestos
Fill Materials in the vicinity of TP157	▪ Asbestos

3.2.3 Exposure Pathways and Receptors

The potential contamination sources, exposure pathways and human and environmental receptors that were considered relevant for this document are summarised in **Table 3-3**.

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Table 3-3 Conceptual Site Model

Potential Sources	Impacted Media	Chemicals of Potential Concern	Transport mechanism	Exposure pathway	Potential receptor
Fill of unknown origin and quality placed at the site	Soil	PM and asbestos	Disturbance of surface and subsurface soils during site redevelopment and during future intrusive works	Ingestion Dermal contact Inhalation of dust particulates	Demolition and construction workers; Future intrusive workers; Future users of the site.
			Atmospheric dispersion from soil to outdoor and indoor air spaces	Inhalation of dust particulates	

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4.0 REMEDIATION GOALS AND CRITERIA

4.1 Remediation Goals

The remediation goals for this document are consistent with *SEPP 2021* and Council's contaminated land policy. These include:

- Meeting the conditions of the planning consent, to render the site suitable for the proposed land use(s);
- Demonstrating that the proposed remediation strategy for the site is environmentally justifiable, practical and technically feasible;
- Adopting clean-up criteria appropriate for the future use of the site, to mitigate possible impacts to human health and the environment;
- Consideration of the principles of ecologically sustainable development in line with Section 9 of the Contaminated Land Management Act 1997;
- Minimising waste, as per the Waste Avoidance and Resource Recovery Act 2001;
- Remediating all contamination at the site, so there are no unacceptable risks to on-site and off-site receptors; and
- Demonstrating that the plans for management of remediation work consider work health and safety, environmental management and site contingencies.

4.2 Remediation Criteria

The remediation acceptance criteria (RAC) to be adopted for the site are outlined in **Table 4-1**. These were selected from available NEPC- and NSW EPA- approved guidelines or endorsed default publications (where necessary and justified), with due consideration of the exposure scenario that is expected for the site, the likely exposure pathways and the identified potential receptors.

Table 4-1 Proposed Remediation Criteria

Media	Adopted Guidelines	Rationale
Soil	Health based Investigation (HIL) & Screening Levels (HSL)	Soil Health-based Investigation Levels (HILs) NEPC (2013) <i>HIL-A</i> thresholds for residential settings with garden / accessible soils. Soil Health-based Screening Levels (HSLs) NEPC (2013) <i>HSL-A</i> and <i>B</i> thresholds for vapour intrusion at low to high density residential sites, to assess potential human health impacts from residual vapours resulting from petroleum, BTEX and naphthalene. Asbestos Health Based Screening Levels For asbestos in soil, the following criteria are applicable: ▪ Bonded ACM - <i>HSL-A</i> in all areas of the site; ▪ Friable Asbestos: 0.001% w/w in all areas of the site; ▪ No visible asbestos on soil surface in all areas of the site. Ecological Investigation Levels (EILs) / Ecological Screening Levels (ESLs) NEPC (2013) EILs/ESLs for urban residential and public open space land use scenarios. Ecological criteria were adopted to assess the potential impact to proposed landscaping areas, where plants could be exposed to soils and where precipitation may result in subsurface infiltration and resulting leaching of soil impacts to groundwater. The derived EIL criteria presented can be based on the addition of site

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Media	Adopted Guidelines	Rationale
		specific Added Contaminant Limit (ACL) criteria and the Ambient Background Concentration (ABC) for a NSW suburb. The adopted ESL criteria presented is based on fine or coarse grained criteria.

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5.0 REMEDIATION TECHNOLOGY

5.1 Regulatory Overview

Under the NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Amendment Measure*, the preferred hierarchy for site remediation and/or management is:

- On-site treatment of the contamination so that it is destroyed or the associated risk is reduced to an acceptable level; and
- Off-site treatment of excavated soil, so that the contamination is destroyed or the associated risk is reduced to an acceptable level, after which soil is returned to the site; or, if the above are not practicable:
- Consolidation and isolation of the soil on-site by containment with a properly designed barrier; and
- Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material; or
- Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

When deciding which option to choose, the sustainability (environmental, economic, and social) of each should be considered, in terms of achieving an appropriate balance between the benefits and effects of undertaking the method.

For this site, a number of remediation options were reviewed to examine the suitability of each method, the surrounding properties, geological and hydrogeological limitations and the following considerations:

- Development requirements;
- Prioritisation of works in areas of most concern;
- Ability of remedial method to treat contamination with respect to material and infrastructure limitations;
- Remedial timetable;
- Defensible method to ensure the site is remediated to appropriate levels / validation criteria; and
- Regulatory compliance.

5.2 Remediation Technologies Review

Various soil remediation options were reviewed to examine the suitability of each method, with due regard for the surrounding land uses, as well as the (hydro)geological limitations. Each of the available remediation technologies is summarised in terms of its suitability in **Table 5-1**.

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Table 5-1 Remedial Technology Review - Soils

Remediation Methodology	Description	Advantages	Disadvantages	Suitability
No Action	Can be considered if there is no measurable contamination (contaminant concentrations below adopted criteria), or exposure is unlikely and contaminants are not mobile.	No remediation costs. Creates minimal disturbance to the site.	Would pose limitations on land use options. May require a long term environmental management plan (LTEMP) and ongoing monitoring.	<u>Not Suitable</u> Exceedances were detected during previous investigations and there is potential for exposure to receptors.
On-site bioremediation	Excavated soils are broken down and aerated, mixed with reagents to help microorganism populations grow, stockpiled and aerated above ground.	Cost effective if soils are reused on site. Lower disposal costs (if any). Limited requirement to import fill material to site.	Material handling area required. Longer remediation timeframes. Potential for odour problems.	<u>Not suitable</u> Method not suitable for asbestos.
<i>In situ</i> treatment	<i>In situ</i> treatment of impacted soils within the vadose and saturated zones using forced advection or abiotic injection methods, such as soil vapour extraction, in situ chemical oxidation, etc.	Minimal disturbance (no excavation). Cost effective for large scale site remediation of lighter petroleum hydrocarbons. Potential to simultaneously remediate soil and groundwater (if impacted).	High establishment costs (equipment and installation). Potential for odour and/or health and safety problems. Requires detailed design and pilot trials.	<u>Not suitable</u> Method designed for widespread hydrocarbon impacts. Not suitable for asbestos.
Consolidation and/or capping	Impacted soils managed (retained) on-site by capping the surface of a defined area with geotextiles and/or a clean, impermeable layer of fill material.	Effectively removes risk to human health by eliminating exposure pathways.	Requires detailed capping design. Would pose limitations on land use. Typically requires a LTEMP.	<u>Potentially suitable</u> A LTEMP would be required, due to the retention of contaminated materials.
Excavation and off-site disposal	Transport materials directly to a licensed landfill facility. Reinstate site with imported clean fill material.	Fast, impacted material can be removed immediately. Eliminates vapour/odour issues. Minimal design and management costs.	High costs associated with disposal of wastes and importation of backfill. Requires waste classification and tracking, keeping of records. Sustainability issues related with disposal to landfill.	<u>Suitable</u> Will meet the key objective to make the site suitable for residential use without the need for LTEMP / ongoing monitoring.
Natural attenuation	Allowing the contaminants to biodegrade naturally while systematically monitoring the contamination plume behaviour.	Minimal disturbance (no excavation). Sustainable and cost-effective remediation method.	Longer remediation timeframes. Potential for further impacts on the groundwater aquifer and nearby environmental receptors. Typically requires a LTEMP.	<u>Not Suitable</u> Asbestos is a contaminant concern and is not amendable to natural attenuation.

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5.3 Preferred Remediation Option

Based on the available technologies and the cost effectiveness of each, as well as the proposed site development and the potential risks to human health and the environment, the preferred remediation strategy for the site is excavation and off-site disposal of impacted soils to licensed waste facilities.

All wastes shall be transported to appropriate, EPA-licensed facilities, after formal classification. All excavated (remediation) areas shall be validated by base and wall soil sampling. Where required, the site will be reinstated with validated, imported (or recovered) excavated natural materials.

Note that on-site consolidation (encapsulation) and/or capping of impacted materials may be a secondary option, where economic constraints dictate.

5.4 Remediation Works Category, Consent and Planning

5.4.1 Sub Surface Conditions

In accordance with the *State Environmental Planning Policy (Resilience and Hazards) 2021*, the category of the remediation works defines whether consent is required prior to commencement. Under *SEPP 2021*, works where there is the potential for significant environmental impact are classed as *Category 1* and require development consent. *Category 2* works pose a low potential for environmental impact and do not therefore require prior consent. The determination for this site is given in **Table 5-2**.

Table 5-2 Remediation Works Category Determination

Significant Environment Impact	Yes/No	Category
Designated Development or State Significant Development	No	2
Critical or threatened species habitat	No	2
Impact on threatened species, populations, ecological communities or their habitats	No	2
In area identified environmental significance such as scenic areas, wetlands (see list*)	No	2
Comply with a policy made under the contaminated land planning guidelines by the council	Yes	2
Is work ancillary to designated development	Yes	2

Notes: * Environmental significance list -coastal protection, conservation or heritage conservation, habitat area, habitat protection area, habitat or wildlife corridor, environment protection, escarpment, escarpment protection or escarpment preservation, floodway, littoral rainforest, nature reserve, scenic area or scenic protection, or wetland.

Based on this determination, the remediation works for the site are considered *Category 2* and do not require development consent. Nevertheless, 30 days prior to commencement of remediation, notification to the consent authority (Orange City Council) will be made. The council has the right of intervention after that time for a breach of the *NSW EPA Act 1997* or non-compliance with *SEPP 2021*. The notification will also serve as the basis for updating Council records on properties in the local government area and will:

- Be in writing;
- Provide contact details for the notice;
- Briefly describe the remediation work;
- Show why the remediation is considered Category 2 work;
- Specify the property description, including street address, on which the remediation is to be carried out;
- Provide a location map; and

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- Provide estimates for commencement and completion dates of the work.

Provision of this RAP, as well as an indication of commencement and completion dates of the works in writing, is usually sufficient to meet the requirements of this notification.

5.4.2 Development Consent and Control Plans

All works must be in accordance with a site specific DCP (currently in draft) and any specific consent conditions issued for the development.

5.4.3 Planning Requirements

The appointed site contractor must prepare a site-specific Work Health and Safety Plan (WHSP) and Construction Environmental Management Plan (CEMP) for the project, covering human / environmental health and safety issues, as well as all measures required under Council's DA approval and DCPs.

As removal of ACMs is required, a project-specific Asbestos Management Plan (AMP) must be followed for all site works. The appointed asbestos removal contractor must be appropriately licensed. The licenced asbestos removal contractor (LARC) must notify SafeWork NSW in writing at least five days before the remedial work commences.

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6.0 REMEDIATION WORKS

6.1 Remediation Sequence

Site characterisation revealed heavy metal exceedances (lead, copper and zinc) and presence of demolition waste including asbestos containing materials (ACM) in the vicinity of the stockpile at northwestern portion of the site, plus one localised area with asbestos-impacted fill soils (i.e. the vicinity of TP157).

Notes:

No respirable fibres were detected in the fill soil samples from TP151, TP152 and TP157; rather the ACMs were limited to cement sheet fragments. The impacts were expected to be limited to the topsoil / fill layer ($\leq 0.2\text{m}$ BGL) at TP157 and within the stockpile.

The site remediation works will therefore include (though not necessarily be limited to):

- **Stage 1** – Preliminaries and site establishment;
- **Stage 2** – Data gap closure;
- **Stage 3** – Remedial excavation of asbestos-impacted soils;
- **Stage 4** – Bulk excavation and waste classification;
- **Stage 5** – Final surface inspection;
- **Stage 6** – Validation report preparation.

Contingent Action

Should an unexpected find be discovered during the course of the remediation, or additional impacted soils be encountered, then the procedures described under the *Unexpected Find Protocol* (**Appendix C**) and/or the *Validation Strategy* (**Section 8**) will be implemented, until the remediation goals have been achieved and the site is deemed suitable for the intended (subdivision and residential) land use.

6.2 Stage 1 – Preliminaries and Site Establishment

Council Notification

Notice must be given to Council at least 30 days prior to the commencement of remediation works (**Section 5.4**). A list of all required work permits must be obtained from Council and arrangements are to be made to obtain the necessary approvals from the relevant regulatory authorities.

Site Preparation and Planning

The site should be prepared in accordance with the general requirements of the site management details outlined in **Section 6**. Before site works commence, the site contractor(s) will prepare site specific plans including a WHSP, CEMP and an AMP.

It will also be necessary to establish environmental controls, site access, security, fencing and any required warning signage prior to works commencement.

A project plan should also be developed to outline engineering design for excavation support, staging of excavation works, stockpiling, waste stabilisation, waste material loading, traffic management and waste tracking.

The project plan should incorporate a staging plan that outlines the basic stages of the remediation works. The staging plan should include, but not be limited to:

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- Staging of areas to be excavated;
- Areas designated for waste segregation, screening and storage (stockpiling), amenities, soil and groundwater treatment;
- Truck movements to allow loading to mitigate impacts to surrounding land users and council infrastructure; and
- Details of any required environmental management measures such as, dust control.

Remediation Workshop

As part of the site preparation phase a remediation workshop should be conducted with the appointed contractor(s) to further develop required remedial measures, excavation plans, waste classifications, and environmental management requirements. It would be appropriate for the appointed environmental consultant to be present at the workshop to provide guidance in relation to environmental management measures to be applied during the remediation and site validation activities.

6.3 Stage 2 – Data Gap Closure

Characterisation of Stockpile Footprint Soils

Additional soil characterisation will be conducted following removal of the existing stockpile. The tasks will include:

- Excavation test pits within stockpile footprint. The pits are to be advanced to the depth of the natural soils.
- Analysis of representative samples for the COPCs, specifically:
 - Heavy Metals (including lead, copper and zinc); and
 - Asbestos.

Delineation of ACM Impacts at TP157

Investigations completed to date suggest that ACM contamination within the vicinity of TP157 is limited to the topsoil fill layer ($\leq 0.2\text{m}$ BGL).

This location will be delineated using an initial 5m x 5m square grid, stepping out 2.5m in each direction from the original borehole, as illustrated in **Figure 6-1** below.

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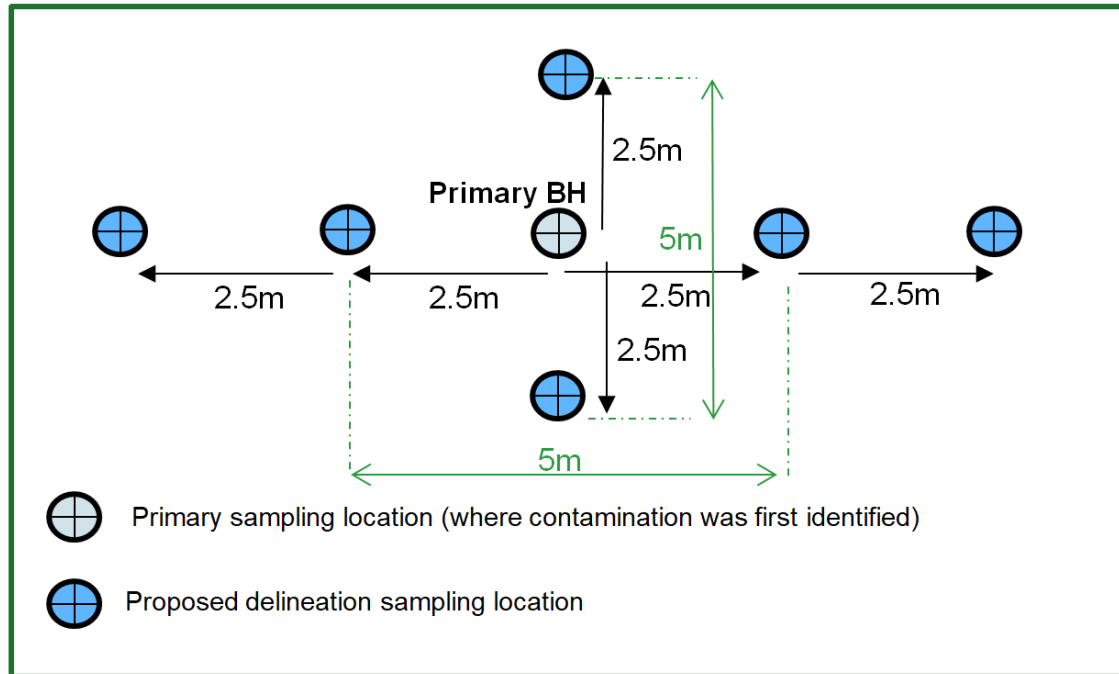


Figure 6-1 Proposed delineation sampling locations

A test pit is to be excavated at each delineation point. The sampling is to extend to natural soils. The analytical program shall include the 10L and 500mL quantitative (gravimetric) methods for asbestos (minimum of four samples to be tested).

Should results for any of the initial delineation samples exceed the adopted criteria, additional delineation will be performed, stepping out a further 2.5m from the corresponding pit.

Notes:

All data gap closure investigation relating to asbestos in soil is sampling by way of test pitting (not boreholes), in accordance with WADOH (2021) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*.

All additional (data gap closure) investigation is to be designed under a specific SAQP, as per the requirements of EPA (2020) *Consultants Reporting on Contaminated Land*. Reference should also be made to EPA (2022a) *Sampling Design Part 1 – Application* and EPA (2022b) *Sampling Design Part 2 – Interpretation*.

6.4 Stage 3 – Remedial excavation of asbestos-impacted soils

Following delineation of the lateral and vertical extents of ACM-impacted soils, remedial excavations will be conducted under the supervision of a suitably qualified environmental professional. Prior to their inception, a remedial work method statement (RWMS) shall be agreed upon by all parties concerned, namely the principal / project manager, remediation contractor and environmental consultant. This statement shall document the remedial (excavation) works required.

In summary, ACM-impacted areas will be remediated using the following procedure:

1. Mark out the impacted area (as determined by the delineation works). The extent of the impact should be marked in a way to withstand external conditions and should be readily identifiable during the entire remedial works program, to enable contaminated soil chase-out excavations and revalidation, if necessary.

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2. Plant, machinery and/or other equipment used for the excavation works should be dedicated to the individual excavation, and should be clean and free of all solid materials prior to the start of remedial excavation works.
3. Soils which have been classified will be excavated and directly loaded onto a transport vehicle (tipper).
4. Under the *NSW Waste Regulations 2014*, different waste streams must be kept separate. Soils with different waste classifications cannot be loaded onto the same waste transport vehicle, for landfill disposal purposes.
5. Should the temporary stockpiling of excavated, contamination soils be necessary, soils from different areas must be stockpiled separately and isolated from all other excavated materials, on an impermeable surface (such as a plastic liner). Stockpiles should also be protected from wind to avoid airborne dispersion of dust.
6. Any soils with heavy staining and/or exhibiting odours are to be isolated from other excavated materials, for additional waste classification sampling and testing.
7. Validation samples will be collected from excavation surfaces for laboratory analysis of the contaminant (or group of contaminants) for which the respective area is being remediated (i.e. asbestos). Validation sampling methodology is described in **Section 8**.
8. Should any validation sample from any remedial excavation be found to contain contaminant concentrations that exceed the adopted soil remediation criteria, additional chase-out excavations will be conducted to remove more fill from the area of residual impacts, followed by resampling for revalidation testing.
9. When all validation samples show results that are below the adopted remediation criteria, the area will be deemed as effectively remediated.

Appropriate dust control measures must be implemented during excavation of soil material at the site, as described in **Section 8**. Should odours be significant enough to cause nuisance at a site boundary, then measures for odour control must be adopted, as described under the unexpected find protocol (**Appendix C**).

Notes:

The "chase-out" excavation procedure shall be adopted for any unexpected find identified during the remediation program. Validation testing of such will depend on the specific COPC(s).

Additional waste classification may be necessary for suspicious materials which exhibit odours or appear stained or discoloured. The discovery of such soils will trigger the *Unexpected Find Protocol* provided in **Appendix C**. In this situation, the appointed environmental consultant should be immediately informed, so that evaluation and waste characterisation can be undertaken.

Generators and transporters of *Special Waste (Asbestos)* have a legal obligation to ensure their waste is transported to a lawful place under Clauses 76 and 79 of the *Protection of the Environment (Waste) Regulation 2014*. Consignors, transporters and facilities receiving such waste must use "Integrated Waste Tracking Solution - IWTS" to provide information to the EPA regarding their movement within NSW. The EPA website <https://wastelocate.epa.nsw.gov.au/> provides further information.

6.5 Stage 4 – Bulk excavation and waste classification

Bulk Excavations

The process for conducting bulk (non-contaminated soil) excavation, waste classification and disposal will be as follows:

- Plant, machinery and/or other equipment used for the excavation works should be dedicated to the individual excavation.

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- Fill and natural soils to be excavated must be pre-classified according to EPA (2014) *Waste Classification Guidelines*. Waste classification reports must be issued by the environmental consultant.
- Soils which have been classified will be excavated and directly loaded onto EPA-licensed vehicles for transport to the identified landfill premises.
- Under the *NSW Waste Regulations 2014*, different waste streams must be kept separate. Soils with different waste classifications cannot be loaded onto the same waste transport vehicle, for landfill disposal purposes.
- Should the temporary stockpiling of excavated soils be necessary, soils from different areas must be stockpiled separately and isolated from all other excavated materials, on an impermeable surface (such as a plastic liner). Stockpiles should also be protected from wind to avoid airborne dispersion of dust.
- Any soils with heavy staining and/or exhibiting odours are to be isolated from other excavated materials, for additional waste classification sampling and testing.
- The earthworks and transport contractors must identify suitably licenced waste landfill premises for disposal of waste materials and confirm that the premises will accept the waste in accordance with its environmental protection license.
- Waste transport contractors must carry a copy of the relevant waste classification with every transported load.
- A site log shall be maintained by the earthworks contractor, including a numbered location for each excavation area, to enable the tracking of loads against on-site origin and final destination.
- Waste must be transferred to the designated landfill according to applicable legislation and via a pre-determined haul route. Council shall be notified of the intended route.
- The transport contractor must supply all waste (tipping) dockets to the environmental consultant, via the site manager, for validation reporting purposes.

Management of VENM

Virgin excavated natural material (VENM), as defined in the EPA (2014) *Waste Classification Guidelines*, may be suitable for on- and off- site reuse. Confirmation of the VENM waste classification must be made with the concurrence of appointed environmental consultant. The re-use of VENM at an off-site location must be approved in writing by the receiving site land owner before it is transported from the site.

The earthworks contractor must provide the following to the environmental consultant and client for reporting purposes:

- All approval documents and correspondence from the receiving site authority and approver;
- Details of volume(s) excavated from the site, including the measured depth below existing ground level, or surveyed elevation of the VENM at the top and bottom excavation levels;
- Laboratory results from samples of designated material verifying a classification as VENM;
- A description of the VENM that was sent to the receiving site; and
- Copies of VENM weighbridge dockets, trip tickets and/or consignment disposal confirmation that confirms the date, exit time, and truck license plate and operator for each load.

In advance of VENM excavation, VENM must be protected from exposure to site contamination activities or materials. Measures to protect VENM from exposure to contamination may include:

- Covering VENM in-situ or in stockpile with plastic sheeting;

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- Placing stockpiled VENM on top of protective plastic sheeting;
- Minimising time of exposure to the site environmental conditions; and
- Relocating contaminated soils and/or contaminating activities (i.e. plant refuelling) away from VENM.

Management of ENM

If the volume of natural soils to be removed includes up to 2% of foreign materials, then a classification of *excavated natural material* (ENM) might be achievable, subject to compliance with the corresponding classification. This classification must be verified by sampling and laboratory analysis to confirm that the materials meet the specific requirements detailed in the EPA *Excavated Natural Material Order 2014* (and *Exemption 2014*).

Waste Classification of Stockpiles

Stockpiled materials designated for waste classification will be collected at a rate of one sample per 25m³ (minimum of three samples) up to 250m³. For stockpiles exceeding 250m³ but less than 2,500m³, a minimum of 10 samples is required and a 95% upper confidence limit of the arithmetic mean (95% UCL) may be used.

The analytical suite for waste classification will include six priority metals (arsenic, cadmium, chromium, lead, mercury and nickel), TPH, BTEX, PAH, OCP, OPP, PCB and asbestos (10L samples for quantification analysis according to NEPM 2013), with TCLP testing (as required) and any additional chemicals of potential concern that may be identified during site remediation.

Stockpiles from different (remediation) areas and different soil profiles shall be kept separate. Each shall have a waste certificate, stating the interpreted classification.

Stockpiles should be placed on either intact hardstand pavement or high-density polyethylene (HDPE) plastic liner and limited to a maximum height of 2m. Stockpiles should be surrounded by star pickets and marking tape, or other suitable material, to clearly delineate boundaries. Stockpiles shall be lightly conditioned by water sprinkler to prevent dust blow and/or covered with tarp if longer duration is required. Where stockpiles are to remain onsite for a period >24 hours, silt fences or hay bales should be erected around each stockpile to prevent losses from surface erosion (runoff).

6.6 Stage 5 – Final surface inspection

A clearance inspection by a LAA will be required at the conclusion of the remediation works, as defined under the SafeWork NSW (2019a) *How to Safely Remove Asbestos* code of practice.

At this stage, only visual assessment is anticipated for final site validation. The need for analysis of representative samples of the remaining ('clean' / natural) soils will be determined by relevant findings during Stages 1-4 of the remediation program.

If final surface validation is deemed necessary with sampling, the methodology will be in accordance with that presented in **Section 8**, adopting a systematic sampling pattern. It is to be designed under a specific SAQP, as per the requirements of EPA (2020) *Consultants Reporting on Contaminated Land*. Reference will also be made to EPA (2022a) *Sampling Design Part 1 - Application* and EPA (2022b) *Sampling Design Part 2 - Interpretation*. The SAQP shall be approved prior to the surface validation proceeding.

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Should any surface validation sample be found to contain impacted soils, additional 'chase-out' excavations (as per Stage 3) will be conducted on the corresponding area, to remove the residual impact followed by resampling for validation purposes.

When satisfied that the site is free of contamination, a clearance certificate will be issued. This certificate shall be included in the final site validation report, which shall be drafted in accordance with the EPA (2020a) *Consultants Reporting on Contaminated Land*.

6.7 Stage 6 – Validation report preparation

Upon completion of the required remediation and validation programs, the environmental consultant shall draft the *Environmental Site Remediation and Validation* report in accordance with the EPA (2020) *Consultants Reporting on Contaminated Land*. The report will document all remedial actions conducted, including profile descriptions of the additional (data gap closure and delineation) investigations, details of all waste disposal, soil sampling methodology and laboratory analytical results. It will cross-reference the asbestos clearance certificates and make statements regarding the effectiveness of the remediation and suitability of the site for subdivision and residential land use.

During the course of this reporting, demobilisation at the site can be instigated by the LARC. Further details on what would be covered in the site validation report are provided in **Section 8**.

6.8 Remediation Schedule

An estimated schedule for the remedial works is provided in **Table 6-1**. The proposed schedule is based on the remedial and validation works being completed as outlined in this RAP.

Table 6-1 Indicative Site Remediation Schedule

Timeframe	Action
Start	Client approval of Remediation Action Plan
Weeks 1-2	Stage 1 – Preliminaries and site establishment (including council notification, site preparation and planning, remediation workshop)
Weeks 3-4	Stage 2 – Data gap closure investigation
Weeks 5-6	Stage 3 – Remedial excavations of ACM-impacted soils
Weeks 7-12	Stage 4 – Bulk excavation and waste classification
Week 13	Stage 5 – Final surface Inspection
Weeks 14-16	Stage 6 – Validation report preparation

6.9 Remedial Contingencies

It is anticipated that the proposed remedial technology will be effective in dealing with the identified contamination; however, remedial contingencies may be required should any of the scenarios in **Table 6-2** arise.

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Table 6-2 Remedial Contingencies

Scenario	Remedial Contingencies/Actions Required
Highly contaminated soils not identified during previous investigations are encountered, particularly at site boundaries	Work to be suspended until the environmental consultant can assess impacted soils and associated risks. Follow the unexpected find protocol as detailed in Appendix C .
Additional abandoned underground storage tanks (USTs) are encountered at the site	Systems to be removed, with the excavations validated and backfilled. Tank removal works to be in accordance with NSW EPA (2020) <i>Guidelines for the implementation of the POEO (underground petroleum storage systems) Regulation 2019</i> and Australian Standard AS4976 (2008). Follow the unexpected find protocol as detailed in Appendix C .
Additional asbestos wastes are encountered	Work to be suspended. Additional asbestos removal to be performed by the appointed contractor, in accordance with SafeWork NSW regulations and this RAP.
Volume of asbestos-impacted soil is larger than estimated, making disposal cost-prohibitive	Seek approval for change in strategy. Amend RAP to include cap and contain strategy where appropriate. Validation to include inspections of capping layer. Such a change in remediation strategy will trigger the drafting of a LTEMP for the site (or designated part thereof). Alternatively, additional material is to be classified in accordance within Section 6.5 and disposed at a licensed facility.
Residual soil impacts remain on-site	Review/assess soil conditions. Carry out site specific second tier risk assessment. Review/assess potential vapour hazard. If there is a vapour risk additional remedial measures may be required such as installation of a vapour barrier or passive or active vapour extraction system. Amendment to RAP required.
Contaminated groundwater (including LNAPL or DNAPL) encountered	Review groundwater conditions on site and determine need for further investigation/remediation and/or management plan. Any dewatering may require approval under the <i>Water Management Act 2000</i> . Remedial options may include natural attenuation, extraction, bio-remediation, phase-separated hydrocarbons recovery using active pumping (including hydraulic control), installation of a groundwater permeability barrier, in situ oxidation or stabilisation. Amendment to RAP required.
Groundwater contaminant plume is identified and is migrating off-site, or there are increases in concentration due to increased infiltration	Review contaminant increase and analytes. Review active remediation alternatives (if necessary). Ensure down-gradient monitoring is undertaken. Carry out fate and transport modelling and assess the need for further action. Amendment to RAP required.
Contamination is identified near heritage items or significant trees (if identified)	Stop work. Review contaminant concentrations and risks to heritage items and/or flora. Assess human health and environmental risks if contamination remains in place. Review natural attenuation options.
Changes in proposed excavation depth or lateral extent	Review remediation works for the site.

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Scenario	Remedial Contingencies/Actions Required
Changes in proposed land use(s) at the site	Review remediation works for the site.

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7.0 SITE MANAGEMENT

7.1 Responsibilities and Contacts

The responsibilities for the various parties involved with the remediation program are outlined in **Table 7-1**.

Table 7-1 Site Management Responsibilities

Responsible Party	Details/Contacts	Responsible for:
Project Manager	Principal Contractor to be confirmed	Overall management of the site remedial activities.
Property Owner and Site Contractor	Landcom and/or Principal Contractor	Notification of site conditions to the EPA under the duty to report contamination under the <i>Contaminated Land Management Act 1997</i> . Implementation of and compliance with the RAP. Notification to contractors of the existence of RAP. Provision of copies of the RAP.
Environmental Management Coordinator (EMC) / Remediation Supervisor	Landcom (and/or Principal Contractor) and Environmental Consultant	Ensuring site remediation works are carried out in an environmentally responsible manner. Liaison between the appointed Environmental Consultant and Council, providing regular updates and informing of any problems encountered. Ensuring all environmental protection measures are in place and functioning correctly during site remediation works. Reporting any environmental issues to owner.
Environmental Consultant	To be confirmed before remedial works are started	Preparation of the RAP. On-site management and guidance of the remedial works. Coordination of validation works, documentation, notifications and permits required to conduct remedial works to a standard suitable of obtaining approval from the NSW EPA. Completing validation sampling and monitoring as requested by the Remediation Contractor and dictated by the RAP. Liaison between remediation contractor and the client.
Earthworks or Remediation Contractor	Engaged by Landcom and/or Principal Contractor	Ensuring all operations are carried out as identified in the RAP (remediation), as directed by the Project Manager and EMC. Inducting all employees, subcontractors and authorised visitors on procedures with respect to site works, WHS and environmental management procedures. Reporting any environmental issues to EMC. Maintaining site induction, site visitor and complaint registers. Ensuring that fugitive emissions and dust potentially leaving the confines of the site are suitably controlled and minimised. Ensuring that water containing any suspended matter or contaminants is minimised, does not leave the site and

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Responsible Party	Details/Contacts	Responsible for:
		is suitably controlled, so as not to pollute the environment. Ensuring that vehicles are cleaned and secured so that no mud, soil or water is deposited on any public roadways or adjacent areas. Ensuring that noise and vibration levels at the site boundaries comply with the legislative requirements. Preparation of site specific plans including WHSP and CEMP.
Local Council	Orange City Council	Ensuring requirements of Development Consent and other planning instruments are met.

7.2 Materials Handling and Management

Table 7-2 summarises the measures that should be implemented in respect of materials handling during remedial and bulk excavation works at the site.

Table 7-2 Materials Handling and Management Requirements

Item	Description/ Requirements
Earthworks contractors	Excavations should be completed by a suitably qualified contractor to ensure: ▪ All employees and contractors are aware of the environmental and health and safety requirements to be adhered to. ▪ There is no discernible release of dust into the atmosphere as a consequence of the works. ▪ There is no discernible release of contaminated soil into any waterway as a consequence of the works. ▪ There are no pollution incidents, health impacts or complaints. ▪ All site specific management plans such as CEMP and AMP should be followed.
Stockpiling of materials	All stockpiles will be maintained as follows: ▪ Stockpiles must be located on sealed surfaces such as sealed concrete, asphalt, or high-density polyethylene. ▪ Should stockpiles be placed on bare soils, which may occur adjacent to remediation areas, bare soil should be lined with builder's plastic before stockpile placement in locations that do not pose any environmental risk, and covered with builder's plastic. ▪ Excavated soils should be stored in an orderly and safe condition ($\leq 2\text{m}$ height). ▪ Stockpiles should be battered with sloped angles to prevent collapse. ▪ Stockpiles should be covered after being lightly conditioned by water sprinkler to prevent dust blow and control odours. ▪ Air emissions to be controlled by using a hydrocarbon mitigation agent, such as BioSolve®, Pinkwater®, Anotech® or an equivalent product selected by the contractor, in combination with the fine mist spraying. ▪ Should the stockpile remain <i>in situ</i> for >24 hours, silt fences or hay bales should be erected around each stockpile to prevent losses from surface erosion (runoff). ▪ Stockpiles shall be strategically located to mitigate environmental impacts while facilitating material handling requirements.
Loading of material	Loading of stockpiles / materials will be as follows: ▪ Transport of contaminated material off the site is to be via a clearly distinguished haul route. ▪ Measures shall be implemented to ensure that no contaminated material is spilled onto public roadways or tracked off-site on vehicle wheels. Such measures

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Item	Description/ Requirements
	should include the use of a wheel washing/cleaning facility, placed before the egress point on the site, and should be able to handle all vehicles and plant operating on-site. Residue from the cleaning facility should be collected and either dewatered on site in a contained / bunded area, or disposed as a slurry to an approved facility. Such residue will be deemed contaminated unless proven otherwise.
Transport of materials	Prior to being assigned to an appropriate waste disposal facility, all waste fill/soils will be classified in accordance with the EPA (2014a) <i>Waste Classification Guidelines</i>. If prior immobilisation treatment of the waste soils is required, disposal consent will be obtained from the NSW EPA prior to spoil transport. - All trucks transporting soils from the site are to be covered with tarpaulins (or equivalent). - All haulage routes for trucks transporting soil, materials, equipment and machinery shall comply with all road traffic rules, minimise noise, vibration and odour to adjacent premises, utilise state roads and minimise use of local road. - All deliveries of soil, materials equipment or machinery should be completed during the approved hours of remediation and exit the site in a forward direction. - Removal of waste materials from the site shall only be carried out by a recognised contractor holding the appropriate EPA NSW licenses, consents and approvals. - Waste materials must be transported less than 150km from the source (POEO 1997, Waste 2014) and landfills are required to be licensed for the category of waste they are scheduled to receive. Additional conditions apply to material that is classified as Hazardous Waste.
Material tracking	Materials excavated from the site should be tracked from the time of excavation until disposal. Tracking of the excavated materials should be completed by recording the following: - Origin of material; - Material type; - Approximate volume; and - Truck registration number. Disposal locations will be determined by the remediation contractor. Disposal location, waste disposal documentation (weighbridge dockets) and the above listed information should be provided to the remediation consultant for reporting purposes. The EPA (2015) <i>Asbestos and Waste Tyres Guidelines</i> state that consignors and transporters of Asbestos Waste, and facilities receiving these wastes, must use "WasteLocate" to provide information to the EPA regarding their movement within NSW. Further information about the "WasteLocate" system is available online from the NSW EPA Website at: https://wastelocate.epa.nsw.gov.au/.
Material visual inspection prior to validation sampling.	Following the completion of remedial works as specified within this RAP, the following applies: - A suitably qualified environmental consultant should undertake a visual inspection of the work area. If visual observations indicate contamination, the earthworks contractors should rectify any issues arising from the inspection (i.e. further excavation or 'chasing out' until soils show no evidence of contamination based on visual inspection and/or odours). - Following satisfactory completion of the visual inspection, validation sampling of soils should be completed. Validation sampling is discussed in Section 8. Only following satisfactory validation will remedial works be deemed as completed.

7.3 Environmental Management

All remediation work must be undertaken with due regard to the minimisation of environmental effects and meet all statutory environmental and safety requirements. The WHSP, CEMP and AMP must therefore address the issues identified in **Table 7-3**.

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Table 7-3 Environmental Management Requirements

Category	Measure
Demolition (including Asbestos Management)	Appropriate measures shall be taken to ensure that demolition works are completed in accordance with SafeWork NSW Standards and Codes of Practice. Any asbestos identified should be managed in accordance with SafeWork NSW Codes of Practice and Australian Standards.
Site Stormwater Management and Control	Appropriate measures shall be taken to ensure that potentially contaminated water does not leave the site. Such measures should include, but not be limited to: ▪ Diversion and isolation of any stormwater from any contaminated areas; ▪ Provision of sediment traps including geotextiles or hay bales; and ▪ Discharge of any (dam) water must meet the appropriate effluent discharge consent condition under the <i>Protection of the Environment Operations Act 1997</i>.
Soil Management	Appropriate measures shall be taken to ensure soils are excavated using an appropriate methodology to reduce nuisance dust and odours from leaving the boundary, and soils are disposed of in accordance with the NSW Government <i>Protection of the Environment Operations (Waste) Regulation 2014</i> .
Dust and Odour	Control of dust and odour shall be maintained by the contractor to ensure no nuisance dust or odours are received at the site boundary. Action levels and specific control measures would be described in the site CEMP and may include, but not necessarily be limited to the following: ▪ Site wide water spraying, as and when appropriate, to eliminate wind-blown dust; ▪ Use of mist sprays, and/or sprinklers on stockpiles, fill screening areas and loaded fill to lightly condition the material; ▪ Use of tarpaulin or tack-coat emulsion or sprays to prevent dust blow from stockpiles or from vehicle loads; ▪ Covering of stockpiles or loads with polythene or geotextile membranes; ▪ Restriction of stockpile heights to 2m above surrounding site level; ▪ Ceasing works during periods of inclement weather; and ▪ Regular checking of fugitive dust and odour, to ensure compliance with the CEMP requirements, undertaking immediate remedial measures to rectify any cases of excessive dust or odour (e.g. use of misting sprays or odour masking agent). It is advised that all site workers use adequate dust masks during soil excavation and that machine operators remain within an enclosed, air conditioned cabin.
Noise and Vibration	Noise and vibration will be restricted to reasonable levels. All plant and machinery used on site will be noise muffled to ensure emissions do not breach statutory levels as defined within the Orange City Council DCP 2004.
Hours of Operation	Working hours will be restricted to those specified in the site specific DA conditions.
Community Engagement	Community engagement should be carried out in accordance with Schedule B(8) of the NEPM (NEPC, 2013). Prior to the commencement of remediation works, every occupier of land either wholly or partly within 100m of the boundary of the premises (including local council and the RMS) should be notified at least 30 days in advance. The notice should include: ▪ Advice of demolition and excavation work to be carried out on the premises; ▪ State the time and date such work is to commence; ▪ Indicate that the works are being conducted to minimise any risk of site contamination impacting on off-site receptors; ▪ Provide appropriate signage on the site fencing, including site contact name and phone number to be contacted should any matter arise; and ▪ Provide contact information and procedure for registering any complaints.

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Category	Measure
Incident Management and Community Relations	While various environmental management and occupational safety plans will be developed to protect human health and the environment, incidents may occur which pose a risk to the various stakeholders. To mitigate these risks and ensure that a suitable response is carried out quickly, a response plan to any incident that may occur on site should be prepared and various responsibilities assigned. The site health and safety plan and environmental management plan should document these procedures and responsibilities, and incident contact numbers should be maintained in an on-site register. All other relevant emergency contact numbers such as Police, Fire Brigade, and Hospital should be listed in the Health and Safety Plan and posted on-site for easy access.

7.4 Contingency Plan for Environmental Incidents

A contingency plan to deal with incidents that could arise during the proposed remediation works must form part of the site-specific WHSP, CEMP and AMP. Refer to **Table 7-4** for a selection of potential issues that may require specific management. The Unexpected Find Protocol (**Appendix C**) should also be followed should an incident occur.

Table 7-4 Contingency Management

Anticipated Problems	Corrective Actions
Chemical / Fuel Spill	Stop work, notify above site project manager. Use accessible soil or appropriate absorbent material on site to absorb the spill (if practicable). Stockpile the impacted material in a secure location, sample and determine the appropriate disposal/treatment option.
Excessive Dust	Use water sprays to suppress the dust or stop site activities generating the dust until it abates.
Excessive Noise	Identify the source, isolate the source if possible, modify the actions of the source or erect temporary noise barriers.
Excessive Odours / Vapours	Stage works to minimise odours/vapours. If excessive organic odours/vapours are being generated, stop works and monitor ambient air across site for organic vapours with a photo-ionisation detector (PID) and odours at site boundaries. Implement control measures including respirators for on-site workers, use of odour suppressants, wetting down of excavated material. No nuisance odours shall be detected at any site boundary as part of the remedial works. Should odour emissions be detected at or beyond the site boundary, it is recommended, as part of the CEMP and community consultation, that the remediation contractor and the project manager notify the owners and occupiers of premises adjoining and across the road from the site regarding potential odour issues. Notification should be in writing. In the notification, as well as on street signage, provide contact details of the site personnel for anyone who may be concerned by odour emission during the remediation. Pause site works to allow for excess odour to subside to a level acceptable by off-site receptors, should it be necessary, after implementation of the above-listed control measures. Record logs for volatile emissions and odours. Such records should be kept on-site and made available for inspection on request. In regard to off-site impact from petroleum vapour, odour is generally detected at concentrations much lower than what will constitute a health-based risk. Measures listed above (Table 7-3) may also be applied for vapour control.

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Excessive Rainfall	Ensure sediment and surface water controls are operating correctly. If possible divert surface water away from active work areas or excavations.
Water in Excavations	Collect samples and assess against relevant POEO requirements to enable disposal options to be formulated.
Leaking Machinery or Equipment	Stop the identified leak (if possible). Clean up the spill with absorbent material. Stockpile the impacted material in a secure location, sample and determine the appropriate disposal/treatment option.
Failure of Erosion or Sedimentation Control Measures	Stop work, repair failed control measure.
Unearthing Unexpected Materials, Fill or Waste	Stop activities, contact the site project manager. Follow the unexpected find protocol as detailed in Appendix C of this RAP. Prepare a management plan to address the issue.
Identification of Cultural or Building Heritage Items	Stop work and notify site project manager. Follow the unexpected find protocol as detailed in Appendix C of this RAP. Prepare action or conservation plan as required.
Equipment Failures	Ensure that spare equipment is on hand at site, or that the failed equipment can be serviced by site personnel or a local contractor.
Complaint Management	Notify client, project manager and environmental consultant following complaint. Report complaint as per management procedures. Implement control measures to address reason of complaint (if possible). Notify complainant of results of remedial actions.

7.5 Work Health and Safety Plan

As required by the NSW *Work Health and Safety Act 2011* and associated regulations, a WHSP should be prepared, to manage the health and safety of site workers and nearby residents, and address such issues as site security, exclusion zones, excavation safety, vibration, noise, odour and dust levels. The plan should address the risks during the remediation works and cover site specific requirements associated with the contaminants present within the site soils.

The site officer responsible for implementing health and safety procedures should induct all site personnel so that they are aware of and comply with, the requirements of this document. It is the contractor's responsibility, with assistance from client/owner(s) of the site to ensure that all other permits, approvals, consents or licences are current. The following hazards and mitigation measures relevant to the remedial works are summarised in **Table 7-5**.

Table 7-5 Remedial Hazards

Anticipated Problems	Corrective Actions
Chemical Hazards	Contaminated sites have chemical compounds, substances or materials that may present a risk to human health and the environment (especially asbestos). Chemicals of concern and associated risks are as detailed in the CSM (Section 3). The site specific WHSP and AMP should set out controls to mitigate any potential risks.
Physical Hazards	The following hazards are to be considered during site works: ▪ Heat exposure; ▪ Buried services; ▪ Noise, vibration and dust; ▪ Electrical equipment; and ▪ The operation of heavy plant equipment.

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Anticipated Problems	Corrective Actions
Personal Protective Equipment and Monitoring	Personnel should, wherever possible, avoid direct contact with potentially contaminated material. Workers are to ensure that surface waters or groundwater is not ingested or swallowed and that direct skin contact with soil and water is avoided. The standard PPE prescribed for the remedial works includes: ▪ P2 dust mask; ▪ Long sleeve shirt and trousers; ▪ Steel-toe footwear; ▪ Safety glasses and helmet; ▪ Hi-visibility vest/clothing.

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8.0 VALIDATION STRATEGY

Remediation of the site will be deemed acceptable based on the achievement of the following validation objectives:

- **Remedial Excavations** – Validation of all remedial excavation areas and classification of stockpiles will involve sampling and analysis to ensure that contaminant concentrations are below the remediation criteria (**Section 4.2**).
- **Backfill Materials** – Validation of imported materials used for the backfilling of remediated areas would be required to verify their suitability for the proposed land use. Certification of the material should be supplied to the environmental consultant for review prior to importation. The data provided is to be assessed against the soil remediation criteria (**Section 4.2**) to confirm soil suitability. As the site is not an EPA-licensed premises under the *POEO Act 1997*, required regulatory approval for importation of soils to the site must fall within one of the following categories:
 1. *Virgin Excavated Natural Material (VENM)*;
 2. *EPA Resource Recovery Order*; or
 3. *EPA Special Exemption*, by application where a current EPA Resource Recovery Order does not exist.

If suitable certifying information cannot be supplied, the environmental consultant is to conduct an assessment of the source material as shown in **Table 8-1**. Deliveries of imported material to the site should be undertaken while the environmental consultant is present, to confirm the consistency of the material and also confirm the material is aesthetically suitable for the designated use (i.e. material has minimal negative aesthetic issues of odour, foreign materials, and demolition or construction materials, waste materials, stressed vegetation, and soil discoloration).

- a) Receipts and dockets are to be provided by the supplier of the imported material for every truck or load of material that is imported into the site. These dockets are to be supplied to the environmental consultant for inclusion in the final site validation report.
- b) Geotechnical considerations with respect to imported materials should be taken into account by the earthwork/landscape contractor and engagement of a suitably qualified geotechnical consultant is recommended.

The SAQP will be crucial to the site validation phase. It must ensure that the data are representative and provide a robust basis for site decisions.

8.1 Validation Requirements

Validation of the remediation phase will be achieved when:

- All stages of the RAP are confirmed as completed;
- Each “hold point” inspection / clearance has been completed;
- All laboratory analytical results for validation samples comply with the remediation criteria;
- The asbestos clearance certificate has been completed by the environmental consultant;
- The *Environmental Site Remediation and Validation* report has been approved.

Note: Validation sampling will be undertaken during / following the removal of contaminated material, to ensure that the vertical and lateral extents of impact have been defined and “chased out”.

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8.2 Validation Sampling Methodology

Soil sampling and handling will be performed in accordance with the methods described in **Table 8-1** (sampling design) and **Table 8-2** (sample collection and handling).

Table 8-1 Sampling Design

Remediation Area	Sampling Density	Chemicals of Concern
Validation Sampling		
Asbestos area in the vicinity of TP157	Wall – 1 sampling location per wall or per 5m length of excavation wall Base – 1 sample per 25m ²	Asbestos (Gravimetric Protocol ¹)
Footprint of stockpile at northwestern portion of the site	1 sample per 25m ² based on the final footprint area.	Asbestos (Gravimetric Protocol ¹)
Waste Characterisation		
Stockpiled materials Impacted soils for off-site disposal	Minimum one sample per 25m ³ (with a minimum of 3 samples for stockpiles <75m ³) For stockpiles exceeding 250m ³ but less than 2,500m ³ , collect minimum 10 samples Calculate 95% UCL for each contaminant, for comparison with criterion	Heavy metals, TRH, VOC (including BTEX), PAH, phenols, OCP, OPP, PCB, asbestos (presence/absence)
Stockpiled materials Soils intended for on-site reuse and/or off-site disposal as ENM / VENM	Stockpiled natural material must comply with the sampling regime under the NSW EPA <i>Excavated Natural Material Order 2014</i>	Heavy metals, TRH, BTEX, PAH, pH, electrical conductivity (EC), foreign material (including asbestos)
Imported Soil Characterisation		
Imported soil materials	Imported VENM / ENM with no certification to be sampled at rate of one sample per 25m ³ (minimum of 3 samples for <75m ³) For >250m ³ but <2,500m ³ , collect minimum 10 samples Calculate 95% UCL for each contaminant Must comply with NSW EPA <i>Excavated Natural Material Order 2014</i>	Heavy metals, TRH, BTEX, PAH, OCP, OPP, PCB, pH, EC, foreign material (including asbestos)

Footnote:

¹ The gravimetric protocol for asbestos quantification in soil according to NEPC (2013) / WADoH (2009/2021) requires the collection of parallel samples at each point: a 10L sample for bulk screening of ACM (passing soil through a 7mm sieve, with hand-picking of fragments off a colour-contrast sheet/board), and a 500mL sample for laboratory characterisation of asbestos fines / fibrous asbestos.

Table 8-2 Validation Sample Collection and Handling Procedures

Action	Description of Required Works
Sample Collection	Soil validation sampling will be directly from the exposed (excavated) surface, or from the material brought to the surface by the backhoe / excavator bucket. Sampling data shall be recorded to comply with chain of custody requirements.
Sampling, Handling, Transport and Tracking	The use of stainless-steel or disposable (one time use) equipment. All sampling equipment (including hand tools or excavator parts) to be washed in a 3% solution of phosphate free detergent (e.g. <i>Decon 90</i>), followed by a rinse with potable water prior to each sample being collected. Direct transfer of the sample into new glass jars, bottles, vials or plastic bags is preferred, with each plastic bag individually sealed to eliminate cross contamination during transportation to the laboratory.

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Action	Description of Required Works
	Label sample containers with individual and unique identification, including number, depth, date and time of sampling. Place sample containers into a chilled, enclosed, and secure container for transport to the laboratory. Provide chain of custody documentation to ensure that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to the laboratory. For asbestos validation, the sampling method for quantitative analysis by gravimetric protocol (NEPC (2013) / WaDOH (2009/2021)) will be as follows: ▪ A 10L soil sample is to be collected from each wall and base in 1m soil horizons (e.g. 0-1, 1-2, 2-3 mBGL etc.). Soil characteristics are to be recorded (constituents, grain size, etc.). ▪ Collected soils are to be screened using a 7mmx7mm sieve. In the areas where the soil is too moist and sieving is not possible due to clumping of soil in between the sieve, the collected soils are to be spread across a blue tarp (colour contrast) and visually inspected for fragments of FCS. ▪ FCS fragments are to be placed in a separate sample bag and sealed for identification of fibre type by the contract laboratory (0.01% w/w detection limit). ▪ A separate 500mL sample is to be collected from the source of the initial 10L sample and transferred into a plastic bag and sealed for determination of friable asbestos as fibrous asbestos/asbestos fines (FA/AF) by the contract laboratory (0.001% w/w detection limit)
Sample Containers and Holding Times	Metals - 250g glass jar / refrigeration 4°C / 6 months (maximum holding period). TRH/BTEX/CVOC - 250g glass jar / refrigeration 4°C / 14 days (maximum holding period). PAH/OCP/OPP - 250g glass jar / refrigeration 4°C / 14 days (maximum holding period). Asbestos - up to a 10 Litre resealable plastic (polyethylene) bag / no refrigeration / indefinite holding time.
Field QA/QC	Quality assurance (QA) and quality control (QC) procedures will be adopted throughout the validation program, to ensure data precision, accuracy and representativeness, which will be assessed through the analysis of field duplicates, equipment rinsates and trip blanks and spikes. Appropriate sampling procedures will be undertaken to prevent cross contamination, in accordance with Geotechnique's <i>Standard Operating Procedures Manual</i>. This will mean: ▪ Standard operating procedures (SOPs) are followed; ▪ Site safety plans are developed prior to works commencement; ▪ Split duplicate field samples are collected and analysed; ▪ Samples are stored under secure, temperature-controlled conditions; ▪ Chain of custody documentation is employed for the handling, transport and delivery of samples to the contracted environmental laboratory; and ▪ Contaminated soil, fill or groundwater originating from the site area is disposed in accordance with relevant regulatory guidelines. Field QC samples will include: ▪ intra-laboratory (blind) duplicates, collected at a rate of 1:10 primary samples; ▪ inter-laboratory (split) duplicates, collected at a rate of 1:20 primary samples; ▪ one trip blank per sample batch; ▪ one VOC spike per sample batch; and ▪ one equipment rinsate blank per sample day. For asbestos (field) QC, the blind and split duplicates will be 500mL quantification samples, collected from final surfaces.
Laboratory QA/QC	The contract laboratory will conduct in-house QA/QC procedures, involving the routine analysis of: ▪ Reagent blanks;

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Action	Description of Required Works
	- Matrix spike and surrogate recoveries; - Laboratory duplicates; and - Calibration standards; with - Statistical analysis of each QC measure.
Achievement of Data Quality Objectives	Data quality objectives (DQO) will be defined (Table 8-3) and an assessment of the overall data quality will be presented in the final validation report, in accordance with the NSW EPA (2017) <i>Guidelines for the NSW Site Auditor Scheme</i> .

8.3 Quality Objectives

8.3.1 Data Quality Objectives

In accordance with the USEPA (2006) *Data Quality Assessment* and the EPA (2017) *Guidelines for the NSW Site Auditor Scheme*, DQO will be defined by the environmental consultant / LAA to determine the appropriate level of data quality needed for the specific requirements of the project. The DQO process to be applied for the proposed remediation and validation is documented in **Table 8-3**.

Table 8-3 Data Quality Objectives

Step	Description
State the Problem	The site is to be rendered suitable for the proposed new subdivision including low to medium density residential lots, low rise apartments, local parks, stormwater basins, wetland and sewer pump station (Section 1.0). Previous investigations (Section 3.1) indicated asbestos and heavy metals impacts in one stockpile and asbestos impact in shallow fill soils at one location. The tasks and procedures described in this RAP are to be undertaken, to achieve the remediation goal of making the site suitable for proposed land use.
Identify the Decision	Based on the remediation objectives outlined in Section 1.0, the following decisions need to be made: - Has the nature and extent of soil impacts on-site been defined? - Does the level of impact, coupled with the fate and transport of identified contaminants, represent an unacceptable risk to identified human and/or environmental receptors on or offsite? and - Will further remediation and/or environmental management be required before the site is suitable for the intended land use?
Identify Inputs to the Decision	Inputs to the decision-making process will include: - Findings from previous site investigations; - Details of the proposed site use; - Understanding of current site use and historic activities that have occurred, including potential off-site sources of contamination; - Geological and hydrogeological data relevant to the area; - Field observations for the presence of visual/olfactory contamination indicators; - Contaminant concentrations in soil samples confirming effective removal of identified impacts; and - Confirmation that data quality indicators (DQIs) were achieved for sample collection and handling, as well as field and laboratory QC samples.

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Step	Description
Define the Boundary of the Remediation / Validation	Lateral – Works will be limited to the site boundaries (Drawing No 20674/1-AA2). Vertical – From existing ground surface, underlying fill and natural soil horizons, to the base of contaminated soil and/or excavation level. Temporal – Results will be valid on the day samples are collected and will remain valid if no changes to site use occur, and contamination (if present) does not migrate from off-site sources.
Develop a Decision Rule	The decision rules for validation are: - Is the site suitable for the proposed land use? <i>If the concentrations of contaminants that remain are below the adopted remediation acceptance criteria for the intended land use (Table 4-1), then the site will be deemed suitable for the proposed development.</i> - Is additional information required to determine the suitability of the site for its proposed use? <i>Should additional information be required, as determined by the updated CSM, then appropriate recommendations will be provided.</i> Decision criteria for analytical data are defined by the DQIs in Section 8.3.2.
Specify Acceptable Limits on Decision Errors	Specific limits for this project will be in accordance with the NEPM, specific DQIs for assessing useability of data and Geotechnique standard operating procedures. To assess the useability of data, pre-determined DQIs for accuracy, precision, representativeness and completeness will be applied (presented in Section 8.3.2). If any of the DQIs are not met, further assessment will be necessary to determine whether the non-conformance will significantly affect data useability. Corrective actions may include requesting further information from samplers and/or analytical laboratories, downgrading of the quality of the data and/or re-collection of samples.
Optimise the Design for Obtaining Data	Written instructions will be issued, to guide personnel during the fieldwork activities. Remediation works are to be performed as per Section 6. Validation sampling to be completed as per Section 8 methodology. All procedures will be implemented to optimise data collection and achieve the DQOs. Review of the results will be undertaken to determine if further excavation and/or additional sampling are warranted. Additional investigations would be warranted where concentrations are found to exceed remediation criteria endorsed by the EPA, relevant to the proposed land use(s).

8.3.2 Data Quality Indicators

To ensure that the validation data (including any additional assessment data) are of an acceptable quality, the results will be evaluated against the DQIs given in **Table 8-4**.

Table 8-4 Data Quality Indicators

QA/QC Component	Data Quality Indicator(s)
Precision A quantitative measure of the variability (or reproducibility) of data	Data precision will be assessed by reviewing the performance of blind field duplicates, through calculation of relative percentage differences (RPD). Data precision deemed acceptable if RPDs are less than 30%. RPDs that exceed this range are considered acceptable where: - Results are less than 10 times the limits of reporting (LOR); - Results are less than 20 times the LOR and the RPD is less than 50%; or - Heterogeneous materials or volatile compounds are encountered.
Accuracy A quantitative measure of the closeness of reported data to the “true” value	Data accuracy assessed through the analysis of: - Split field duplicates; - Field (rinsate and trip) and laboratory blanks; - Matrix spikes;

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QA/QC Component	Data Quality Indicator(s)
	▪ Laboratory control samples; and ▪ Calibration standards.
Representativeness The confidence (expressed qualitatively) that data are representative of each medium present onsite	To ensure the data produced by the laboratory is representative of conditions encountered in the field, the following measures will be taken: ▪ Blank samples run in parallel with field samples, to confirm there are no unacceptable instances of laboratory artefacts; ▪ Review of RPDs for field and laboratory duplicates, to provide an indication that the samples were generally homogeneous, with no unacceptable instances of significant sample matrix heterogeneities; ▪ The appropriateness of sample collection, handling and preservation techniques will be assessed, to confirm there was minimal opportunity for sample interference or degradation (i.e., volatile loss during transport due to incorrect preservation / transport methods); and ▪ The environmental consultant and LAA will have appropriate experience.
Completeness A measure of the amount of useable data from a data collection activity	Data sets acquired during the validation will be complete upon confirmation that: ▪ SOPs were adhered to; and ▪ Copies of all chain of custody (COC) documentation are properly completed. Such measures will enable consideration whether the generated data were sufficient for the purposes of the land use validation.
Comparability The confidence (expressed qualitatively) that data are equivalent for each sampling and analytical event	Issues of comparability of separate data sets are reduced through adherence to SOPs and regulator-endorsed or published guidelines and standards on each data gathering activity. In addition the data are to be collected by experienced samplers and NATA-accredited laboratory methodologies will be employed for sample analysis.

8.4 Validation Reporting

Once site validation is achieved, all results shall be presented in the final *Site Environmental Remediation and Validation Report*, prepared by the environmental consultant / LAA in accordance with the NSW EPA (2020) *Consultants Reporting on Contaminated Land*. The validation report will document all findings, the CSM, fieldwork methods, laboratory analyses and results and the data quality assessment. It will also:

- Confirm implementation of the RAP;
- Provide a clear concluding statement that the site was remediated to a suitable standard for the proposed development; and
- Be submitted for Council approval at the completion of the remediation phase.

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Lot 1 DP153167, Lot 6 DP1031236 and Lot 200 DP1288388
Redmond Place, Orange

9.0 CONCLUSION

This RAP has been prepared to inform the remediation works to be conducted at Lot 1 DP153167, Lot 6 DP1031236 and Lot 200 DP1288388, Redmond Place, Orange, which are necessary in order to render the site suitable for the proposed subdivision development.

The remedial works concern:

- Removal of demolition waste stockpile in the northwestern portion of the site;
- Excavation and off-site disposal of ACM-impacted fill soils from the vicinity of TP157;
- Characterisation of soils at the footprint of the stockpile after removal.

The remediation goal is to make the site suitable for the proposed land use being residential development without a need for on-going monitoring, in accordance with *State Environmental Planning Policy (Resilience and Hazards) 2021* and Camden Council's contaminated land policy.

The preferred remediation strategy is excavation and off-site disposal. Where required, all wastes shall be transported to EPA-licensed facilities, after formal classification.

It is envisaged that the remediation works will be implemented in stages, as follows:

- **Stage 1** – Preliminaries and site establishment;
- **Stage 2** – Data gap closure;
- **Stage 3** – Remedial excavation of asbestos-impacted soils;
- **Stage 4** – Bulk excavation and waste classification;
- **Stage 5** – Final surface inspection;
- **Stage 6** – Validation report preparation.

Contingent Action

Should an unexpected find be discovered during the course of the remediation, or additional impacted soils be encountered, then the procedures described under the Unexpected Find Protocol (**Appendix C**) and/or the Validation Strategy (**Section 8**) will be implemented, until the remediation goals have been achieved and the site is deemed suitable for the intended land use.

In conclusion, Geotechnique considers that the site can be made suitable for the proposed residential land use through implementation of the processes described in this RAP.

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Lot 1 DP153167, Lot 6 DP1031236 and Lot 200 DP1288388
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10.0 LIMITATIONS

This report has been prepared for the purpose stated within. This report can also be relied upon by Orange City Council for development and building application assessment processes. Any reliance on this report by other parties shall be at such parties' sole risk as the report might not contain sufficient information for their purposes.

The information in this report is considered accurate at the dates of the field work for this further investigation (16 April 2025), in accordance with the conditions of the site. Any variations to the site form or use beyond those dates could nullify the conclusion stated.

No contamination assessment can eliminate all risk; even a rigorous professional assessment might not detect all contamination within a site. Although the potential always exists for contaminants and contaminated soils to be present between sampled locations and in the grass covered areas.

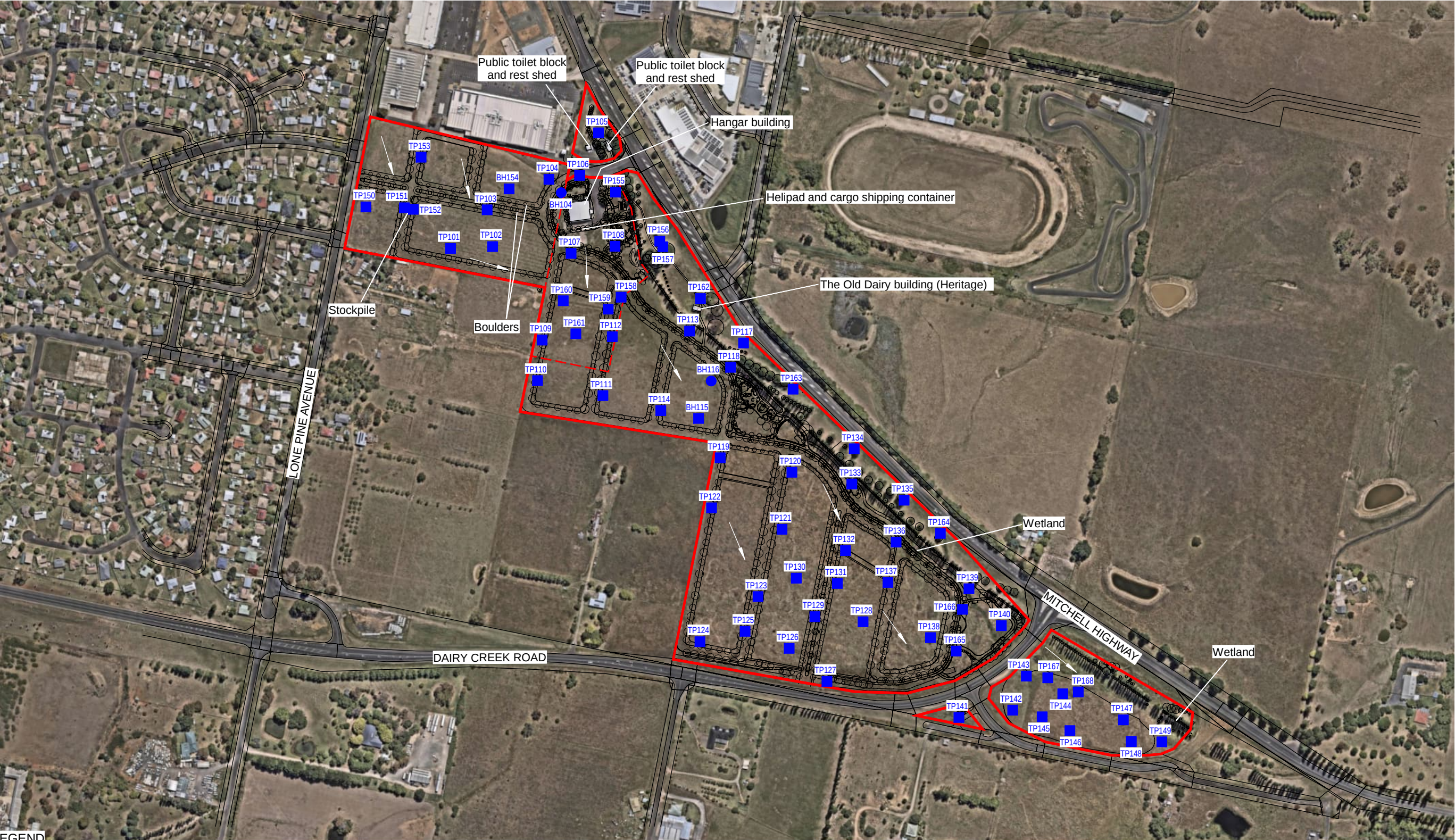
Presented in **Appendix D** is a document entitled "Environmental Notes", which should be read in conjunction with this further investigation and RAP.

LIST OF REFERENCES

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DRAWINGS

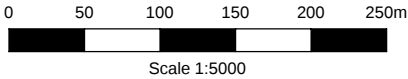
20674/1-AA1	<i>Site Features, Test Pit & Borehole Locations</i>
20674/1-AA2	<i>Locations of Concern</i>



LEGEND

- Test Pit
- Borehole
- Slope

Imagery © NearMap.com



PO Box 880
Penrith NSW 2750
Tel: 02 4722 2700

e-mail: info@geotech.com.au
www.geotech.com.au

NOTES

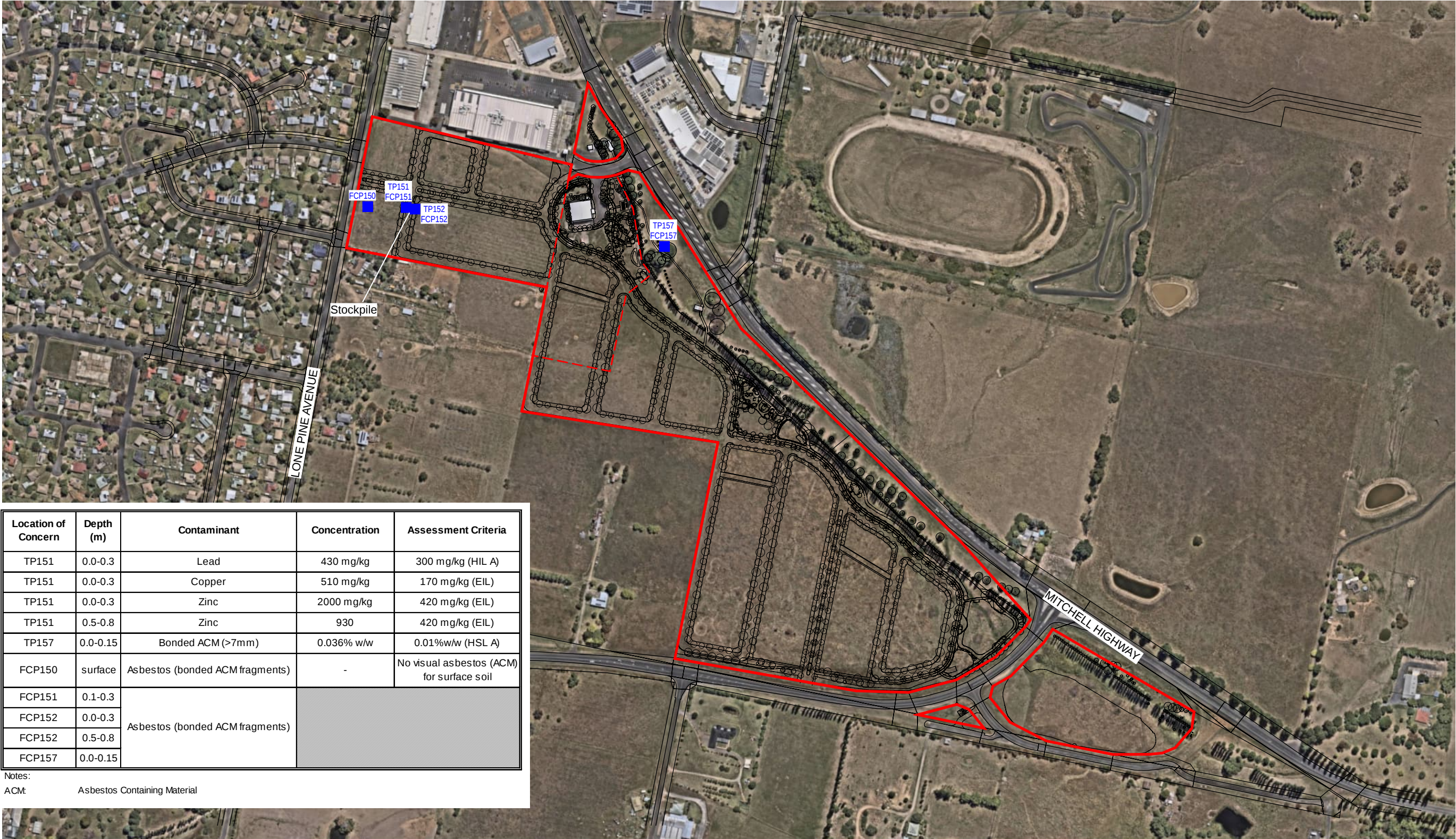
- This drawing has been produced using a base plan provided by others, to which additional information e.g., test pits, borehole locations or notes have been added. Some or all of the information on this plan may not be relevant at the time of producing this drawing.
- Site features are shown at approximate locations and are not to scale.

Landcom
BPA 16642
Redmond Place
Orange

Site Features, Test Pit and Borehole Locations

Drawing No: 20674/1-AA1
Job No: 20674/1
Drawn By: MH
Date: 26 June 2025
Checked By: KB/LY

File No: 20674-1
Layers: 0, AA1



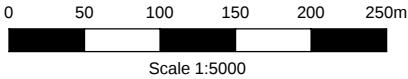
Location of Concern	Depth (m)	Contaminant	Concentration	Assessment Criteria
TP151	0.0-0.3	Lead	430 mg/kg	300 mg/kg (HIL A)
TP151	0.0-0.3	Copper	510 mg/kg	170 mg/kg (EIL)
TP151	0.0-0.3	Zinc	2000 mg/kg	420 mg/kg (EIL)
TP151	0.5-0.8	Zinc	930	420 mg/kg (EIL)
TP157	0.0-0.15	Bonded ACM (>7mm)	0.036% w/w	0.01%w/w (HSL A)
FCP150	surface	Asbestos (bonded ACM fragments)	-	No visual asbestos (ACM) for surface soil
FCP151	0.1-0.3	Asbestos (bonded ACM fragments)		
FCP152	0.0-0.3			
FCP152	0.5-0.8			
FCP157	0.0-0.15			

Notes:
ACM: Asbestos Containing Material

Imagery © NearMap.com

LEGEND

Test Pit



PO Box 880
Penrith NSW 2750
Tel: 02 4722 2700

e-mail:info@geotech.com.au
www.geotech.com.au

NOTES

1. This drawing has been produced using a base plan provided by others, to which additional information e.g., test pits, borehole locations or notes have been added. Some or all of the information on this plan may not be relevant at the time of producing this drawing.
2. Site features are shown at approximate locations and are not to scale.

Landcom
BPA 16642
Redmond Place
Orange

Locations of Concern

Drawing No: 20674/1-AA2
Job No: 20674/1
Drawn By: MH
Date: 26 June 2025
Checked By: LY

File No: 20674-1
Layers: 0, AA2

APPENDIX A

PROPOSED DEVELOPMENT PLAN



APPENDIX B

SUPPORTING INFORMATION FROM THE INVESTIGATION PHASE

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP101	
Location : Redmond Place, Orange		Date : 15/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 902.987	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CI	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets and gravel	M<PL	Vst-H		Inclusion of plastic
	G				0.5			Silty CLAY, medium plasticity, orange to brown, with gravel, trace sand				
					1							
					1.5			@1.5m, grey mottled orange				
					2							Resistance to excavator
					2.5			Test Pit TP101 terminated at 2.5m Target depth reached				
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP102	
Location : Redmond Place, Orange		Date : 15/04/2025	
Logged/Checked by: KB/YN			

Equipment type and model: 5t Excavator		R.L. surface : 901.837	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CL-CI	TOPSOIL: Silty Clay, low plasticity, brown, trace root fibres and gravel	M<PL	St		Inclusion of plastic
	G				0.5			Silty CLAY, low to medium plasticity, orange to brown, trace gravel and sand				
					1			Test Pit TP102 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP103	
Location : Redmond Place, Orange		Date : 15/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 901.844	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CL-CI	TOPSOIL: Clayey Silt, low plasticity, brown, trace root fibres and gravel	M<PL	St		Inclusion of tarp
	G				0.5			Silty CLAY, low to medium plasticity, orange to brown, trace gravel and sand				
					1			Test Pit TP103 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

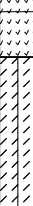
Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP105	
Location : Redmond Place, Orange		Date : 15/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 902.749	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, brown, trace gravel and rootlets				
	G				0.5		CI	Silty CLAY, medium plasticity, orange, trace sand	M<PL	St-Vst		
					1			@1.0m, mottled black, with gravel				
					1.5			@1.2m, grey mottled orange and black				
					2							
					2.5		CH	Silty CLAY, high plasticity, grey mottled orange and yellow, trace organics				
					3			Test Pit TP105 terminated at 2.5m Target depth reached				
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP106	
Location : Redmond Place, Orange		Date : 15/04/2025	
Logged/Checked by: KB/YN			

Equipment type and model: 5t Excavator		R.L. surface : 901.761	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CI	MULCH	M>PL	St		
	G							TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
								Silty CLAY, medium plasticity, grey mottled orange, trace sand				
					0.5							
					1			Test Pit TP106 terminated at 0.7m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP107	
Location : Redmond Place, Orange		Date : 15/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 899.944	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets ----- @0.2m, no trace rootlets				
	G				0.5		CI-CH	Silty CLAY, medium to high plasticity, orange to brown, with gravel, trace sand	M<PL	St		
					1			Test Pit TP107 terminated at 1.0m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP108	
Location : Redmond Place, Orange		Date : 15/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 899.598	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
	G				0.5		CI	Silty CLAY, medium plasticity, orange to brown, trace rootlets and sand	M<PL	Vst-H		
					1							
					1.5			@1.5m, grey mottled orange				
					2							
					2.3			@2.3m, high plasticity				
					2.5			Test Pit TP108 terminated at 2.5m Target depth reached				
					3							
					3.5							
					4							
				4.5								

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP109	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 900.804	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5		CI	Silty CLAY, medium plasticity, orange to brown, with fine to coarse grained gravel, trace sand	M<PL	St-Vst		
			U ₅₀ DB		1							
					1.5			@1.3m, grey mottled orange and black, with gravel				
			DS		2							
					2.5			Test Pit TP109 terminated at 2.5m Target depth reached				
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP110	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 901.338	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP110 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP111	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 900.102	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
	G				0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP111 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP112	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 898.990	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5		CI-CH	Silty CLAY, medium to high plasticity, orange to brown, trace sand	M<PL	St		
					1			Test Pit TP112 terminated at 0.7m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP113	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 898.660	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			FILL: Silty Clay, low plasticity, brown, trace rootlets, gravel Test Pit TP113 terminated at 0.1m due to services	M<PL			
					0.5							
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP114	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 897.903	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP114 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP117	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 897.587	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5			Test Pit TP117 terminated at 0.2m due to services				
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP118	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 896.652	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP118 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP119	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 897.500	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
	G				0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP119 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP120	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 895.853	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
	G				0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP120 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP121	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 896.865	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP121 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP122	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 899.176	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP122 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP123	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 896.072	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
	G				0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP123 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP124	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 896.354	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
	G				0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP124 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP125	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 895.193	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP125 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP126	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 894.837	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP126 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP127	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 893.949	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CL	TOPSOIL: Clayey Silt, low plasticity, brown, trace rootlets	M<PL	St-Vst		
					0.5			Silty CLAY, low plasticity, brown to orange, trace gravel and sand				
			DS		0.5							
			DB		1							
			DS		1.5			@1.5m, mottled black, trace gravel				
					2							
					2.5			Test Pit TP127 terminated at 2.5m Target depth reached				
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP128	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 894.399	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP128 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP129	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 894.951	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP129 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP130	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 896.455	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			FILL: Silty Clay, low plasticity, brown, trace rootlets, with gravel and cobbles, trace boulders	M<PL			
	G				0.5		CI-CH	Silty CLAY, medium to high plasticity, brown to orange, trace sand	M<PL	St		
					1			Test Pit TP130 terminated at 1.0m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP131	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 894.867	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
	G				0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP131 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP132	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 894.439	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP132 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP133	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 894.093	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP133 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1										
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP134										
Location : Redmond Place, Orange		Date : 16/04/2025										
Logged/Checked by: KB/YN												
Equipment type and model: 5t Excavator		R.L. surface : 894.530										
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD										
groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5			Test Pit TP134 terminated at 0.2m due to services				
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1										
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP135										
Location : Redmond Place, Orange		Date : 16/04/2025										
Logged/Checked by: KB/YN												
Equipment type and model: 5t Excavator		R.L. surface : 893.640										
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD										
groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5			Test Pit TP135 terminated at 0.2m due to services				
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP136	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 892.969	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP			NOC 4 5 4 4 7 7 6 5 3 4 2 3 3 4 4 1.5 2 2.5 3 3.5 4 4.5	0		CI	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St-Vst		
					0.5			Silty CLAY, medium plasticity, brown to orange				
					1							
					1.5			@1.5m, trace gravel				
					2							
					2.5			Test Pit TP136 terminated at 2.5m Target depth reached				
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP137	
Location : Redmond Place, Orange		Date : 17/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 893.728	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, trace sand				
					1			Test Pit TP137 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP138	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 893.185	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Clayey Silt, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, brown to orange, trace sand				
					1			Test Pit TP138 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP139	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 892.440	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Clayey Silt, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, brown to orange, trace sand				
					1			Test Pit TP139 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP140	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 891.841	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CI-CH	TOPSOIL: Clayey Silt, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, brown to orange				
					1			Test Pit TP140 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP141	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 892.994	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			FILL: Silty Clay, low plasticity, brown, trace gravel and rootlets	M<PL			Inclusion of stake
	G		DS		0.5		CL-CH	Silty CLAY, low to medium plasticity, orange, with gravel, trace sand @0.8m, with boulders	M<PL	St		
			DS		1							
					1.5							
					2			Test Pit TP141 terminated at 1.8m due to refusal on suspected boulder				
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP142	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 892.629	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			FILL: Silty Clay, low plasticity, brown, trace gravel and rootlets	M<PL			
	G		U ₅₀		0.5		CH	Silty CLAY, high plasticity, orange, with gravel, trace sand	M<PL	St-Vst		
					1			@0.8m, with boulders				
			DS		1			@1.0m, mottled black				
					1.5							
					2							
					2.5			Test Pit TP142 terminated at 2.1m due to refusal on suspected boulder				
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP143	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 891.639	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			FILL: Silty Clay, low to medium plasticity, brown, with gravel, trace rootlets	M<PL			Inclusion of boulders
	G				0.5		CI-CH	Silty CLAY, medium to high plasticity, grey mottled orange to black, trace sand	M<PL	St		
					1			Test Pit TP143 terminated at 1.0m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP144	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 890.424	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5			Test Pit TP144 terminated at 0.2m due to services				
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP145	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 891.403	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, orange to brown, with gravel				
					0.5		CI-CH	Silty CLAY, medium to high plasticity, orange to brown, with gravel	M<PL	St		
					1			Test Pit TP145 terminated at 0.8m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP146	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 890.177	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G			NOC 3 5 7 10 16 18 18 17	0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5	CI-CH	Silty CLAY, medium to high plasticity, grey mottled orange, with gravel, trace sand	M<PL	Vst-H			
						GM	Silty GRAVEL, fine to medium grained, grey mottled orange and black, trace sand	D	D			
						CI-CH	Silty CLAY, high plasticity, grey mottled orange to black, with gravel and sand		H			
					1							
					1.5							
					2							
					2.5							
					2.5			Test Pit TP146 terminated at 2.5m Target depth reached				
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1										
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP147										
Location : Redmond Place, Orange		Date : 16/04/2025										
Logged/Checked by: KB/YN												
Equipment type and model: 5t Excavator		R.L. surface : 889.141										
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD										
groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5			Test Pit TP147 terminated at 0.2m due to services				
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP148	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 889.483	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			FILL: Silty Clay, low plasticity, brown, trace rootlets	M<PL			
	G				0.5		CI	Silty CLAY, medium plasticity, orange mottled grey, black and brown, with gravel and boulders, trace boulders	M<PL	St		
					1			Test Pit TP148 terminated at 0.7m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1										
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP149										
Location : Redmond Place, Orange		Date : 16/04/2025										
Logged/Checked by: KB/YN												
Equipment type and model: 5t Excavator		R.L. surface : 886.394										
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD										
groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5			Test Pit TP149 terminated at 0.2m due to services				
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client :		Landcom			Job No : 20674/1		Pit No : TP150			Date : 15/04/2025		
Project :		Proposed Subdivision Development (BPA 16642)			Logged/Checked by: KB/YN							
Location :		Redmond Place, Orange										
Equipment type and model:					5t Excavator		R.L. surface :			903.485		
Excavation dimensions :					1.8 m long 0.45 m wide		datum :			AHD		

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CL-CI	TOPSOIL: Silty Clay, low plasticity, brown, trace root fibres and gravel	M<PL	St		
	G				0.5			Silty CLAY, low to medium plasticity, orange to brown, trace gravel and sand				
					1			Test Pit TP150 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP151	
Location : Redmond Place, Orange		Date : 15/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 903.496	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			STOCKPILE: Silty Clay, low plasticity, brown, trace rootlets and gravel				Inclusion of bricks, tiles, fry, metal, concrete
					0.5			FILL: Silty Clay, low plasticity, brown, trace gravel	M<PL			
	GP						CI-CH	Silty CLAY, medium to high plasticity, orange to brown, trace sand	M<PL	St		
	G				1							
					1.5			Test Pit TP151 terminated at 1.3m Target depth reached				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP152	
Location : Redmond Place, Orange		Date : 15/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 903.673	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			STOCKPILE: Silty Clay, low plasticity, brown, trace rootlets and gravel				Inclusion of bricks, tiles, fry, metal, concrete, bitumen
					0.5			FILL: Silty Clay, low plasticity, brown, trace gravel	M<PL			Inclusion of bricks, tiles, fry, metal, concrete, bitumen
	GP											
	G											
					1		CI-CH	Silty CLAY, medium to high plasticity, orange to brown, trace sand	M<PL	St		
					1.5			Test Pit TP152 terminated at 1.3m Target depth reached				
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP155	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 901.458	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				Inclusion of bitumen
	GP							FILL: Silty Clay, low plasticity, orange to brown, with cobbles	M<PL			
	G				0.5		CI	Silty CLAY, medium plasticity, grey mottled orange, trace rootlets, sand	M<PL	St		
					1			Test Pit TP155 terminated at 1.0m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP156	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 900.220	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
	G						CL	Silty CLAY, low plasticity, brown to orange, with fine to coarse grained gravel, trace sand	M<PL	St		
					0.5							
				U ₅₀								
				DS	1							
				DB				@1.2m, grey mottled orange and black				
					1.5							
					2							
					2.5			Test Pit TP156 terminated @2.5m target depth reached				
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP157	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface :	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			FILL: Silty Clay, low plasticity, brown, trace rootlets, with gravel	M<PL			FCP
					0.5			Test Pit TP157 terminated at 0.2m due to services				
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP158	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 899.023	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5		CH	Silty CLAY, high plasticity, orange to brown, trace gravel and sand	M<PL	St		
			DB U ₅₀		1			@1.0m, grey mottled orange and black, with gravel				
			DS		1.5							
					2							
					2.5			Test Pit TP158 terminated @2.5m target depth reached				
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP159	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 898.648	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5		CI-CH	Silty CLAY, medium to high plasticity, orange to brown, with gravel, trace sand	M<PL	St		
					1			Test Pit TP159 terminated at 0.7m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP160	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 899.196	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5		CI-CH	Silty CLAY, medium to high plasticity, orange to brown, with gravel, trace sand	M<PL	St		
					1			Test Pit TP160 terminated at 0.7m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP161	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 899.769	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5		CI-CH	Silty CLAY, medium to high plasticity, orange to brown	M<PL	St		
					1			Test Pit TP161 terminated at 0.7m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1										
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP162										
Location : Redmond Place, Orange		Date : 16/04/2025										
Logged/Checked by: KB/YN												
Equipment type and model: 5t Excavator		R.L. surface : 899.885										
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD										
groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			FILL: Silty Clay, low plasticity, brown, trace rootlets, with gravel	M<PL			
					0.5			Test Pit TP162 terminated at 0.2m due to services				
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1										
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP163										
Location : Redmond Place, Orange		Date : 16/04/2025										
Logged/Checked by: KB/YN												
Equipment type and model: 5t Excavator		R.L. surface : 895.540										
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD										
groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0			TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets				
					0.5			Test Pit TP163 terminated at 0.2m due to services				
					1							
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client :		Landcom			Job No :		20674/1		
Project :		Proposed Subdivision Development (BPA 16642)			Pit No :		TP164		
Location :		Redmond Place, Orange			Date :		16/04/2025		
					Logged/Checked by: KB/YN				
Equipment type and model:					5t Excavator		R.L. surface : 893.327		
Excavation dimensions :					1.8 m long 0.45 m wide		datum : AHD		

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	G				0		CI-CH	TOPSOIL: Silty Clay, low plasticity, brown, trace rootlets and gravel	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, orange to brown, with gravel				
					1			Test Pit TP164 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

engineering log - excavation

Client : Landcom		Job No : 20674/1	
Project : Proposed Subdivision Development (BPA 16642)		Pit No : TP165	
Location : Redmond Place, Orange		Date : 16/04/2025	
Logged/Checked by: KB/YN			
Equipment type and model: 5t Excavator		R.L. surface : 893.192	
Excavation dimensions : 1.8 m long 0.45 m wide		datum : AHD	

groundwater	env samples	PID reading (ppm)	geo samples	field tests	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
DRY	GP				0		CI-CH	TOPSOIL: Clayey Silt, low plasticity, brown, trace rootlets	M<PL	St		
					0.5			Silty CLAY, medium to high plasticity, brown to orange				
					1			Test Pit TP145 terminated at 0.6m Target depth reached				
					1.5							
					2							
					2.5							
					3							
					3.5							
					4							
					4.5							

TABLE E
METAL, CATION EXCHANGE CAPACITY (CEC) & pH TEST RESULTS
DISCRETE SAMPLES
(Ref No: 20674/1-AA)

Sample Location	Depth (m)	Soil Type	METAL (mg/kg)									CEC (cmol/kg)	pH
			ARSENIC	CADMIUM	CHROMIUM (Total)	Hexavalent Chromium, Cr6+	COPPER	LEAD	MERCURY	NICKEL	ZINC		
TP101	0.0-0.1	Clay	4	<0.3	16	-	23	20	<0.05	5.6	23	-	-
TP102	0.0-0.1	Clay	15	<0.3	14	-	51	60	0.07	5.4	58	-	-
TP103	0.0-0.1	Silt	5	<0.3	23	-	28	36	<0.05	4.2	23	-	-
TP104	0.0-0.1	Silt	2	<0.3	20	-	9.8	12	<0.05	5.1	11	5.2	5.6
TP105	0.0-0.15	Clay	1	<0.3	25	-	12	17	<0.05	9	20	-	-
TP105	0.25-0.35	Clay	1	<0.3	24	-	13	7	<0.05	8.5	13	5.7	6.2
TP106	0.05-0.2	Clay	1	<0.3	20	-	13	7	<0.05	6.8	12	-	-
TP106	0.25-0.35	Clay	<1	<0.3	46	-	9.6	6	<0.05	4.6	7	3.7	5.9
TP107	0.0-0.15	Clay	5	<0.3	48	-	14	28	<0.05	35	19	-	-
TP108	0.0-0.15	Clay	2	<0.3	24	-	15	25	0.09	24	61	-	-
TP108	0.25-0.35	Clay	1	<0.3	22	-	14	11	<0.05	7.4	30	10	6.6
TP109	0.0-0.15	Clay	3	<0.3	30	-	14	24	<0.05	5.4	40	6.2	5.5
TP110	0.0-0.1	Clay	6	<0.3	37	-	17	40	<0.05	9.6	18	-	-
TP111	0.0-0.1	Clay	5	<0.3	31	-	13	32	<0.05	7.5	12	2.6	5.6
TP111	0.15-0.25	Clay	2	<0.3	77	-	15	14	<0.05	9.4	13	3.9	6
TP112	0.0-0.15	Clay	4	<0.3	13	-	9.4	21	<0.05	3	9	-	-
TP113	0.0-0.1	Clay	4	<0.3	29	-	12	55	<0.05	5.3	56	2.6	5.5
TP114	0.0-0.1	Clay	2	<0.3	19	-	8.5	20	<0.05	2.6	13	2	5.2
TP115	0.0-0.1	Silt	<1	<0.3	16	-	8.2	7	<0.05	5.4	5	3	5.6
TP116	0.0-0.1	Silt	1	<0.3	13	-	7.3	7	<0.05	3.9	7	-	-
TP117	0.0-0.15	Clay	2	<0.3	31	-	13	12	<0.05	6.5	18	3.6	5.7
TP118	0.0-0.1	Clay	1	<0.3	17	-	6.1	8	<0.05	2.9	5	-	-
TP119	0.0-0.1	Clay	1	<0.3	10	-	6.4	10	<0.05	2.5	15	-	-
TP120	0.0-0.1	Clay	1	<0.3	14	-	7.3	7	<0.05	2.4	9	2.1	5.1
TP121	0.0-0.1	Clay	1	<0.3	22	-	16	10	<0.05	4.3	15	-	-
TP122	0.0-0.1	Clay	2	<0.3	15	-	13	10	<0.05	3.3	12	-	-
TP123	0.0-0.1	Clay	2	<0.3	31	-	14	11	<0.05	3.2	12	1.3	4.5
TP123	0.15-0.25	Clay	2	<0.3	55	-	13	11	<0.05	3.5	13	0.81	4.3
TP124	0.0-0.1	Clay	<1	<0.3	11	-	5.7	11	<0.05	1.8	6	-	-
TP124	0.15-0.25	Clay	<1	<0.3	20	-	6	7	<0.05	2.1	5	2.3	5.3
TP125	0.0-0.1	Clay	2	<0.3	14	-	7.6	9	<0.05	2.5	8	-	-
TP126	0.0-0.1	Clay	<1	<0.3	33	-	6.2	7	<0.05	2.9	7	-	-
TP127	0.0-0.1	Silt	2	<0.3	17	-	8	11	<0.05	5.6	12	3.4	5.7
TP128	0.0-0.1	Clay	2	<0.3	52	-	11	12	<0.05	6.1	14	-	-
TP129	0.0-0.1	Clay	1	<0.3	41	-	11	9	<0.05	5.6	14	-	-
TP130	0.0-0.15	Clay	2	<0.3	28	-	28	9	<0.05	4.1	30	6.4	5.5
TP131	0.0-0.1	Clay	2	<0.3	59	-	18	14	<0.05	4	16	-	-
TP131	0.15-0.25	Clay	1	<0.3	27	-	15	10	<0.05	3.2	14	1.8	5.1
TP132	0.0-0.1	Clay	2	<0.3	17	-	12	12	<0.05	4	11	-	-
TP133	0.0-0.1	Clay	1	<0.3	11	-	6.4	9	<0.05	2.9	6	3.9	5.4
TP134	0.0-0.15	Clay	2	<0.3	26	-	8.7	10	<0.05	7.4	8	-	-
TP135	0.0-0.15	Clay	2	<0.3	25	-	11	13	<0.05	7.4	10	-	-
TP136	0.0-0.1	Clay	2	<0.3	13	-	8.8	11	<0.05	4.3	11	-	-
TP137	0.0-0.1	Clay	2	<0.3	40	-	12	19	<0.05	6.6	15	-	-
TP138	0.0-0.1	Silt	3	<0.3	36	-	20	88	0.06	5.5	100	-	-
TP139	0.0-0.1	Silt	3	<0.3	48	-	20	21	0.06	13	35	8.2	6.1
TP140	0.0-0.1	Silt	5	<0.3	43	-	26	15	<0.05	17	44	-	-
TP141	0.0-0.15	Clay	3	<0.3	43	-	21	14	<0.05	6.6	24	7.8	6.2
TP142	0.0-0.15	Clay	3	<0.3	25	-	22	12	<0.05	12	31	-	-
TP143	0.0-0.15	Clay	2	<0.3	27	-	17	8	<0.05	7.9	18	10	7.4
TP144	0.0-0.15	Clay	2	<0.3	96	-	14	8	<0.05	9.9	17	-	-
TP145	0.0-0.15	Clay	3	<0.3	130	<0.5	21	10	<0.05	17	39	6.4	5.6
TP146	0.0-0.15	Clay	2	<0.3	50	-	9	9	<0.05	4.5	11	-	-
TP147	0.0-0.15	Clay	2	<0.3	56	-	15	10	<0.05	5.5	13	-	-
TP148	0.0-0.15	Clay	5	<0.3	68	-	22	13	<0.05	19	28	7.6	6
TP148	0.55-0.65	Clay	15	<0.3	64	-	30	2	0.07	64	50	27	6.9
TP149	0.0-0.15	Clay	2	<0.3	23	-	40	7	<0.05	8.6	37	20	7
TP150	0.0-0.1	Clay	8	<0.3	170	<0.5	32	33	<0.05	21	26	4.5	5.3
TP150	0.15-0.25	Clay	5	<0.3	130	<0.5	24	25	<0.05	19	19	5.7	5.9

TABLE E
METAL, CATION EXCHANGE CAPACITY (CEC) & pH TEST RESULTS
DISCRETE SAMPLES
(Ref No: 20674/1-AA)

Sample Location	Depth (m)	Soil Type	METAL (mg/kg)									CEC (cmol/kg)	pH
			ARSENIC	CADMIUM	CHROMIUM (Total)	Hexavalent Chromium, Cr6+	COPPER	LEAD	MERCURY	NICKEL	ZINC		
TP151	0.0-0.3	Clay	11	0.7	31	-	510	430	0.05	26	2000	41	7.3
TP151	0.5-0.8	Clay	28	0.6	35	-	73	220	0.1	13	930	13	7.5
TP151	0.85-0.95	Clay	1	<0.3	52	-	14	6	<0.05	7.5	14	12	6.5
TP152	0.0-0.3	Clay	10	<0.3	53	-	23	35	<0.05	7.2	110	12	7.6
TP152	0.5-0.8	Clay	6	0.4	29	-	29	45	0.07	10	160	14	6.7
TP153	0.0-0.15	Clay	3	<0.3	65	-	20	12	<0.05	8.5	22	6.6	6.5
TP153	0.5-0.8	Clay	3	<0.3	23	-	19	12	<0.05	8	17	-	-
TP153	1.0-1.3	Clay	6	<0.3	160	0.8	13	15	<0.05	5.3	11	6.4	6.7
TP153	1.55-1.65	Clay	2	<0.3	28	-	11	6	<0.05	6.3	10	-	-
TP154	0.0-0.15	Silt	7	<0.3	58	-	35	28	0.11	22	48	15	6.8
TP154	0.55-0.65	Clay	3	<0.3	32	-	17	18	<0.05	9.6	14	7.2	7
TP155	0.0-0.15	Clay	6	<0.3	8.9	-	9.6	5	<0.05	4.5	22	6.2	6.3
TP155	0.2-0.5	Clay	26	<0.3	8.1	-	31	8	<0.05	9.1	31	14	7.6
TP156	0.0-0.15	Clay	3	<0.3	32	-	16	15	<0.05	12	22	-	-
TP157	0.0-0.15	Clay	15	<0.3	29	-	32	60	0.39	10	110	-	-
TP158	0.0-0.15	Clay	2	<0.3	15	-	7.8	13	<0.05	4.4	10	-	-
TP159	0.0-0.15	Clay	4	<0.3	19	-	14	21	<0.05	6.6	18	-	-
TP160	0.0-0.15	Clay	4	<0.3	52	-	18	12	<0.05	10	16	-	-
TP161	0.0-0.15	Clay	6	<0.3	14	-	16	33	<0.05	3.9	10	-	-
TP162	0.0-0.15	Clay	2	<0.3	55	-	17	22	<0.05	8.6	34	-	-
TP163	0.0-0.15	Clay	2	<0.3	97	-	11	11	<0.05	8.1	9	-	-
TP164	0.0-0.1	Clay	3	<0.3	43	-	21	15	<0.05	13	21	-	-
TP165	0.0-0.1	Silt	3	<0.3	55	-	21	93	<0.05	7.2	95	8.1	6.3
Limit of Reporting (LOR)			1	0.3	0.5	0.5	0.5	1	0.05	0.5	2	0.02	0.1
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)													
Health-based Investigation Levels (HIL) ^a A - Residential A			100	20	100 ^c	100 ^c	6000	300	10 ^d	400	7400		
Ecological Investigation Levels (EIL) ^b - Urban residential			100 ^e	-	190 ^f	190 ^f	170	1200 ^g	-	110	420		

- Notes:
- a: Residential with garden / accessible soil (home grown produce <10% fruit and vegetable intake (no poultry)), also includes childcare centres, preschools and primary schools.
 - b: EIL of aged chromium (III), copper, nickel & zinc were derived from calculation spreadsheet developed by CSIRO for NEPC; Old Suburb with Low Traffic; the average CEC=8.08 cmol/kg & pH=6.09; the assumed clay content=1 % were selected for derivation of EIL; a conservative approach.
 - c: Chromium (VI)
 - d: Methyl Mercury
 - e: Generic EIL for aged arsenic
 - f: Chromium (III)
 - g: Generic added contaminant limit for aged lead + ambient background concentration; Old Suburb with Low Traffic.

TABLE I
ASBESTOS TEST RESULTS
DISCRETE SAMPLES
(Ref No: 20674/1-AA)

Sample Location	Depth (m)	ASBESTOS (% w/w)		
Soil Sample		Bonded ACM (>7mm)	AF	FA
TP101	0.0-0.1	<0.01	<0.001	<0.001
TP102	0.0-0.1	<0.01	<0.001	<0.001
TP103	0.0-0.1	<0.01	<0.001	<0.001
TP113	0.0-0.1	<0.01	<0.001	<0.001
TP130	0.0-0.15	<0.01	<0.001	<0.001
TP141	0.0-0.15	<0.01	<0.001	<0.001
TP142	0.0-0.15	<0.01	<0.001	<0.001
TP143	0.0-0.15	<0.01	<0.001	<0.001
TP148	0.0-0.15	<0.01	<0.001	<0.001
TP150	0.0-0.1	<0.01	<0.001	<0.001
TP151	0.0-0.3	<0.01	<0.001	<0.001
TP151	0.5-0.8	<0.01	<0.001	<0.001
TP152	0.0-0.3	0.002	<0.001	<0.001
TP152	0.5-0.8	<0.01	<0.001	<0.001
TP153	0.0-0.15	<0.01	<0.001	<0.001
TP153	0.5-0.8	<0.01	<0.001	<0.001
TP153	1.0-1.3	<0.01	<0.001	<0.001
BH154	0.0-0.15	<0.01	<0.001	<0.001
TP155	0.0-0.15	<0.01	<0.001	<0.001
TP155	0.2-0.5	<0.01	<0.001	<0.001
TP157	0.0-0.15	0.036	<0.001	<0.001
TP162	0.0-0.15	<0.01	<0.001	<0.001
TP165	0.0-0.1	<0.01	<0.001	<0.001
Limits of Reporting (LOR)		0.01	0.001	0.001
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)				
Health Screening Levels ^a - Residential A		0.01	0.001	0.001
Fibro-cement Piece				
FCP150	Surface	ACM		
FCP151	0.0-0.3	ACM		
FCP152	0.0-0.3	ACM		
FCP152	0.5-0.8	ACM		
FCP157	0.0-0.15	ACM		

Notes:

ACM: Asbestos Containing Material

AF: Asbestos Fines

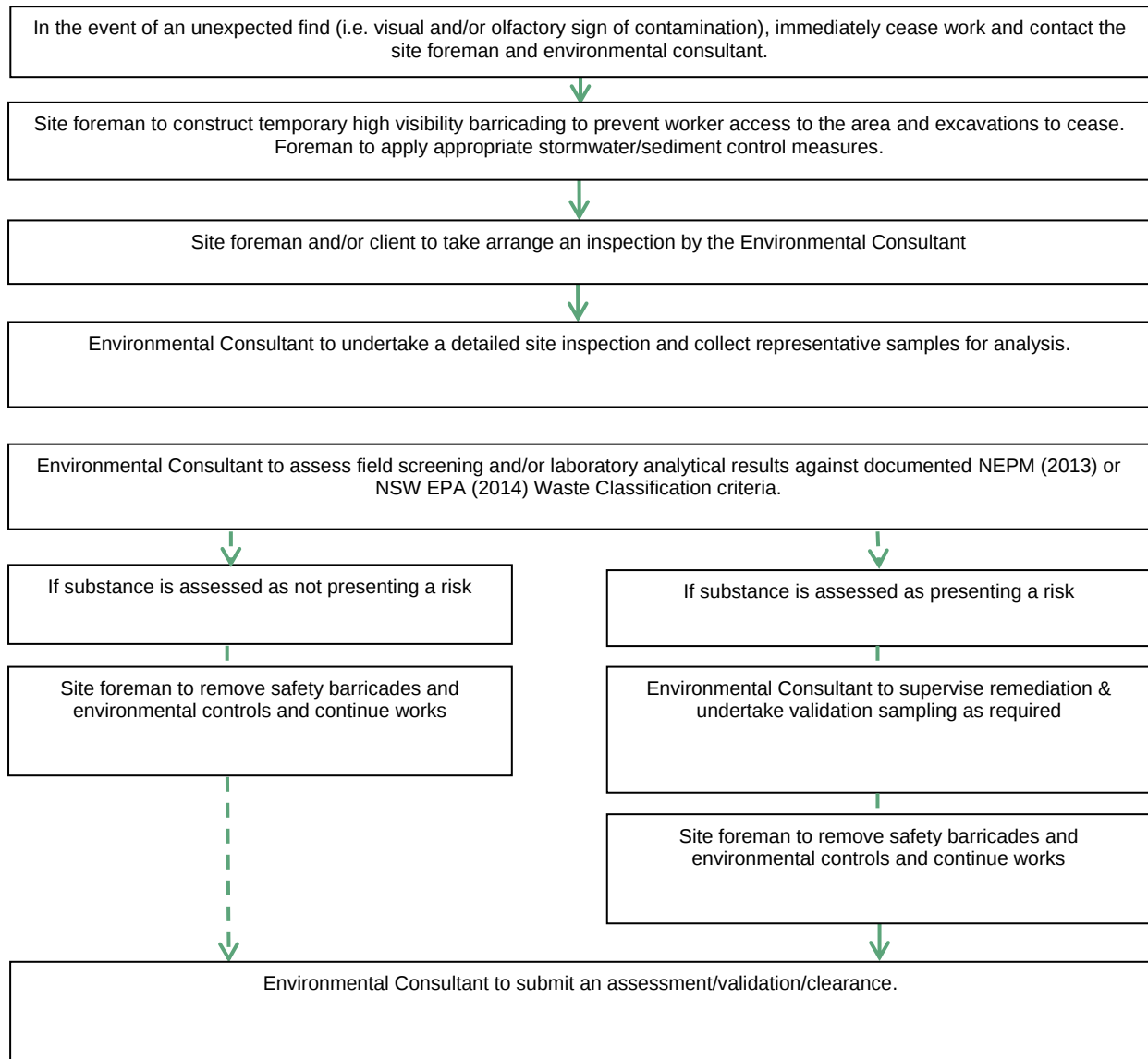
FA: Fibrous Asbestos

a: Residential with garden / accessible soil (home grown produce <10% fruit and vegetable intake (no poultry)), also includes childcare centres, preschools and primary schools.

APPENDIX C

UNEXPECTED FINDS MANAGEMENT PROTOCOL

UNEXPECTED FINDS PROTOCOL



APPENDIX D

ENVIRONMENTAL NOTES

IMPORTANT INFORMATION REGARDING YOUR ENVIRONMENTAL SITE ASSESSMENT

These notes have been prepared by Geotechnique Pty Ltd, using guidelines prepared by the ASFE (Associated Soil and Foundation Engineers). The notes are offered to assist in the interpretation of your environmental site assessment report.

REASONS FOR AN ENVIRONMENTAL ASSESSMENT

Environmental site assessments are typically, though not exclusively, performed in the following circumstances:

- As a pre-acquisition assessment on behalf of either a purchaser or a vendor, when a property is to be sold
- As a pre-development assessment, when a property or area of land is to be redeveloped, or the land use has changed e.g. from a factory to a residential subdivision
- As a pre-development assessment of greenfield sites, to establish baseline conditions and assess environmental, geological and hydrological constraints to the development of e.g. a landfill
- As an audit of the environmental effects of previous and present site usage

Each circumstance requires a specific approach to the assessment of soil and groundwater contamination. In all cases the objective is to identify and if possible quantify the risks that unrecognised contamination poses to the ongoing proposed activity. Such risks may be both financial (clean-up costs or limitations in site use) and physical (health risks to site users or the public).

ENVIRONMENTAL SITE ASSESSMENT LIMITATIONS

Although information provided by an environmental site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination within a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which did not show signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant that may occur; only the most likely contaminants are screened.

AN ENVIRONMENTAL SITE ASSESSMENT REPORT IS BASED ON A UNIQUE SET OF PROJECT SPECIFIC FACTORS

In the following events and in order to avoid cost problems, you should ask your consultant to assess any changes in the conclusion and recommendations made in the assessment:

- When the nature of the proposed development is changed e.g. if a residential development is proposed, rather than a commercial development
- When the size or configuration of the proposed development is altered e.g. if a basement is added
- When the location or orientation of the proposed structure is modified
- When there is a change of land ownership, or
- For application to an adjacent site

ENVIRONMENTAL SITE ASSESSMENT FINDINGS ARE PROFESSIONAL ESTIMATES

Site assessment identifies actual sub-surface conditions only at those points where samples are taken, when they are taken. Data obtained from the sampling and subsequent laboratory analyses are interpreted by geologists, engineers or scientists and opinions are drawn about the overall sub-surface conditions, the nature and extent of contamination, the likely impact on any proposed development and appropriate remediation measures. Actual conditions may differ from those inferred, because no professional, no matter how qualified and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, however, steps can be taken to help minimise the impact. For this reason site owners should retain the services of their consultants throughout the development stages of the project in order to identify variances, conduct additional tests that may be necessary and to recommend solutions to problems encountered on site.

Soil and groundwater contamination is a field in which legislation and interpretation of legislation by government departments is changing rapidly. Whilst every attempt is made by Geotechnique Pty Ltd to be familiar with current policy, our interpretation of the investigation findings should not be taken to be that of the relevant authority. When approval from a statutory authority is required for a project, approval should be directly sought.

STABILITY OF SUB-SURFACE CONDITIONS

Sub-surface conditions can change by natural processes and site activities. As an environmental site assessment is based on conditions existing at the time of the investigation, project decisions should not be based on environmental site assessment data that may have been affected by time. The consultant should be requested to advise if additional tests are required.

ENVIRONMENTAL SITE ASSESSMENTS ARE PERFORMED FOR SPECIFIC PURPOSES AND CLIENTS

Environmental site assessments are prepared in response to a specific scope of work required to meet the specific needs of specific individuals e.g. an assessment prepared for a consulting civil engineer may not be adequate to a construction contractor or another consulting civil engineer.

An assessment should not be used by other persons for any purpose or by the client for a different purpose. No individual, other than the client, should apply an assessment, even for its intended purpose, without first conferring with the consultant. No person should apply an assessment for any purpose other than that originally contemplated, without first conferring with the consultant.

MISINTERPRETATION OF ENVIRONMENTAL SITE ASSESSMENTS

Costly problems can occur when design professionals develop plans based on misinterpretation of an environmental site assessment. In order to minimise problems, the environmental consultant should be retained to work with appropriate design professionals, to explain relevant findings and to review the adequacy of plans and specifications relative to contamination issues.

LOGS SHOULD NOT BE SEPARATED FROM THE REPORT

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists, based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these would not be redrawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however, contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. Should this occur, delays and disputes, or unanticipated costs may result.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of sub-surface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations, such as contractors.

READ RESPONSIBILITY CLAUSES CLOSELY

An environmental site assessment is based extensively on judgement and opinion; therefore, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. In order to aid in prevention of this problem, model clauses have been developed for use in written transmittals. These are definitive clauses, designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment and you are encouraged to read them closely. Your consultant will be happy to give full and frank answers to any questions you may have.