Environmental Group Australia

Mirvac Residential (NSW) Developments Pty Ltd

Remedial Action Plan

Western Sydney University - Milperra Campus
Horsley Road & Bullecourt Avenue, Milperra NSW

Report No:
2300-RAP-01-300924.v1f

Report Date:
4/11/2025

info@egau.com.au

NSW: 36E Fitzroy Street, Marrickville, NSW 2204
VIC: 88 Langridge St, Collingwood VIC 3066

Document Record

Revision	Date	Author	Reviewer
v1d	30 September 2024	Isabelle Figatowski	Steven Wallace
v2d	11 October 2024	Isabelle Figatowski	Steven Wallace
v3d	8 August 2025	Maxwell Cunningham	Steven Wallace
v4d	26 August 2025	Maxwell Cunningham	Steven Wallace
v5d	12 September 2025	Maxwell Cunningham	Steven Wallace
v1f	4 November 2025	Maxwell Cunningham	Steven Wallace

Author Signature			**Reviewer Signature**	
Name	Isabelle Figatowski	Maxwell Cunningham	**Name**	Steven Wallace
Credentials	B.Sc. (Env. Consulting)	B.Sc. Zoology NSW LAA002032	**Credentials**	CEnvP, M.Sc.Env.Sci, B.Sc. Meteorology, NSW
Title	Environmental Scientist	Environmental Scientist	**Title**	Senior Environmental Scientist

Document Title:	Remediation Action Plan, Western Sydney University – Milperra Campus, Horsley Road & Bullecourt Avenue, Milperra NSW
Site Address:	Western Sydney University – Milperra Campus, Horsley Road & Bullecourt Avenue, Milperra NSW
Client Name:	Mirvac Residential (NSW) Developments Pty Ltd
Site Size:	19.6 ha
Reference Number:	2300-RAP-02-101024.v1f
Project Type:	Remedial Action Plan
Project Type Abbreviation:	RAP
Document Draft:	Final
Document Revision No.	v1f

Prepared by Environmental Group Australia Pty Ltd ABN: 83 671 599 143

Executive Summary

Environmental Group Australia (EGA) was engaged by Mirvac Residential (NSW) Developments Pty Ltd, to prepare a Remedial Action Plan (RAP) for the proposed residential development within the former Western Sydney University – Milperra Campus, Horsley Road & Bullecourt Avenue, Milperra NSW (refer **Figure 1**).

This RAP supersedes the existing RAP prepared for the site by Alliance Geotechnical (AG) prepared in 2022. An addendum to the AG RAP was required to reflect the contamination assessments undertaken at the site since 2022, in addition to capturing the changes to the site condition following demolition of on-site structures.

EGA has the following project appreciation:

- The entirety of the site covers an area of approximately 19.6 ha;
- The site was formerly utilised as a university campus with on-site accommodation, open space parkland, playing fields and associated infrastructure;
- The site is proposed for redevelopment comprising a low-density residential land use setting;
- Historically the site has been utilised for agricultural activities with rural-residential structures;
- A Phase 2 Environmental Site Assessment was undertaken within the student residence development area in 2011 by Coffey (Coffey 2011);
- A Soil Contamination Investigation was undertaken across the site by Noel Arnold and Associates in 2011 (NAA 2011);
- A Phase 1 Environmental Assessment Report was undertaken across the site in 2020 by JBS&G Australia (JBS&G 2020);
- A Detailed Site Investigation (DSI) was carried out for the site in December 2019 and January 2020 by Alliance Geotechnical (AG), which identified five areas of environmental concern;
- A Remedial Action Plan (RAP) was prepared for the site by AG in January 2020, which identified four data gaps requiring further assessment;
- A Hazardous Building Material Survey was prepared for the onsite structures by EGA in 2024 which identified asbestos containing building materials, lead containing paints, SMFs, presumed PCB capacitors and ozone depleting refrigerants;
- A Phase 2 Assessment Detailed Site Investigation was completed by EGA in 2025 to address data gaps identified within AG 2022;
- The demolition of on-site structures as part of the redevelopment of site was completed across 2024 and 2025;
- A Demolition Clearance Report was prepared by EGA in 2025 documenting the removal of hazardous building materials before and during the demolition process;
- Non-friable asbestos impacted soils encountered within building footprints (AEC05) during completion of the demolition scope for site across 2024 and 2025 were partially remediated to facilitate continuation of the works in those areas. These partial remediation works generated approximately 7,626 m^3 of non-friable asbestos impacted spoil which is stockpiled on site atop a geofabric layer;
- Non-friable asbestos impacted soils associated with AEC02 were partially excavated during construction of a sediment basin in the south of site. These partial remediation works generated approximately 4,156 m^3 of non-friable asbestos impacted spoil which is stockpiled on site atop a geofabric layer; and
- An update to the Remedial Action Plan (RAP) is required to update and compliment the site's existing RAP (AG 2022) and address the remediation and validation of identified Areas of Environmental Concern (AEC) within the site.

The objectives of this RAP are to:

- Prepare a Remedial Action Plan (RAP) in line with the NSW EPA guidelines for 'consultants reporting on contaminated land' in addition to local council contaminated land policy (Canterbury Bankstown 2017) to address the issues that have been identified on the site and to provide a strategy to render the site suitable for the proposed development;
- Provide provision for supplementary contamination assessments to address data gaps identified in previous contamination assessments undertaken for the site;
- Achieve an acceptable outcome that is technically, logistically and financially feasible;
- Summarise the findings of site contamination investigation reports and present a refined conceptual site model;
- Document the identified contamination risks to human health and/or the environment;
- Define the extent of remediation required across the site;
- Assess options and remedial technologies to achieve the remediation objectives and select and justify a preferred approach, which must include the consideration of the principles of ecologically sustainable development;
- Document in detail all procedures and plans to reduce risks posed by contamination to acceptable levels for the proposed site use;
- Establish the environmental safeguards required to complete the remediation in an environmentally acceptable manner, including consideration of the potential for off-site impacts (such as air quality, odour and aesthetics);
- Address contingencies and unexpected finds protocols;
- Identify the necessary approvals and licences required by regulatory authorities including any items contained in development consent conditions;
- Clearly outline waste classification, handling and tracking requirements in accordance with the Guidelines for the NSW Site Auditor Scheme and Waste Classification Guidelines (EPA 2014);
- Ensure remediation is consistent with relevant laws, policies (including planning instruments and policies) and guidelines and reference these in the remedial action plan;
- Identify how successful implementation of the remedial action plan will be demonstrated; and
- Provide a management framework that will give Council confidence that the remedial measures will be undertaken in accordance with the RAP, to make the site suitable for the proposed use.

The scope of the RAP has been established on the basis of findings from the previous contamination investigations completed, with the RAP aimed at providing:

- Provision to undertake a supplementary contamination assessment to address data gaps identified in previous contamination assessments;
- An appropriate remedial strategy to render the site suitable for the proposed urban residential land-use;
- Appropriate requirements for the validation and verification of the successful implementation of the remediation strategy and the remediation acceptance criteria to be adopted;
- Appropriate environmental safeguards required to conduct the remediation works in an environmentally acceptable manner; and
- OH&S procedures required to conduct the remediation works in a manner that will not pose a threat to the health of site workers or users.

The available site data was assessed within the objectives of this investigation and in the context of the proposed development works. That assessment identified areas of environmental concern (AECs) and contaminants of concern (COC) which have the potential to be present within and the site. The AECs identified are presented in attached **Figure 2** and associated contaminants of concern are presented in **Table 1.1.**

Table 1.1 Areas of Environmental Concern and Contaminants of Potential Concern

ID	Area of Environmental Concern	Contaminants of Concern	Affected mediums	Exposure risk	Proposed Remedial Strategy	Figure
AEC01	Friable Asbestos* Impacted Fill Soils	Friable Asbestos	Soil	Human Health & Aesthetics	Off-site disposal	3
	Non-Friable Asbestos Impacted Fill Soils	Non-Friable Asbestos	Soil	Human Health & Aesthetics	Off-site disposal	3
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils	Lead, Cadmium and Zinc	Soil	Human Health and Ecological Health	Off-site disposal	2
AEC02	Friable Asbestos Impacted Fill Soils **	Friable Asbestos	Soil	Human Health & Aesthetics	Off-site disposal	4
	Non-Friable Asbestos Impacted Fill Soils	Non-Friable Asbestos	Soil	Human Health & Aesthetics	Remediation and on-site reuse at depth	4
	Stockpiled Non-Friable Asbestos Impacted Soils	Non-Friable Asbestos	Soil	Human Health & Aesthetics	Remediation and on-site reuse at depth	4
AEC03	Non-Friable Asbestos Impacted Fill Soils	Asbestos	Soil	Human Health & Aesthetics	Remediation and on-site reuse at depth	5
AEC05	Building Footprints (Assessed)	Asbestos	Soil	Human Health	Remediation and on-site reuse at depth	6

Notes: * Five of the six friable asbestos hotspots remediated, soils associated with sampling locations 'EBH2', 'EBH3', 'EBH5', 'SS10' and 'BH39' have been removed off-site and the excavations validated. ** Both friable asbestos hotspots remediated, soils associated with sampling locations 'EBH24' and 'EBH25' have been removed off-site and the excavations validated.

The available site data was assessed within the objectives of this investigation and in the context of the proposed development works. That assessment identified potential areas of environmental concern (PAECs) and contaminants of potential concern (COPC) which have the potential to be present within the broader property and the site and require further assessment. The PAECs identified are presented in attached **Figure 7** and associated contaminants of concern are presented in **Table 1.2.**

Discussion on the assessment of Potential Areas of Environmental Concern is presented in Section 8.

Table 1.2 PAECs and COPC

ID	Potential Area of Environmental Concern	Source	Contaminants of Concern	Affected mediums	Exposure risk
PAEC04	Former Underground Storage or Petroleum-Based Product Onsite	Unleaded Petrol & Diesel Tanks	Heavy Metals, TRH, PAH, VOC/SVOC, Phenols	Soil & Groundwater	Human Health, Ecological Health & Aesthetics
PAEC05	Building Footprints (pending assessment)	Uncontrolled Demolition/Filling	Metals, PAH, BTEX, TRH, PCB, OCP/OPP, Phenols and Asbestos	Soil	Human Health & Aesthetics
	Stockpiled Non-Friable Asbestos Impacted Soils	Uncontrolled Demolition/Filling	Metals, PAH, BTEX, TRH, PCB, OCP/OPP, Phenols and Asbestos	Soil	Human Health & Aesthetics
PAEC06	Migration of Landfill Gas	Landfill Activities South of the Site	Methane, Carbon Dioxide, Carbon monoxide, Hydrogen sulphide	Ground Gas	Human Health
PAEC07	Adjacent Industrial Land Use to the North and North-East of the Site	Industrial Activities North and North-East of the Site	Heavy Metals, TRH, BTEX, PAH, VOC, OCP/OPP, PCB, PFAS, inorganic compounds	Groundwater	Human Health
PAEC08	Risk of redundant fibre cement conduits and septic tanks within the site footprint	Historical Agricultural Land-Use Activities	Metals, PAH, BTEX, TRH, Asbestos, OCPs, E.Coli and Thermotolerant Coliforms	Soil	Human Health and Ecological
PAEC09	Risk of asbestos contamination within the site footprint	Historical Agricultural Land-Use Activities	Asbestos	Soil	Human Health and Ecological

The remedial goal for this site is to remediate potential contamination (where identified) to a level that does not present an unacceptable human health exposure and environmental risks, making the suit suitable for the proposed development. EGA notes that the client, would prefer that the remedial works be undertaken in a manner that does not result in the need for:

- Notation on a planning certificate for the site;
- A covenant registered on the title to the land; or
- A long-term environmental management plan (EMP).

The extent of contamination within the site is presented within **Table 1.3** overleaf.

Table 1.3 Approximate Remedial Extents

ID	Area of Environmental Concern	Approximate Extent
AEC01	Friable Asbestos Impacted Fill Soils	25 m^2 x 0.5 m bgsl Total ≈ 12.5 m^3 / 22.5 tonnes
	Non-Friable Asbestos Impacted Fill Soils	3,950 m^2 x (0.2 to 0.7 m / average 0.5 m bgsl) 1,975 m^3 / 3,555 tonnes
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils	1,000 m^2 x 0.25 m bgsl 250 m^3 / 450 tonnes *(Extent may vary following supplementary assessment)*
AEC02	Non-Friable Asbestos Impacted Fill Soils	10,425 m^2 x (0.1 to 1.2 m / average 0.5 m bgsl) 5,212.5 m^3 / 9,382.5 tonnes
	Stockpiled Non-Friable Asbestos Impacted Soils	Stockpiled: *4,156 m^3 / 7,480 tonnes*
AEC03	Non-Friable Asbestos Impacted Fill Soils	15,480 m^2 x (0.3 to 1.4 m / average 0.6 m bgsl) 9,288 m^3 / 16,718 tonnes
AEC05	Building Footprints (Assessed)	14,050 m^2 x (0.3 to 1.0 m / average 0.6 m bgsl) *8,430 m^3 / 15,174 tonnes*
	Stockpiled Non-Friable Asbestos Impacted Soils	Stockpiled: *7,626 m^3 / 13,726 tonnes*
AEC08	Risk of redundant fibre cement conduits and septic tanks within the site footprint	Site Footprint
AEC09	Risk of asbestos contamination within the site footprint	Site Footprint

Based on SE's assessment detailed above, the most suitable remedial strategy will comprise a combination of treatment options consistent the ultimate end land use of the site. **Table 1.4** below summarises the preferred remediation strategies with regards to the identified contamination within the site.

Table 1.4 Selected Remediation Strategies

AEC ID	Contamination Risk	Selected Remediation Strategy
AEC01	Friable Asbestos Impacted Fill Soils	Excavation and Off-Site Disposal
	Non-Friable Asbestos Impacted Fill Soils	On-Site Treatment and Beneficial Re-Use
AEC02	Non-Friable Asbestos Impacted Fill Soils	On-Site Treatment and Beneficial Re-Use
AEC03	Non-Friable Asbestos Impacted Fill Soils	On-Site Treatment and Beneficial Re-Use
AEC05	Soil Materials Beneath Existing Building Footprints	On-Site Treatment and Beneficial Re-Use
-	Direct Contact Risks in Soil Materials (*if identified*)	Excavation and Off-Site Disposal
-	Ecological Risks in Soil Materials (only) (*if identified*)	Excavation and Beneficial Re-Use at depths > 2 m bgsl
-	Aesthetic Risks (*if identified*)	Excavation and On-Site Treatment to Remove Foreign Materials; or Off-Site Disposal

Areas subject to remediation are outlined in **Figure 2.**

Excavation and disposal off-site is considered as a contingency remedial strategy for all contamination risks.

Based on the information presented in the historical contamination assessment reports, EGA concludes that the remedial goal can be achieved, and the site made suitable for the proposed land use setting, subject to:

- Implementation of the strategies, methodologies and measures set out in this remedial action plan;
- Should newly identified unacceptable land contamination risks be identified during the supplementary assessment and remediation works, a revision to this RAP may be required. The revision should be prepared by a suitably experienced environmental consultant;
- Prior to any removal of soils from site for offsite disposal during remedial works, a waste classification for those soils should be prepared by a suitably experienced environmental consultant;
- Future remedial works should be monitored and validated by a suitably experienced environmental consultant; and
- Following the completion of the remediation and validation work, the environmental consultant needs to prepare a site remediation and validation report that documents both the remediation and validation work as required by the EPA (2020) reporting guidelines.

This report must be read in conjunction with the limitations set out in **Section 15.**

TABLE OF CONTENTS

FIGURES

APPENDIX A

List of Abbreviations

A list of the common abbreviations used throughout this report is provided below:

AHD	Australian Height Datum
AST	Aboveground storage tank
bgs	Below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
Btoc	Below top of casing
CoC	Chain of Custody
CSM	Conceptual Site Model
DSI	Detailed Site Investigation
EC	Electrical conductivity
EIL	Ecological Investigation Level
EGA	Envrionmental Group Australia Pty Ltd
EPA	Environment Protection Authority
HIL	Health Investigation Levels
HSL	Health Screening Levels
LOR	[Laboratory] Limit of reporting
NATA	National Association of Testing Laboratories
N/A	Not applicable
ND	Not detected
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW EPA	NSW Environment Protection Authority
OCP	Organochlorine Pesticide
OPP	Organophosphorus Pesticide
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PID	Photo-ionisation detector
PSI	Preliminary Site Investigation
QA/QC	Quality assurance/Quality control
RPD	Relative percentage difference
SAQP	Sampling Analysis and Quality Plan
SVOC	Semi-volatile organic compound
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
UST	Underground storage tank

1 INTRODUCTION

1.1 Background

Environmental Group Australia (EGA) was engaged by Mirvac Residential (NSW) Developments Pty Ltd, to prepare a Remedial Action Plan (RAP) for the proposed residential development within the former Western Sydney University – Milperra Campus, Horsley Road & Bullecourt Avenue, Milperra NSW (refer **Figure 1**).

This RAP supersedes the existing RAP prepared for the site by Alliance Geotechnical (AG) prepared in 2022. An addendum to the AG RAP was required to reflect the contamination assessments undertaken at the site since 2022, in addition to capturing the changes to the site condition following demolition of on-site structures.

EGA has the following project appreciation:

- The entirety of the site covers an area of approximately 19.6 ha;
- The site was formerly utilised as a university campus with on-site accommodation, open space parkland, playing fields and associated infrastructure;
- The site is proposed for redevelopment comprising a low-density residential land use setting;
- Historically the site has been utilised for agricultural activities with rural-residential structures;
- A Phase 2 Environmental Site Assessment was undertaken within the student residence development area in 2011 by Coffey (Coffey 2011);
- A Soil Contamination Investigation was undertaken across the site by Noel Arnold and Associates in 2011 (NAA 2011);
- A Phase 1 Environmental Assessment Report was undertaken across the site in 2020 by JBS&G Australia (JBS&G 2020);
- A Detailed Site Investigation (DSI) was carried out for the site in December 2019 and January 2020 by Alliance Geotechnical (AG), which identified five areas of environmental concern;
- A Remedial Action Plan (RAP) was prepared for the site by AG in January 2020, which identified four data gaps requiring further assessment;
- A hazardous Building Material Survey was prepared for the onsite structures by EGA in 2024 which identified asbestos containing building materials, lead containing paints, SMFs, presumed PCB capacitors and ozone depleting refrigerants;
- A Phase 2 Assessment Detailed Site Investigation was completed by EGA in 2025 to address data gaps identified within AG 2022;
- The demolition of on-site structures as part of the redevelopment of site was completed across 2024 and 2025;
- A Demolition Clearance Report was prepared by EGA in 2025 documenting the removal of hazardous building materials during the demolition process;
- Non-friable asbestos impacted soils encountered within building footprints (AEC05) during completion of the demolition scope for site across 2024 and 2025 were partially remediated to facilitate continuation of the works in those areas. These partial remediation works generated approximately 7,626 m^3 of non-friable asbestos impacted spoil which is stockpiled on site atop a geofabric layer;
- Non-friable asbestos impacted soils associated with AEC02 were partially excavated during construction of a sediment basin in the south of site. These partial remediation works generated approximately 4,156 m^3 of non-friable asbestos impacted spoil which is stockpiled on site atop a geofabric layer; and
- An update to the Remedial Action Plan (RAP) is required to update and compliment the site's existing RAP (AG 2022) and address the remediation and validation of identified Areas of Environmental Concern (AEC) within the site.

1.2 Proposed Development

EGA understands that the proposed development within the site will comprise construction of residential housing and associated infrastructure within a low-density residential land use setting. The proposed development will entail subdivision of the site into up to 430 residential lots, approximately 2 ha of conservation land in the north-east corner of site and three open space areas / public parks.

Residential lots will be sold off under Torrens tittle. The road corridors and parkland areas will be acquired by local council. The conversation area will be maintained through a community title scheme applicable to both E1 and C2 areas.

Table 1.2.1 Proposed Development Stages

Development Stage	Parks/ Conservation Area	Construction Timeframe
1	No	Q3 2026 to Q4 2026
2	Central park	Q3 2026 to Q1 2027
3	C2 Conservation Area	Q2 2027 to Q3 2027
4	Southern Park	Q2 2027 to Q2 2028
5	No	Q2 2028 to Q4 2028
6	Northern park	Q3 2028 to Q1 2029
7	No	Q1 2029 to Q3 2029

The proposed bulk earthworks plan for the site comprises approximately 55,502 m^3 of cut and 60,584 m^3 of fill (refer to Masterplan Civil DA Plas appendix A).

Currently under the *State Environmental Planning Policy (Resilience and Hazards 2021)* – a consent authority must not consent to the carrying out of any redevelopment unless it has considered whether the land is contaminated.

1.3 Objectives

The objectives of this RAP are to:

- Prepare a Remedial Action Plan (RAP) in line with the NSW EPA guidelines for 'consultants reporting on contaminated land' in addition to local council contaminated land policy (Canterbury Bankstown 2017) to address the issues that have been identified on the site and to provide a strategy to render the site suitable for the proposed development;
- Provide provision for supplementary contamination assessments to address data gaps identified in previous contamination assessments undertaken for the site;
- Achieve an acceptable outcome that is technically, logistically and financially feasible;
- Summarise the findings of site contamination investigation reports and present a refined conceptual site model;
- Document the identified contamination risks to human health and/or the environment;
- Define the extent of remediation required across the site;
- Assess options and remedial technologies to achieve the remediation objectives and select and justify a preferred approach, which must include the consideration of the principles of ecologically sustainable development;
- Document in detail all procedures and plans to reduce risks posed by contamination to acceptable levels for the proposed site use;
- Establish the environmental safeguards required to complete the remediation in an environmentally acceptable manner, including consideration of the potential for off-site impacts (such as air quality, odour and aesthetics);
- Address contingencies and unexpected finds protocols;
- Identify the necessary approvals and licences required by regulatory authorities including any items contained in development consent conditions;

- Clearly outline waste classification, handling and tracking requirements in accordance with the Guidelines for the NSW Site Auditor Scheme and Waste Classification Guidelines (EPA 2014);
- Ensure remediation is consistent with relevant laws, policies (including planning instruments and policies) and guidelines and reference these in the remedial action plan;
- Identify how successful implementation of the remedial action plan will be demonstrated; and
- Provide a management framework that will give Council confidence that the remedial measures will be undertaken in accordance with the RAP, to make the site suitable for the proposed use.

1.4 Scope of Remedial Action Plan

The scope of the RAP has been established on the basis of findings from the previous contamination investigations completed, with the RAP aimed at providing:

- Provision to undertake a supplementary contamination assessment to address data gaps identified in previous contamination assessments;
- An appropriate remedial strategy to render the site suitable for the proposed urban residential land-use;
- Appropriate requirements for the validation and verification of the successful implementation of the remediation strategy and the remediation acceptance criteria to be adopted;
- Appropriate environmental safeguards required to conduct the remediation works in an environmentally acceptable manner; and
- OH&S procedures required to conduct the remediation works in a manner that will not pose a threat to the health of site workers or users.

1.5 Roles and Responsibilities

The main parties involved in carrying out the remediation works at the site are the Project Manager, Remediation Contractor and the Environmental Consultant. A table of role and responsibilities of all parties has been outlined below in **Table 1.5.1** overleaf.

Council's Contaminated Land Policy requires that "Prior to determining development applications, Council must be satisfied that remedial measures have been, or will be, undertaken in accordance with the submitted RAP, to make the site suitable for the proposed use." This RAP achieves this objective by specifying a management framework that aims to achieve this objective.

The adopted management framework for this RAP involves:

- All remediation work at the Site needs to be undertaken in accordance with the RAP and any interim audit advice approved by Council and referenced in a Development Application;
- Any changes to the remediation strategy are to be approved in writing by the Site Auditor and Council prior to the change being implemented; and
- A generic task breakdown structure has been designed with hold points at the end of critical tasks.

Table 1.5.1 Roles and Responsibilities for the Remediation Works

Roles	Responsibility
Property Owner or Site Developer	• Overall responsibility of site and key liaison for council. Appoints appropriate site contractors, including all other members of the Remediation Works Team.
Project Manager	• Responsible for overseeing the implementation of the RAP.
Remediation Contractor	• Responsible for conducting the remediation works and managing the site in accordance with the requirements of the RAP and associated Development Consent. • Site Preparation including establishment of management plan requirements, importation of suitable landscaping material (if required) waste classification and disposal, as well as ensuring the remediation is conducted in accordance with this plan. • Ensure consultant is up to date with work schedules and is engaged to complete key components of the work (i.e. waste classification assessments, etc) • Implementation of measures required to mitigate any adverse effects resulting from the remediation • Ensure all spoil removed from site is classified by the environmental consultant and is disposed of at a suitable facility • Tracking of waste between the site and deposition facility, including collection of all waste documentation to be provided to the environmental consultant. • Reporting any environmental issues, complaints or unexpected finds to the project manager and environmental consultant
Environmental Consultant	• Development of the remediation objectives and strategy • Support all other members of the Remediation Works Team in understanding the requirements of the RAP and the potential risk posed should measures not be implemented • Updating all other members of the Remediation Works Team following receipt of results from the supplementary contamination assessment • Monitoring of key remediation components, collection of all environmental samples, and provide guidance to ensure the remediation is understood, and effective • Complete site validation tasks and detail the works in a validation report concluding on site suitability
The Department of Planning, Housing and Infrastructure	• Responsible for granting all consents and ensuring the recommendations of environmental reports are implemented
Site Auditor	Responsibilities for addressing the following scope: • Has the contaminated land consultant complied with all EPA endorsed guidelines • What further investigations or remediation is required before the land is suitable for any specified use or range of uses? • Whether the auditor considers that the proposed remediation is adequate, and if undertaken, will render the site to be suitable for the proposed use

2 SITE IDENTIFICATION

The site identification details and associated information are presented in **Table 2.1.**

Table 2.1 Site Identification Information

Attribute	Description
Street Address	Western Sydney University – Milperra Campus, Bullecourt Avenue, Milperra NSW
Lot and Deposited Plan (DP)	Lot 2 DP1291984 Lot 1 DP101147
Geographical Coordinates	33°56'25.876" S 150°59'26.563" E (Centre of site)
Site Area	19.6 ha
Local Government Area (LGA)	City of Canterbury-Bankstown
Parish	Bankstown
County	Cumberland
Zoning	SP2 - Infrastructure / Commercial Servies (Educational Establishment) RE1 - Public Recreation R1 - General Residential C2 - Environmental Conservation E1 - Local Centre *Canterbury-Bankstown Local Environmental Plan 2023*

The locality of the site is set out in **Figure 1**.

The general layout and boundary of the site is set out in **Figure 2**.

3 GEOLOGY, ACID SULFATE SOILS, TOPOGRAPHY AND HYDROGEOLOGY

Regional geology, topography, soil landscape and hydrogeological information are presented in **Table 3.1**.

Table 3.1 Regional Setting Information

Attribute	Description
Geology	A review of the Environment NSW 'eSpade V2.1' web application (environment.nsw.gov.au/eSpade2WebApp, accessed 30 September 2024), indicated that the site is likely to be underlain by Wianamatta Group Ashfield Shale defined as laminite and dark grey siltstone, Bringelly Shale defined as shale with occasional calcareous claystone, laminite and infrequent coal, and Minchinbury Sandstone defined as fine to medium-grained quartz lithic sandstone.
Acid Sulfate Soils	A review of the acid sulfate soil risk mapping layer accessed on the Environment NSW 'eSpade V2.1' web application (accessed 30 September 2024), indicated that the site lies in an area mapped as ***'No Known Occurrence'*** with respect to acid sulfate soils. This infers that land management activities are not likely to be affected by acid sulfate soil materials. Further assessment of acid sulfate soils in the context of this investigation is considered by EGA as not warranted.
Topography	Generally, the local landscape consists of gently undulating rises on Wianamatta Group Shale with local relief 10 – 30 m and slopes generally >5% but occasionally up to 10%. The site topography slopes downwards from the north-east to south-west corner. EGA understands that the site is located at an elevation approximately 3 m to 22 m Australian Height Datum (AHD).
Hydrology and Hydrogeology	Surface water courses proximal to the site include an unnamed tributary of Kelso Creek, located approximately 300 m south of the site, Kelso Creek located approximately 600 m south of the site, and Georges River located approximately 1.3 km south-west of the site. Based on distances to the nearest surface water course and the site topography, groundwater flow in the vicinity of the subject area within the site is considered likely to be towards the south-west. A review of the NSW Office of Water groundwater database undertaken on 30 September 2024 indicated there are 7 registered groundwater features located within a 500 m radius of the north-eastern portion of the site; • GW113993 – groundwater monitoring bore, final drill depth 4.00 metres below ground level (mBGL), standing water level (SWL) not specified, located approximately 105 m east of the site; • GW113998 – groundwater monitoring bore, final drill depth 4.50 mBGL, SWL not specified, located approximately 150 m east of the site; • GW113994 – groundwater monitoring bore, final drill depth 5.20 mBGL, SWL not specified, located approximately 145 m east of the site; • GW113997 – groundwater monitoring bore, final drill depth 12.50 mBGL, SWL not specified, located approximately 240 m east of the site; • GW113999 – groundwater monitoring bore, final drill depth 7.00 mBGL, SWL not specified, located approximately 250 m east of the site; • GW113995 – groundwater monitoring bore, final drill depth 4.00 mBGL, SWL not specified, located approximately 278 m east of the site; and • GW113996 – groundwater monitoring bore, final drill depth 4.00 mBGL, SWL not specified, located approximately 307 m east of the site.
Adjacent Sensitive Receptors	A review of the Bureau of Meteorology Groundwater Dependent Ecosystem Map was undertaken to determine the closest sensitive ecological receptors. The closest highly dependent groundwater ecosystem was the Georges River, located approximately 1.3 km south-west of the site. The closest sensitive human receptors are the residential properties surrounding the site's boundary and any future onsite construction workers / builders.

4 PREVIOUS CONTAMINATION ASSESSMENTS

The following reports were reviewed during the project:

- Coffey (Coffey 2011), 'Phase 2 Environmental Site Assessment – Student Residence Development University of Western Sydney, Bankstown Campus', dated 25 August 2011, Ref: GEOTLCOV24163AG-AB;
- Noel Arnold and Associates (NAA 2011), 'Soil Contamination Investigation, University of Western Sydney – Bankstown Campus Bullecourt Avenue, Milperra NSW', dated October 2011, Ref: SJ0085:95458;
- Environmental Investigation Services (EIS 2016), 'Preliminary Contamination Screening and Waste Classification, Proposed Oval Facilities, UWS Bankstown Campus, 2 Bullecourt Avenue, Milperra' dated 7 April 2016, no report ref provided;
- JBS&G (JBS&G 2018), 'Phase 1 Environmental Assessment Report, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-1-1;
- Alliance Geotechnical (AG 2020), 'Detailed Site Investigation, Western Sydney University – Milperra Campus, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-1-1;
- Alliance Geotechnical (AG 2022), 'Remedial Action Plan, Western Sydney University – Milperra Campus, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-2-1;
- Environmental Group Australia (2025), 'Phase 2 Assessment Detailed Site Investigation, Western Sydney University – Milperra Campus, Milperra NSW', dated 26 August 2025, Ref: 2300-DSI-01-220224.v5f;
- Sydney Environmental Group (2023), 'Hazardous Building Material Survey, Western Sydney University – Milperra Campus, Milperra NSW', dated 27 February 2024, Ref: 2300-HBMS-01-081123.v1f; and
- Sydney Environmental Group (2025), 'Demolition Clearance Report, 2 Bullecourt Avenue, Milperra NSW', dated 15 October 2025, Ref: 2300-LTR-05-160725.v2f;

A summary of the previous contamination assessments is provided in **Sections 2** to **4.9.**

EGA notes that the site investigations were prepared in accordance with the hazardous and Resilience SEPP and reported in accordance with the NSW EPA (2020) Guidelines on 'Consultants Reporting on Contaminated Land'. As part of the Site Audit Statement issued for the previously prepared Remediation Action Plan (AG 2022), in which the previously prepared contamination reporting above is summarised, NSW site Auditor Louise Walkden stated that '*In the Auditors opinion, the nature and extent of contamination has been sufficiently determined for remediation planning purposes, noting data gaps can be adequately addressed under the RAP framework.*'

The assessment of fill materials within the site, with the exception of previously inaccessible areas beneath hardstand and structures is considered complete. Further characterisation of the lateral extent and nature of the identified asbestos impacts was outlined in the AG 2022 RAP to aid and inform remediation.

These characterisation works were undertaken across 2024 by SEG and 2025 by EGA, which are reported in the 2025 EGA Phase 2 Assessment DSI. Some portions of site remained inaccessible or where unable to be sampled at the time of that assessment. These data gap areas have been outlined within this RAP (refer to **Table 8.2** and **Figure 7**).

4.1 Phase 2 Environmental Site Assessment (Coffey 2011)

For the purposes of the Phase 2 Environmental Site Assessment (P2 ESA), Coffey assumed the assessment boundary comprised approximately 1.5 ha. At the time of reporting, it was subsequently understood that the proposed student residence development was to extend further to the east and cover an area of approximately 3 ha.

Coffey understood that UWS required a P2 ESA to support a development application (DA) to Bankstown City Council.

The objectives of the assessment were to:

- Assess the acid sulfate soil status of the site based on a review of risk map and field observations;
- Assess the contamination status of the site by undertaking sampling and testing of soil; and
- Provide recommendations for further investigation/remediation requirements (if any) for the site to be suitable for the proposed student accommodation development.

The scope of work undertaken included:

- Fieldwork including soil sampling;
- Laboratory testing; and
- Data assessment and reporting.

Based on the site history information and visual observations, a number of Areas of Environmental Concern (AECs) and Chemicals of Potential Concern (COPCs) were identified. The identified AECs and associated CoPCs identified by Coffey 2021 are presented in Table 4.1.1 below.

Table 4.1.1 AECs and associated COPC

Potential Areas of Concern	Chemicals of Potential Concern	Extent of Contamination
Southern end of the site – building rubble burial	TPH, PAH, Metals, Asbestos	Building rubble was buried up to 3 m to 4 m below the site surface.
Former farm dam – potential contaminated fill	TPH, BTEX, PAH, OCP, Metals, Asbestos	Potentially contaminated fill could have been used to backfill the dam
Whole site – use of pesticides for pest/weed control	OCP, Metals	Chemical application (such as pesticides) was commonly used in historical farming activities. Contamination, if present, is likely to be localised near the surface and minor.
Whole site – hazardous building materials	Asbestos, Lead	Historical fam sheds/houses could contain asbestos and lead paint. Weathering, leaching and spreading (during demolition) of material would likely to be localised in the near surface.
Existing Building Footprints (inaccessible)	Uncontrolled Filling	Metals, PAH, BTEX, TRH, PCB, OCP/OPP, Phenols and Asbestos

Twenty-five boreholes were cored across the site on 11 and 12 July 2011, and samples submitted to a NATA accredited laboratory for analysis of CoPC.

Analytical results indicated the contaminant concentrations were less than the adopted site criteria, with the exception of:

- Asbestos, which was detected at six locations across the site.

Coffey recommended additional assessment to be undertaken to further characterise the asbestos impact and to assist in the selection of remedial and management options.

4.2 Soil Contamination Investigation (NAA 2011)

NAA was commissioned by JDH Architects to undertake a Soil Contamination Investigation (SCI) in an area in the northeast of the Bankstown Campus at the University of Western Sydney - Bankstown Campus located at Bullecourt Avenue, Milperra NSW. The portion of the site investigated in NAA (2011) was approximately 2,500 m^2 in area and resided to the north of the existing P2 car park at the Bankstown Campus. The proposed redevelopment comprised construction of a single storey childcare facility with adjacent car parking facilities.

The objectives of the SCI were to provide information on the extent and nature of contamination (if any) within the fill/soil material at the site and to assess the suitability of the site for the proposed land-use as a childcare facility.

NAA undertook the following scope of works to achieve the project objectives:

- Prepare a safe work method statement for works to be conducted at the site;
- Complete a site inspection and a comprehensive site walkover;
- Conduct grid-based sampling pattern by the hand augering of eight locations within the boundaries of the site. Hand augering was undertaken to a maximum depth of approximately 1.2 m below ground surface with sampling conducted at varying depths through the fill/soil profile;
- Collect 17 soil samples;
- Conduct NATA-certified laboratory-based analysis of soil; and
- Prepare a SCI report.

Based on the findings of the investigation, NAA concluded the following:

- Hotspots of lead contamination at locations BH3 0.0-0.2 m and S2 0.0-0.1 m were identified during an intrusive investigation previously undertaken by Coffey (AG was not provided this report);
- Concentrations of cadmium (BH3 0.0-0.2 m) and zinc (BH3 0.0-0.2 m, S2 0.0-0.1 m and S7 0.0-0.1 m) have been found to exceed the adopted Provisional Phytotoxicity Investigation Levels (PPIL);
- The site was unsuitable for the proposed land use as a childcare facility due to the presence of hotspots of lead contamination which may present a risk to human health if not appropriately managed;
- Exceedances of PPILs have also been reported at these locations and can be addressed as part of the management of the lead hotspots; and
- A marginal exceedance of zinc concentrations when compared with the PPIL was recorded at S7 0.0-0.1 m. Given the marginal nature of this exceedance, it does not impact upon the suitability of the site for the proposal land use as a childcare facility.

Based on these conclusions, NAA 2011 made the following recommendations:

- Given the shallow nature of the impacted material, it was assumed that this material will be excavated and removed from site during the course of site preparation works (e.g. stripping back of topsoil material) for the purposes of redevelopment;
- Fill/soils to be removed offsite for disposal should be classified in accordance with NSW EPA Waste Classification Guidelines (2014) and should be disposed of at an appropriately licenced landfill facility;
- Following site preparation works, a suitably qualified and experienced Environmental Consultant should return to site to collect validation samples of the area of concern (in vicinity of BH3, S2 and S7) in order to confirm acceptable residual concentrations of heavy metals are present with respect to the adopted HIL and PPIL and that the site is suitable for the intended land use; and

- If it is determined that site preparation works will not result in the excavation and removal of the shallow material at BH3 0.0-0.2 m and S2 0.0-0.1 m, remediation works will be required. In this event, it is recommended that a Remedial Action Plan (RAP) be developed to address remediation of the hotspots of contamination identified.

4.3 Preliminary Contamination Screening and Waste Classification (EIS 2016)

Burtenshaw Scoufis Architecture + Interiors commissioned Environmental Investigation Services (EIS) to assign a waste classification to in-situ soil adjacent to the west of the athletics track located at 2 Bullecourt Avenue, Milperra NSW.

The aim of the investigation was to assess soil contamination issues at the site and to provide a waste classification for the material to be excavated for the proposed oval development.

The scope of work included the following:

- Review of available geological information;
- Soil sampling from three boreholes;
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC); and
- Preparation of a letter report presenting the results of the investigation.

All results were below the site assessment criteria (SAC) adopted for the site. Overlying fill soils were classified as General Solid Waste (Non-putrescible) and underlying natural soils were classified as Virgin Excavated Natural Material (VENM). Based on this data, EIS concluded that the risk of widespread significant soil contamination in the development area was relatively low. The fill and natural soil material assessed was considered by EIS to be suitable for re-use on the subject site, provided it meets geotechnical and earthwork requirements.

4.4 Phase 1 Environmental Assessment Report (JBS&G 2018)

JBS&G Australia Pty Ltd (JBS&G) was engaged by Western Sydney University (WSU) to prepare a Phase 1 Environmental Assessment Report for the WSU Milperra Campus located off Bullecourt Avenue, Milperra NSW. Based on current Master Plan concepts for the Milperra Campus, JBS&G understood WSU intended to create an integrated living and working precinct with a range of land uses including medium to high density residential, mixed use, retail, community, open space and conservation areas at the site.

The objective of the investigation was to assess the potential for contamination relating to historical and current land use activities at the site to constrain the intended development objectives, and to make recommendations for further investigations and or remediation to achieve intended land uses of the development.

To meet the project objectives, JBS&G carried out the following scope of works:

- Review of available council documentation, aerial photographs, legal title information, EPA records and heritage records to identify areas of environmental concern (AECs) and associated contaminants of potential concern (CoPC);
- Review of site setting including topography, hydrology, hydrogeology and geology;
- Review of records of environmental incidents or former environmental licenses held by the NSW EPA;
- A detailed site inspection of accessible areas to identify potential AECs and CoPC not identified in the historical record review;
- Development and documentation of a conceptual site model (CSM);
- Limited soil sampling and analysis of soil samples for a range of CoPC;
- Assessment of soil sampling and analysis results against EPA endorsed guideline criteria for residential land use; and
- Preparation of the Phase 1 Environmental Site Assessment report in general accordance with guidelines made or approved by the NSW EPA.

Surrounding land use at the time of JBS&Gs site walk over was comprised of the following:

- North: Bullecourt Avenue with commercial / industrial land-use beyond including a service station to the north-west;
- East: Mount Saint Joseph's High School and Horsley Road with commercial / industrial land-use beyond;
- South: The South Western Motorway (M5) with Kelso Landfill beyond; and
- West: Ashford Avenue with residential land-use beyond.

A SafeWork NSW search of the Stored Chemical Information Database (SCID) and the microfiche records held by SafeWork was requested. Information provided by SafeWork NSW included details on a number of abandoned (2) underground storage tanks (USTs) formerly located in the central western section of the site. Review of the SafeWork NSW documentation indicated the 2 x 2,500 L USTs were removed on Friday 19 December 1997 by Email Petroleum Systems.

Based on site history review and observations during the site walkover, JBS&G identified the following AEC and associated CoPC presented in **Table 4.4.1** below.

Table 4.4.1 AECs and associated COPCs

Areas of Environmental Concern (AECs)	Contaminants of Potential Concern (CoPCs)
Demolition of historical site structure that may have contained hazardous building materials	Heavy metals, lead and asbestos
Surface soils impacted with herbicides/pesticides due to the maintenance of site from noxious weeds/pests	OCPs
Fill materials across the site, potential imported to site	Heavy metals, TRH, BTEX, PAH, OCPs, PCBs and asbestos
Burial area (fill material)	Heavy metals, TRH, BTEX, PAH, VOCs
Landfill gas along the southern boundary adjacent the Kelso Landfill	Methane and other landfill gases (LFG)

JBS&G presented the following outcomes of its phase 1 assessment.

Based on the unidentified sources of fill material potentially imported to the site to backfill/raise topographic features and the potential for fill material at the site to contain waste materials associated with demolition of historical buildings potentially containing asbestos and/or lead paint, fill materials must be considered a potential contaminated medium. Due to the age of some existing site structures, it is possible that they may contain hazardous building materials including asbestos and lead based paints. Soils immediately surrounding buildings are considered as potentially contaminated medium.

In addition, buildings containing asbestos and / or lead paint which may have been demolished without appropriate controls may have also impacted surface soils. Surface soils must also therefore be considered a potential contaminated medium.

Based on the suspected depth of groundwater > 8 m bgs, the likelihood of contamination of groundwater as a result of activities at the site is considered to be low. Based on the presence of the landfill site to the south and the nearby commercial/industrial properties to the north and east, there is potential for groundwater to be impacted as a result of offsite activities.

Given the relatively close proximity of the landfill to the south of the site, landfill gas has the potential to be a contaminated medium in the southern portion of the site.

JBS&G carried out a limited detailed site inspection and investigation. During the detailed site inspection JBS&G noted the observation of topography for potential adjustments in ground levels due to filling, presence of waste material such as asbestos containing material (ACM) on the ground surface and on external surfaces of structures and potential chemical/fuel storage, use or spillage.

On 23 August 2017, ten surface samples were collected from the site using a hand auger and forwarded to a NATA accredited laboratory for analysis of heavy metals, PAH, asbestos (NEPM 500 ml) and OCPs. During soil sampling, a geotechnical fabric layer was identified below the ground surface at sampling point SS10.

Analytical results indicated the contaminant concentrations were less than the adopted site criteria, with the exception of:

- SS10 – asbestos fibres/fibrous asbestos (AF/FA) detected at 0.02% w/w above the adopted HSL site criteria 0.001% w/w.

Based on the findings of this investigation, JBS&G made the following conclusions:

- The site has historically been used for a combination of agricultural and residential uses prior to development of the university;
- There is the potential for impacts to soil as a result of the demolition of former building structures potentially containing hazardous building materials, including asbestos and lead paint. This was confirmed by the identification of asbestos at sampling point SS10 and review of the Coffey 2011 Phase 2 Environmental Site Assessment Report, which also identified and recommended management of asbestos in soil;
- There is the potential for presence of imported fill material of unknown origin to have been used during historical construction activities at the site; and
- Based on the presence of the landfill site to the south and the nearby commercial industrial properties to the north, northwest and east, there is considered to be a potential for contaminated groundwater and landfill gas migration to have impacted the site.

Based on these conclusions, JBS&G recommended a detailed site investigation (DSI) is undertaken for the site in order to assess the extent and degree of contamination at the site and to provide an assessment of risk posed by site contaminants to human and environmental health. In addition to the DSI, JBS&G recommended a hazardous building material survey be completed prior to commencement of redevelopment works such that materials identified as comprising lead paint and or asbestos may be appropriately managed with regard to exposure risks to site workers and future building occupants.

4.5 Detailed Site Investigation (AG 2020)

Alliance Geotechnical Pty Ltd (AG) was engaged by Mirvac Residential (NSW) Developments Pty Ltd to conduct a Stage 2 Detailed Site Investigation (DSI) for the site located at Western Sydney University – Milperra Campus, Milperra NSW.

AG had the following project appreciation:

- The site was an active campus of Western Sydney University;
- The investigation was limited to areas outside of building structures and discretion was required in active areas of the site;
- The site was proposed for rezoning and subdivision to facilitate residential development. It was understood that this will comprise demolition of the existing university campus and construction of a low-density residential development; and
- A Detailed Site Investigation was required to accompany the development application.

The primary objectives of this investigation were;

- To assess the potential for contamination to be present on the site in available accessible areas as a result of past and current land use activities;

- To provide advice on whether the site would be suitable (in the context of land contamination) for the proposed land use setting; and
- To provide recommendations for further investigation, management and/or remediation (if warranted).

AG undertook the following activities to address the project objectives:

- A desktop review of relevant information pertaining to the site;
- A site walkover to understand current site conditions;
- Conduct an intrusive site investigation via hydraulic excavator, drill rig and hand auger to establish ground conditions, facilitate the collection of representative soil and groundwater samples and install groundwater monitoring wells;
- Laboratory analysis of selected soil and groundwater samples collected during the field investigation; and
- An assessment of the contamination status of the site and preparation of a DSI in accordance with the Guidelines for Consultants Reporting on Contaminated Sites, 2011.

Based on evidence assessed as part of the investigation, AG made the following conclusions;

- The detected concentrations of contaminants of potential concern in groundwater are considered unlikely to present a risk to surrounding aquatic environments;
- The detected concentrations of contaminants of potential concern in groundwater are considered unsuitable for discharge to municipal stormwater without further treatment / assessment;
- The detected concentrations of contaminants of potential concern in the soil samples analysed are considered unlikely to present a risk an unacceptable direct contact human health exposure risk;
- The detected concentrations of asbestos fines / friable asbestos and non-friable asbestos containing materials in the soil samples analysed are considered likely to present a risk an unacceptable direct contact human health exposure risk;
- The detected concentrations of contaminants of potential concern in the soil samples analysed are considered unlikely to present a risk an unacceptable inhalation / vapour intrusion exposure risk;
- The detected concentrations of contaminants of potential concern in the soil samples analysed are considered unlikely to present a risk an unacceptable TPH management limit exposure risk; and
- The detected concentrations of contaminants of potential concern in the soil samples analysed are considered unlikely to present a risk an unacceptable aesthetic risk.

The following areas of environmental concern were identified:

Table 4.5.1 Areas of Environmental Concern (AG 2020)

ID	Area of Environmental Concern	Land Use Activity	Contaminants of Potential Concern
AEC01	Friable / Non-Friable Asbestos and Heavy Metal impacted Surficial and Fill Soils	Uncontrolled Filling	Asbestos, Lead, Cadmium and Zinc
AEC02	Friable Asbestos impacted Fill Soils	Uncontrolled Filling	Asbestos
AEC03	Non-Friable Asbestos impacted Surficial and Fill Soils	Uncontrolled Filling	Asbestos

ID	Area of Environmental Concern	Land Use Activity	Contaminants of Potential Concern
AEC04	Potential Underground Storage of Petroleum Products Onsite (JBS&G 2018)	Uncontrolled Fuel / Oil Spillage	Metals, PAH, BTEX and TRH
AEC05	Existing Building Footprints (inaccessible)	Uncontrolled Filling	Metals, PAH, BTEX, TRH, PCB, OCP/OPP, Phenols and Asbestos

Based upon conclusions made, AG recommended the following;

- A further supplementary contamination assessment should be considered to further understanding of nature and extent of contamination identified onsite and address data gaps presented by building footprints, inaccessible areas and building footprints;
- Preparation of a Remedial Action Plan (RAP) is required to detail the works needed to adequately delineate, remediate and validate the areas of concern that present an unacceptable contamination risk;
- If groundwater is expected to be encountered during the proposed development, a groundwater management plan would be required;
- The preparation of any supplementary contamination assessments, remedial action plans and/or groundwater management plans should be completed by an appropriately experienced environmental consultant;
- As per NSW WHS Regulations, any removal of friable asbestos requires the engagement of a Class A licensed asbestos removalist and a pre-notification to SafeWork NSW, with accompanying air monitoring during the works and clearances post completion to be conducted by a licensed asbestos assessor (LAA);
- Following remediation of the identified contamination, validation sampling and a site validation report will be required to confirm the effectiveness of the remedial works; and
- Any soil proposed for disposal should be classified and disposed of as per the NSW EPA Waste Classification Guidelines, 2014 with all disposal documentation retained by the client for inclusion within the site validation report.

4.6 Remedial Action Plan (AG 2022)

Alliance Geotechnical Pty Ltd (AG) was engaged by Mirvac Residential (NSW) Developments Pty Ltd to prepare a Remedial Action Plan (RAP) for the site located at Western Sydney University – Milperra Campus, Milperra NSW.

AG had the following project appreciation:

- The site was an active campus of Western Sydney University;
- The investigation was limited to areas outside of building structures and discretion was required in active areas of the site;
- The property was understood to be proposed for rezoning and subdivision to facilitate residential development. It was understood that this will comprise demolition of the existing university campus and construction of a low-density residential development; and
- A Detailed Site Investigation (DSI) was carried out for the site by AG in 2020, which recommended a supplementary contamination assessment to understand the nature and extent of contamination identified onsite and address data gaps presented by building footprints, previous contamination assessments and inaccessible areas of environmental concern; and
- The DSI also concluded that a RAP be prepared in order to detail the works needed to adequately delineate, remediate and validate the areas of concern that present an unacceptable contamination assessment.

The following Sampling Analysis Quality Plan (SAQP) was prepared for the data gap assessment required prior to remediation works.

Table 4.6.1 Data Gap Assessment SAQP (AG 2022)

ID	Area of Environmental Concern	Area (m^2)	Methodology	Analytes
Detailed Asbestos Gravimetric Assessment				
AEC01	Friable / Non-Friable Asbestos impacted Surficial and Fill Soils	12,800	Forty-six (46) sampling points, 10 L sample required every 1 m from surface, 500 ml sub-sample for quantitative asbestos analysis.	Asbestos
AEC02	Friable Asbestos impacted Fill Soils	17,100	Fifty-four (54) sampling points, 10 L sample required every 1 m from surface, 500 ml sub-sample for quantitative asbestos analysis.	Asbestos
AEC03	Non-Friable Asbestos impacted Surficial and Fill Soils	18,240	Eighty-four (84) sampling points, 10 L sample required every 1 m from surface, 500 ml sub-sample for quantitative asbestos analysis.	Asbestos
Remaining areas of site	Potential Asbestos impacted Soils	80,000	Forty-seven (47) sampling points, 10 L sample required every 1 m from surface, 500 ml sub-sample for quantitative asbestos analysis.	Asbestos
Heavy Metal / Asbestos Gravimetric Assessment				
AEC01a	Heavy Metal impacted Surficial and Fill Soils	1,000	Six (6) sampling points, 10 L sample required every 1 m from surface, 500 ml sub-sample for quantitative asbestos analysis.	Lead, Cadmium, Zinc and Asbestos
Chemical Characterisation / Asbestos Gravimetric Assessment				
AEC05	Post Demolition Assessment	37,000		

Based on the data reviewed during the preparation of the RAP, AG concluded the land could be made suitable for the proposed future land use subject to completion of the following;

- Preparation of a SAQP prior to commencement of data gap assessment;
- Implementation of the strategies, methodologies and measures set out in this RAP;
- Should newly identified unacceptable land contamination risks be identified during supplementary assessment works, an addendum to this RAP may be required. The addendum should be prepared by a suitably experienced environmental consultant;
- Prior to any removal of soils from site for offsite disposal during remedial works, waste classification for those soils should be prepared by a suitably experienced environmental consultant. Residual impacted fill materials must also be appropriately characterised as per the strategy outlined in this RAP;
- AG recommended that any waste classifications, remediation monitoring and validation works be undertaken by a suitably experienced environmental consultant;
- It was recognised that contamination risks may remain on the site. In such a case, a LT-EMP would be required to document areas where residual contamination is present on the site, and information on management measures adopted. Provisions contained in the LT-EMP would need

to have a mechanism to be enforceable. A revised RAP would be prepared to document where and how management measures could be implemented.

4.7 Phase 2 Assessment Detailed Site Investigation (EGA 2024)

Environmental Group Australia (EGA) was engaged by Mirvac Residential (NSW) Developments Pty Ltd (the client), to undertake a Phase 2 Assessment Detailed Site Investigation for the site located at Western Sydney University – Milperra Campus, Milperra NSW (refer **Figure 1** with the 'site' boundaries outlined in **Figure 2**).

EGA had the following project appreciation:

- The entirety of the site covers an area of approximately 19.6 ha;
- The site was formerly utilised as a university campus with on-site accommodation, open space parkland, playing fields and associated infrastructure;
- The demolition of on-site structures as part of the redevelopment of site was completed across 2024 and 2025;
- The site is proposed for redevelopment comprising a low-density residential land use setting;
- Historically the site has been utilised for agricultural activities with rural-residential structures;
- A Detailed Site Investigation (DSI) was carried out for the site in December 2019 and January 2020 by Alliance Geotechnical (AG), which identified five (5) areas of environmental concern;
- A Remedial Action Plan (RAP) was prepared for the site by AG in January 2020, which identified four (4) data gaps requiring further assessment;
- A Phase 2 Assessment Detailed Site Investigation was required to address data gaps identified within AG 2022;
- Non-friable asbestos impacted soils encountered structure footprints (AEC05) during completion of the demolition scope for site across 2024 and 2025 were partially remediated to facilitate continuation of the works in those areas. These partial remediation works generated approximately 7,626 m^3 of non-friable asbestos impacted spoil which is stockpiled on site atop a geofabric layer;
- Non-friable asbestos impacted soils associated with AEC02 were partially excavated during construction of a sediment basin in the south of site. These partial remediation works generated approximately 4,156 m^3 of non-friable asbestos impacted spoil which is stockpiled on site atop a geofabric layer;
- The Phase 2 Assessment Detailed Site Investigation was partially completed in January 2024 for AEC01, AEC02 and AEC03 with sampling of AEC05 in July 2025 following completion of the demolition scope for site.

The objective of the project was to:

- Determine the type, extent and level of contamination at the site as a result of past and current land use activities;
- Provide advice on whether the site would be suitable (in the context of land contamination) for the proposed land use setting; and
- Provide recommendations for further investigation, management and/or remediation (if warranted).

EGA undertook the following scope of works to achieve the project objective:

- Review of the previous contamination assessment prepared for the site and identify data gaps that need to be addressed;
- The preparation of a Sampling and Analysis Quality Plan (SAQP);
- Laboratory analysis of selected samples collected during the field investigation; and
- An assessment of the contamination status of the fill materials within the site and the recommendation of any further remedial requirements associated with the redevelopment of the site (if necessary).

Based on EGA's assessment of the desktop review information, fieldwork data and laboratory analytical data, in the context of the proposed redevelopment scenario, EGA made the following conclusions:

- The detected concentrations of the contaminants of potential concern returned from the soils assessed within AEC05 are considered unlikely to present:
    - An unacceptable direct contact human health exposure risk;
    - An unacceptable vapour intrusion human health exposure risk;
    - A petroleum hydrocarbon management limit risk; or
    - An unacceptable ecological exposure risk.
- AEC01a was not accessible at the time of this data gap assessment and requires assessment within a future assessment prior to the start of remediation works;
- 6,500 m^2 of AEC05 associated with the footprints of the childcare centre and asphalt car parking within the north of site was not accessible at the time of the data gap assessment and requires assessment within a future assessment prior to the start of remediation works;
- Friable and Non-friable Asbestos Containing Materials (ACM) were identified within AEC01 during this assessment and previous contamination assessments undertaken;
- Friable and Non-Friable Asbestos Containing Materials (ACM) were identified within AEC02 during this assessment and previous contamination assessments undertaken;
- Non-Friable Asbestos Containing Materials (ACM) were identified within AEC03 during this assessment and previous contamination assessments undertaken;
- Non-Friable Asbestos Containing Materials (ACM) were identified within portions of AEC05 during this assessment and previous contamination assessments undertaken;
- Approximately 11,782 m^3 of stockpiled non-friable asbestos impacted spoil generated from partial remediation works within AEC02 and AEC05 requires further management/remediation;
- Stockpiled non-friable asbestos impacted soils associated with AEC05 require further characterisation to confirm their suitability chemically for treatment and re-use within site;
- Surficial asbestos identified within AEC01, AEC02 and AEC03 currently presents an unacceptable aesthetics risk and require further management / remediation;
- Based on the assessments undertaken as part of this investigation, EGA has concluded that the site has friable and non-friable asbestos impacted soil materials requiring remediation and further management;
- Non-friable asbestos impacted soil materials associated with AEC01, AEC02, AEC03 and AEC05 are suitable for treatment and re-use within site at depths unlikely to be disturbed as part of future site uses once the concentration of ACM has been reduced to below 0.01% w/w;
- Friable asbestos associated with AEC01 and AEC02 will require disposal off-site to a licensed waste receiving facility;
- An updated Remedial Action Plan is required to outline the remediation methodologies required to remediate the newly identified extents of contamination identified;
- Subject to remediation of the identified Areas of Environmental Concern and further assessment of data gap areas, the site can be made suitable for the proposed low-density residential development.

Based on the conclusions stated above and the background data gathered during the course of the investigation, EGA recommended:

- An updated site-wide Remedial Action Plan (RAP) is required to outline the remediation methodologies required to remediate the newly identified extents of asbestos contamination identified; and

- A supplementary contamination assessment is required within AEC01a, AEC04, AEC05, AEC06 and AEC07 prior to the start of remedial works in those areas.

4.8 Hazardous Building Material Survey (SE 2024)

Sydney Environmental Group Pty Ltd (SE) was engaged by Mirvac Residential (NSW) Developments Pty Ltd, to undertake a Hazardous Building Materials Survey of structures located within the Western Sydney University – Bankstown Campus, Milperra NSW prior to the commencement of demolition works.

SE had the following appreciation:

- The structures within the site are proposed for demolition; and
- A hazardous building material survey is required prior to demolition works to identify and document hazardous building materials within the structures situated within the site.

The objectives of the investigation were to:

- Identify hazardous building materials (HBM) within accessible areas of the structures on site;
- Provide a qualitative risk assessment of the hazardous building materials identified (if any);
- Provide recommendations on control measures and strategies for removal; and
- Prepare a Hazardous Materials Register for the site to ensure legislative compliance.

The scope of works undertaken to address the investigation objectives, included:

- Fieldwork, including investigation of subject areas;
- Collection of suspect hazardous building materials;
- Analysis of suspected hazardous building materials samples by a NATA accredited laboratory;
- Provide recommendations for the removal of hazardous building materials where identified; and
- Prepare a Hazardous Building Materials Register for the site, detailing location and type of HBMS present within the site.

For the report, HBM were limited to the following:

- Asbestos Containing Materials (ACM);
- Lead Containing Paint (LCP);
- Lead Containing Dust (LCD);
- Polychlorinated Biphenyls (PCBs);
- Synthetic Mineral Fibres (SMF); and
- Ozone Depleting Substances (ODS).

Table 4.8.1 Summary of Hazardous Building Materials Identified

Item	Areas Identified
Asbestos Containing Materials (ACM)	The following were inaccessible at the time of investigation for safety reasons and must be presumed to contain asbestos containing materials until further assessment is undertaken: • Building 05, exterior, white fibre cement panelling, asbestos containing fibre cement panelling; and • Buildings 01-05, 7-12, 20-24 interior, electrical distribution boxes, presumed non-friable asbestos containing fibre cement insulation board.
Lead Containing Paint (LCP)	LCP was identified, presumed, or suspected to be present on site withing the following locations: • Site-wide, exterior and interior, fire sprinkler system, lead based red paint system, 0.19 % w/w;

	• Building 01 - room G.157, interior, railing, lead based white paint system, 0.14 % w/w; • Building 01 - room G.157, interior, doorframes, lead based red paint system, 04 % w/w; and • Building 05, exterior, beams, lead based yellow paint system, 1.1 % w/w. All detected led was observed to be in good condition and low concentrations (< 2 % w/w) and can be disposed of as general solid waste with no management required.
Lead Containing Dust (LCD)	No LCD was identified, presumed, or suspected to be present within the site
Polychlorinated Biphenyls (PCB)	All fluorescent light fittings are presumed to contain PCB capacitors. Any refurbishment works are to be undertaken by trained and licensed electricians. Fluorescent capacitors should be disposed of separately.
Synthetic Mineral Fibres (SMF)	SMF was identified, presumed, or suspected to be present on site withing the following locations: • Buildings 01-05, 7-12, 14, 20-24, fire door inner core, SMF detected; • Buildings 01-05, 7-12, 14, 20-24, air conditioning units, presumed to contain SMF insultation; and • Buildings 01-05, 7-12, 14, 20-24, hot water system, presumed to contain SMF insulation.
Ozone Depleting Substances (ODS)	All air conditioning units are presumed to contain ODS. Any refurbishment or removal works are to be undertaken by trained refrigerant technicians.

4.9 Demolition Clearance Report (EGA 2025)

Environmental Group Australia Pty Ltd (EGA) was commissioned by Mirvac Pty Ltd (the client) to prepare a Demolition Clearance Report following the demolition of structures located within the site at 2 Bullecourt Avenue, Milperra NSW (hereafter referred to as 'the site').

In consultation with the client, EGA had the following appreciation of the site:

- The site occupies an area of approximately 19.6 hectares;
- The site is proposed for redevelopment, comprising demolition of existing structures, constructions of low-density residential housing and associated infrastructure;
- A Hazardous Building Materials Survey was carried out for the site by SE (2023) which identified asbestos containing building materials requiring removal prior to demolition works. Lead containing paints, potential PCB containing capacitors, synthetic mineral fibre insulation and potential ozone depleting refrigerant gases were also identified;
- A revision to the SE 2023 hazmat was prepare in February 2024, no changes were made to the recommendations in the earlier version;
- During the course of demolition works, unexpected finds in the form of asbestos containing building materials were encountered;
- Removal of hazardous building materials and demolition of the on-site structures was completed across October 2024 through to July 2025;
- All structures within demolition zones 1 to 4 have been demolished in accordance with the consent conditions;
- Structures within demolition zone 5 remain undisturbed; and

The client requires a Demolition Clearance Report to document the removal works undertaken, which has been prepared in line with condition 1.7 of the development consent (DA-1512/2023) by an appropriately qualified occupational hygienist.

The objective of the interim validation report was to:

- Prepare an interim site validation report to document the inspection and removal of hazardous building materials from structures within the site;
- Satisfy conditions 1.7 and 3.6 of the development consent (DA-1512/2023);
- To verify that the demolition areas are free from hazardous building materials like asbestos;
- To provide documentation to Council demonstrating that the demolition work was completed according to regulations;
- To certify that the land is stable and ready for subsequent remediation, excavation, construction, or other development activities; and
- To confirm there is no negative impact on the surrounding area for the completed demo0lition work, thereby preventing potential environmental risks.

The scope of works for EGA was to complete:

- Review of the previously prepared contamination reporting associated with the identification and removal of hazardous building materials within the site; and
- An assessment of the demolition works completed in the context of the demolition consent conditions (DA-1512/2023).

Removal of identified hazardous building materials and unexpected finds encountered during demolition was carried out from October 2024 to July 2025 as per requirements detailed SE (2023) and in line with the SafeWork NSW Code of Practice: How to Safely Remove Asbestos (2022).

Visual asbestos materials clearance inspections were completed by a licensed asbestos assessor or competent person at the completion of removal works. A systematic grid based visual inspection of the residual soil surface in the structure footprints was also undertaken at the completion of works.

Based on the information presented in the report, it was the opinion of EGA that:

- Hazardous building materials identified and recorded in the hazardous building materials register prepared for site (SE 2023) were removed (where required after further assessment);
- Previously unidentified suspected hazardous building materials encountered during demolition works were inspected by a suitably experienced occupational hygienist and removed by an appropriately licensed asbestos removalist, prior to the recommencement of works;
- Following the removal of hazardous building materials, and at the completion of demolition works, asbestos materials clearance inspections reports were prepared by a suitably qualified occupational hygienist;
- Conditions 1.7 and 3.6 of the development consent (DA-1512/2023) have been satisfied;
- Demolition zones 1 to 4 are free from hazardous building materials, stable and ready for the proposed remediation scope at the site;
- No negative environmental impacts on the surrounding area were noted as a result of the completed demolition scope; and
- Please remain diligent and adhere to the restrictions within the body of this report and the limitations stated below.

4.10 Previously Complete Remediation Works

4.10.1 AEC01 – Friable Asbestos Soil

Partial remediation works were completed within AEC01 during the demolition scope for site to reduce the risk of potential cross contamination resulting from plant traffic around site. Friable asbestos impacted soil materials associated with previous sampling locations 'EBH2', 'EBH3', 'EBH5', 'SS10' and 'BH39' were excavated and disposed off-site on 13 December 2024.

Soil materials within a 5 x 5 m vicinity of 'EBH2', 'EBH3', 'EBH5', 'BH39', and 'SS10' were excavated to 0.6 m BGL (below ground level). The soil materials were temporarily stockpiled atop geotextile and subjected to a waste classification prior to disposal off-site to a licensed receiving facility. Removal works were undertaken by ASP Pty Ltd, ASP Pty Ltd, a Class A Licensed Asbestos Removalist (AD210968), under the supervision of SE.

Following removal works, the residual soil surface within the subject areas were subject to a systematic grid based visual inspection. No asbestos containing materials were not observed on the residual soil surface within the subject area during or following the removal works. Validation samples (500 ml) were collected from the base and the walls of the excavation and submitted for laboratory analysis (WA DOH 0.001%). Asbestos (FA/AF or ACM) was not detected above the laboratory limit of reporting within any of the validation samples collected.

Boundary control airborne asbestos monitoring was undertaken for the duration of the removal works. Additionally, clearance airborne asbestos monitoring was undertaken within the subject area following the completion of removal works.

The friable asbestos hazard associated with the sampling locations EBH2', 'EBH3', 'EBH5', 'SS10' and 'BH39' is considered to be remediated and validated. An asbestos materials clearance inspection report was prepared on 20 December 2024, the details of these works will be required for inclusion within the site validation report.

EGA notes that the surrounding soils are known to be impacted by asbestos fibre cement fragments and require further remediation to manage the non-friable asbestos risk. One sampling location 'EHB1' previously identified as impacted by friable asbestos within AEC01 was not remediated due to a tree protection zone preventing disturbance of the underlying soils. These materials present a friable asbestos risk which will require further assessment and remediation.

4.10.2 AEC02 – Friable Asbestos Soil

Partial remediation works were completed within AEC02 during the construction of a sediment basin. Friable asbestos impacted soil materials associated with previous sampling locations 'EBH24' and 'EBH25' were excavated and disposed off-site on 4 October 2024.

Soil materials within a 5 x 5 m vicinity of 'EBH24' and 'EBH25' were excavated to 0.6 m BGL (below ground level). The soil materials were temporarily stockpiled atop geotextile and subjected to a waste classification prior to disposal off-site to a licensed receiving facility. Removal works were undertaken by ASP Pty Ltd, ASP Pty Ltd, a Class A Licensed Asbestos Removalist (AD210968), under the supervision of SE.

Following removal works, the residual soil surface within the subject areas were subject to a systematic grid based visual inspection. No asbestos containing materials were not observed on the residual soil surface within the subject area during or following the removal works. Validation samples (500 ml) were collected from the base and the walls of the excavation and submitted for laboratory analysis (WA DOH 0.001 %). Asbestos (FA/AF or ACM) was not detected above the laboratory limit of reporting within any of the validation samples collected.

Boundary control airborne asbestos monitoring was undertaken for the duration of the removal works. Additionally, clearance airborne asbestos monitoring was undertaken within the subject area following the completion of removal works.

The friable asbestos hazard associated with the sampling locations 'EBH24' and 'EBH25' is considered to be remediated and validated. An asbestos materials clearance inspection report was prepared on 14 October 2024, the details of these works will be required for inclusion within the site validation report.

EGA notes that the surrounding soils are known to be impacted by asbestos fibre cement fragments and require further remediation to management the non-friable asbestos risk.

4.11 Potential Sources of Contamination and Contaminants of Potential Concern

A review of the previously prepared contamination reporting identified the following sources of land contamination within the site:

- Shallow fill soils impacted with heavy metals;
- Asbestos contaminated fill materials;
- A former UST area;
- Redundant fibre cement services and septic tanks;
- Land fill gas migration from Kelso Landfill; and
- Groundwater migration onto site from neighbouring industrial land-uses.

4.11.1 Contaminated Fill Outside of Building Footprints

Three areas of asbestos impacted shallow fill soils were identified within the site from the previously prepared contamination reporting.

AEC01 (Friable asbestos impacted soils): Comprises one hotspot associated with sample 'EBH1' collected as part of the Coffey 2011 assessment. Delineation sampling was undertaken as part of the SEG 2024 assessment for five other sampling locations where friable asbestos was identified within AEC01, which were determined not to extend beyond the soils immediately adjacent the previous sampling locations. Sampling could not be undertaken in the vicinity of 'EBH1' at the time of that assessment, as such the asbestos impacts are yet to be fully characterised laterally, but presumed to follow a similar distribution.

The following delineation sampling works are required prior to remediation; test pitting immediately to the north, south, east, west of 'EBH1' with samples (500 ml soil samples submitted for NEPM WA DOH analysis) collected from the previously identified depth of impact which was 0.5 m bsgl (refer to section 8).

AEC01 (Non-friable asbestos impacted soils): Comprises approximately 3,950 m^2 of asbestos impacted shallow fill soils ranging in depth from 0.2 to 0.7 m bsgl. Friable asbestos in the form of poorly conditioned fibre cement fragments and debris was identified within AEC01 during the Coffey 2021, JBS&G 2018 and AG 2020 assessments. The impacts were subject to assessment as part of the EGA 2025 DSI where 20 test pits were advanced throughout the broader area in addition to delineation sampling targeting the soils immediately adjacent the previously identified impacts (with the exception of 'EBH1'). Asbestos was identified in three of the test pits advanced throughout the broader AEC01 area. The results of the delineation sampling indicated the previously identified friable asbestos impacts were limited to the soils immediately adjacent the previously sampled locations (5 m by 5 m).

The extent of non-friable asbestos within AEC01 is considered by EGA as sufficiently characterised. Remediation works should follow the completion of delineation sampling associated with 'EBH1'.

AEC02 (Non-friable asbestos impacted soils): Comprises approximately 10,425 m^2 of asbestos impacted shallow fill soils ranging in depth from 0.1 to 1.2 m bsgl. Friable asbestos in the form of poorly conditioned fibre cement fragments and debris were identified within AEC02 during the Coffey 2021 assessment. These materials were subject to remediation prior to the construction of the sediment basin in 2024 (refer to **section 4.10.2**). Surficial fibre cement fragments and trace FA detections below LOR were identified within AEC02 as part of the AG 2020 assessment. These impacts were subject to assessment as part of the EGA 2025 DSI where 52 test pits were advanced throughout the broader area, Non-friable ACM and FA < 0.001 % w/w asbestos was identified in twelve of the test pits.

As part of the construction of a temporary sediment basin within the AEC02 area, approximately 4,156 m^3 of non-friable asbestos impacted soil was excavated and stockpiled atop a geofabric layer adjacent to AEC02 pending further remediation and validation. The excavation of these materials did not involve the complete removal of asbestos impacts in the sediment basin area, as such further remediation and validation works are considered warranted in-line with the RAP.

The extent of non-friable asbestos within AEC02 is considered by EGA as sufficiently characterised. No further investigation works are required prior to the commencement of remediation works.

AEC03 (Non-friable asbestos impacted soils): Comprises approximately 15,480 m^2 of asbestos impacted shallow fill soils ranging in depth from 0.3 to 1.4 m bsgl. Non-friable asbestos fibre cement fragments were identified within AEC03 as part of the Coffey 2011 and AG 2020 assessments. These impacts were subject to assessment as part of the EGA 2025 DSI where 52 test pits were advanced throughout the broader area, Non-friable ACM and FA < 0.001 % w/w asbestos was identified in seven of the test pits.

Approximately 9,000 m^2 of AEC03 was inaccessible at the time of the assessment. Based off the wide spread nature of asbestos impacts in the vicinity of these data gap areas, EGA considers it reasonable to presume these soils will likely be impacted by asbestos. Further sampling is considered warranted to understand the nature and vertical extend of the impacts.

A supplementary assessment comprising of 19 test pits advanced to natural within the previously inaccessible portions of AEC03 is proposed prior to the commencement of remediation works (refer to **Table 8.7.1**).

4.11.2 Contaminated Fill Across Former Building Footprints

AEC05 (Non-friable asbestos impacted soils): Comprises approximately 14,050 m^2 of shallow fill soils presumed to be impacted with non-friable asbestos fibre cement fragments ranging in depth from 0.3 to 1.0 m bsgl. Non-friable asbestos fibre cement fragments were identified within structure footprints associated with building 1, build 5 and building 10. Partial remediation works were undertaken within these areas to make the area safe for continuation of demolition works (Refer to section 4.9), however the extent of the asbestos impacts were not chased out and validated in-line with the sites RAP and require further management.

Previously inaccessible soils within the structure footprints were subject to assessment following completion of the make safe and demolition works as part of the EGA 2025 DSI where 46 test pits were advanced within the accessible building footprints. Non-friable ACM was identified in one sampling location. The absence of broader asbestos impacts observed during this assessment is not considered by EGA to negate the need for further management and validation within the areas where asbestos was previously observed.

Approximately 4,750 m^2 of AEC05 was inaccessible at the time of the assessment. Based off the wide spread nature of asbestos impacts in the vicinity of these data gap areas, EGA considers it reasonable to presume these soils will likely be impacted by asbestos. Further sampling is considered warranted to understand the nature and vertical extend of the impacts.

As part of the make safe works completed within the structure footprints addressing asbestos impacts encountered during demolition, approximately 7,626 m^3 of spoil was generated and temporarily stockpiled atop a geofabric marker layer. The excavation of these materials did not involve the complete removal of asbestos impacts or validation sampling, as such further remediation and validation works are considered warranted within the affected structure footprints in-line with the RAP.

As the soils were stockpiled prior to the completion of the 2025 EGA assessment within AEC05, these materials are not considered characterised and will require assessment in line with **Table 8.7.1** prior to remediation.

4.11.3 Former UST Area

A SafeWork NSW search of the Stored Chemical Information Database (SCID) and the microfiche records held by SafeWork was requested as part of the AG 2020 investigation. Information provided by SafeWork NSW included details on two (2) underground storage tanks (USTs) formerly located in the central eastern section of the site. Review of the SafeWork NSW documentation indicated the 2 x 2,500L USTs were removed on Friday 19 December 1997 by Email Petroleum Systems.

Removal works were never subject to validation sampling to assess the potential for leaks and spills to have impacted the surrounding soils and groundwater. As such, further investigation is considered warranted to validate the suitability of the surrounding soils in the former location of the tanks for the proposed development.

4.11.4 Buried Services and Redundant Septic Tanks

The Site had a history of rural residential land use up to the 1970s. Consequently, there is a risk that abandoned septic tanks may remain at the site that could contain contaminated waste. The presence and condition of abandoned septic tanks or other unknown buried structure cannot be determined from discrete investigative methods, as such these risk will need to be managed during completion of remediation and bulk earthworks at the site.

Similarly for redundant asbestos containing fibre cement services, the risk posed by asbestos fibre cement conduits will need to be considered and managed during completion of remediation and bulk earthworks at the site. The presence and condition of known services will need to be identified as part of remedial works.

4.11.5 Land Fill Gas Migration from Kelso Land Fill

Putrescible waste accepted by the Kelso Landfill located to the south of site poses a potential source of Landfill gases within the southern portion of site. Landfill gases have the potential to migrate along pressure driven flows, as well as traveling in groundwater once dissolved. These pathways have not been investigated and require further assessment in the form of landfill ground gas monitoring within the south of site (refer to **Table 8.7.1**).

4.11.6 Groundwater Migration onto Site

Industrial land-uses to the north of site pose a potential source of groundwater contamination at the site.

The construction of eight groundwater sampling wells was undertaken as part of the AG 2020 investigation. Two wells installed along the northern boundary were found to be dry and were unable to be sampled. Groundwater samples were collected from the remaining six groundwater wells and analysed for the following analytes; TRH, BTEX, PAH, Phenols, Trace metals (As, Cd, Cr, Cr (VI), Cu, Ni, Pb, Zn), Nitrogen & phosphorus species and Anions and cations.

There were no exceedances of the site adopted criteria returned in the ground water results received as part of the AG 2020 assessment.

The following data gaps in the groundwater assessment were noted by the NSW EPA Accredited site auditor Lousie Walkden in her Site Audit Statement prepared for the AG 2022 RAP:

- Assessment for the presence of PFAS migrating from Bankstown Airport located 1km away was not undertaken and should be assessed; and

- Groundwater sampling density is insufficient for the size of the site to accurately characterise the groundwater beneath the site;

EGA agrees with this position and considered further assessment of the groundwater conditions to supplement the existing data within the site as warranted. The proposed assessment of groundwater is outlined within **Table 8.7.1**.

5. REFINED CONCEPTUAL SITE MODEL

5.1 Areas of Environmental Concern and Contaminants of Concern Requiring Remediation

The available site data was assessed within the objectives of this investigation and in the context of the proposed development works. That assessment identified areas of environmental concern (AECs) and contaminants of concern (COC) which have the potential to be present within and the site. The AECs identified are presented in attached **Figure 2** and associated contaminants of concern are presented in **Table 5.1.**

Table 5.1 Areas of Environmental Concern and Contaminants of Potential Concern

ID	Area of Environmental Concern	Contaminants of Concern	Affected mediums	Exposure risk	Proposed Remedial Strategy	Figure
AEC01	Friable Asbestos* Impacted Fill Soils	Friable Asbestos	Soil	Human Health & Aesthetics	Off-site disposal	3
	Non-Friable Asbestos Impacted Fill Soils	Non-Friable Asbestos	Soil	Human Health & Aesthetics	Off-site disposal	3
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils	Lead, Cadmium and Zinc	Soil	Human Health and Ecological Health	Off-site disposal	2
AEC02	Friable Asbestos Impacted Fill Soils **	Friable Asbestos	Soil	Human Health & Aesthetics	Off-site disposal	4
	Non-Friable Asbestos Impacted Fill Soils	Non-Friable Asbestos	Soil	Human Health & Aesthetics	Remediation and on-site reuse at depth	4
	Stockpiled Non-Friable Asbestos Impacted Soils	Non-Friable Asbestos	Soil	Human Health & Aesthetics	Remediation and on-site reuse at depth	4
AEC03	Non-Friable Asbestos Impacted Fill Soils	Asbestos	Soil	Human Health & Aesthetics	Remediation and on-site reuse at depth	5
AEC05	Building Footprints (Assessed)	Asbestos	Soil	Human Health	Remediation and on-site reuse at depth	6

Notes: * Five of the six friable asbestos hotspots remediated, soils associated with sampling locations 'EBH2', 'EBH3', 'EBH5', 'SS10' and 'BH39' have been removed off-site and the excavations validated. ** Both friable asbestos hotspots remediated, soils associated with sampling locations 'EBH24' and 'EBH25' have been removed off-site and the excavations validated.

The potential contamination pathways are considered to be as follows:

- Inhalation/ingestion of contaminants released in dust during future development by site workers; and
- Inhalation of contaminants during future use by site occupiers.

Relevant potential receptors are considered to include:

- Onsite construction and maintenance workers;
- Third parties during construction (adjacent site users and adjacent residents);
- Future residents/end users;
- Flora and Fauna; and
- Neighbouring residential land users.

5.2 Potential Areas of Environmental Concern and Contaminants of Concern Requiring Investigation

The available site data was assessed within the objectives of this investigation and in the context of the proposed development works. That assessment identified potential areas of environmental concern (PAECs) and contaminants of potential concern (COPC) which have the potential to be present within the site and require further assessment. The PAECs identified are presented in attached **Figure 7** and associated contaminants of concern are presented in **Table 5.2.**

Discussion on the assessment of Potential Areas of Environmental Concern is presented in Section 8.

Table 5.2 PAECs and COPC

ID	Potential Area of Environmental Concern	Source	Contaminants of Concern	Affected mediums	Exposure risk
PAEC04	Former Underground Storage or Petroleum-Based Product Onsite	Unleaded Petrol & Diesel Tanks	Heavy Metals, TRH, PAH, VOC/SVOC, Phenols	Soil & Groundwater	Human Health, Ecological Health & Aesthetics
PAEC05	Building Footprints (pending assessment)	Uncontrolled Demolition/Filling	Metals, PAH, BTEX, TRH, PCB, OCP/OPP, Phenols and Asbestos	Soil	Human Health & Aesthetics
	Stockpiled Non-Friable Asbestos Impacted Soils	Uncontrolled Demolition/Filling	Metals, PAH, BTEX, TRH, PCB, OCP/OPP, Phenols and Asbestos	Soil	Human Health & Aesthetics
PAEC06	Migration of Landfill Gas	Landfill Activities South of the Site	Methane, Carbon Dioxide, Carbon monoxide, Hydrogen sulphide	Ground Gas	Human Health
PAEC07	Adjacent Industrial Land Use to the North and North-East of the Site	Industrial Activities North and North-East of the Site	Heavy Metals, TRH, BTEX, PAH, VOC, OCP/OPP, PCB, PFAS, inorganic compounds	Groundwater	Human Health
PAEC08	Risk of redundant fibre cement conduits and septic tanks within the site footprint	Historical Agricultural Land-Use Activities	Metals, PAH, BTEX, TRH, Asbestos, OCPs, E.Coli and Thermotolerant Coliforms	Soil	Human Health and Ecological
PAEC09	Risk of asbestos contamination within the site footprint	Historical Agricultural Land-Use Activities	Asbestos	Soil	Human Health and Ecological

The potential contamination pathways are considered to be as follows:

- Inhalation/ingestion of contaminants released in dust during future development by site workers;
- Migration of landfill gases through pressure gradients or dissolved in groundwater; and
- Inhalation of contaminants during future use by site occupiers.

Relevant potential receptors are considered to include:

- Onsite construction and maintenance workers;
- Third parties during construction (adjacent site users and adjacent residents);
- Future residents/end users;
- Flora and Fauna; and
- Neighbouring residential land users.

5.3 Land Use Setting

EGA understands that the proposed development within the site will comprise construction of residential housing and associated infrastructure within a low-density residential land use setting. The proposed development will entail subdivision of the site into up to 430 residential lots, approximately 2 ha of conservation land in the north-east corner of site and three open space areas / public parks.

As the proposed future site use is redevelopment under a low-density residential land use setting, EGA considers it appropriate to adopt the 'HIL A – Low-Density Residential' criteria for residential lots. 'HIL C – Open Space / Parkland' criteria will be applied to the portions of site developed as public parkland and conservation areas. 'HIL D – Commercial / Industrial' criterial will be applied to the portions of site developed as roadways and road corridors.

Guidance on the adopted land-use scenarios is provided in Section 2.2 of Schedule B (1) of the National Environment Protection Measure (Assessment of Site Contamination) 2013 (NEPM ASC 2013), in order to assess the site for any future proposed land use as well as the current land use.

5.4 Direct Contact – Human Health

EGA understands that the site is proposed for development of low-density residential dwellings, associated roadways and infrastructure. EGA further notes that demolition of structures within the site and importation of filling materials may complete a direct contact exposure pathway for residential receptors.

Known direct contact human health exposure risks are present within AEC01a requiring further assessment prior to the start of remedial works within a future stage of the project. A small portion of the previously inaccessible areas within site identified as AEC05 remain covered by hard stand and will require further assessment. As such, further consideration of the direct contact risk is required during these works.

EGA recommends a pragmatic approach during the course of any required intrusive excavation works. If contamination is suspected, works should stop, an unexpected finds protocol should be followed and further investigation of the fill materials should be carried out by a suitably qualified and experienced and experienced environmental consultant.

5.5 Inhalation / Vapour Intrusion – Human Health

In order for a potentially unacceptable inhalation / vapour intrusion human health exposure risk to exist, a primary vapour source (e.g. underground storage tank) or secondary vapour source (e.g. significantly contaminated soil or groundwater) must be present onsite. The historical evidence reviewed indicated a very low likelihood for a potential primary source to be present on the site.

Potential sources of groundwater contamination were observed immediately south and north/north-east of the site, associated with landfill activities to the south and industrial land use activities to the north/north-east of the site. A supplementary groundwater assessment will be undertaken at the site to further assess these sources.

Potential sources of vapour intrusion were observed within the western portion of the site, associated with former petroleum and diesel underground storage tanks that are understood to have been removed from the site, landfill activities south of the site and industrial land uses to the north/north-east of the site. While the tank has been removed from site, further vapour intrusion assessment is considered necessary to confirm the surrounding residual soils do not pose a risk .

Asbestos containing materials are also understood to be present across the site footprint, requiring remediation and as such, further inhalation human health consideration is warranted during the remedial and validation works at the site.

EGA recommends a pragmatic approach during the course of any required intrusive / excavation works. If contamination is suspected, works should stop, an unexpected finds protocol should be followed and

further investigation of the fill materials should be carried out by a suitably qualified and experienced environmental consultant.

5.6 Management Limits for Petroleum Hydrocarbon Compounds

NEPM ASC 2013 notes that there are a number of policy considerations which reflect the nature and properties of petroleum hydrocarbons:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosive hazards; and

- Effects on buried infrastructure (e.g. penetration of or damage to, in-ground services by hydrocarbons).

Schedule B1 of NEPM ASC 2013 includes 'management limits' to avoid or minimise these potential effects. Application of the management limits requires consideration of site-specific factors such as the depth of building basements and services and depth to groundwater, to determine the maximum depth to which the limits should apply. NEPM ASC 2013 also notes that management limits may have less relevance at operating industrial sites which have no or limited sensitive receptors in the area of potential impact, and when management limits are exceeded, further site-specific assessment and management may enable any identified risk to be addressed.

Further consideration of this value is warranted with respect to the former petroleum underground storage tank assessment and in the event any unexpected finds are encountered as part of this assessment.

5.7 Aesthetics

The aesthetic criteria adopted for the site comprises the following:

- Fill material remaining on-site to contain no demolition or other types of anthropogenic material greater than trace quantities (>5%);
- No odorous or stained materials remaining on-site; and
- No remains of dead animals remain on-site.

Redundant services, conduits, septic systems to be removed where encountered and any staining/odours associated with these are to also be removed.

During construction, the public and construction employees, may complete an aesthetics exposure pathway between potential contamination and receptors.

Due to the known presence of asbestos containing materials on-site within surficial and fill soils, further consideration of this value is warranted.

5.8 Terrestrial Ecosystems – Ecological Health

Section 3.4.2 of Schedule B1 NEPM ASC 2013, advises a pragmatic risk-based approach should be taken when assessing ecological risks in residential and commercial / industrial land use settings.

EGA understand that the proposed development would include a residential subdivision with comprising construction of low-density residential dwellings, associated roadways and infrastructure. The rest of the site would generally consist of open space and landscaped areas. In these areas, it is considered that an ecological exposure pathway may be present between potential contamination and onsite receptors.

EGA recommends a pragmatic approach during the course of any required intrusive / excavation works. If contamination is suspected, works should stop, an unexpected finds protocol should be followed and further investigation of the fill materials should be carried out by a suitably qualified and experienced environmental consultant.

5.9 Drinking Water Use

Expected poor regional water quality as a result of historical regional agricultural land use activities and disturbance, is considered likely to prevent groundwater from being a drinking water resource of value.

There are no groundwater bores onsite or down-gradient of the site, registered for drinking water use. It is noted that a reticulated mains potable water supply is available in the area. No further consideration of this value is deemed necessary as drinking water will not be sourced from the site as part of the future redevelopment plans.

5.10 Recreational Water Use

Surface water courses within and proximal to the site include an unnamed tributary of Kelso Creek, located approximately 300 m south of the site, Kelso Creek located approximately 600 m south of the site, and Georges River located approximately 1.3 km south-west of the site.

Based on observations, it is considered unlikely that surface water courses within close proximity to the site would be used recreationally for swimming, fishing, consumption, or water sports. Potential receptors of groundwater extraction and subsequent recreational use as part of irrigation systems may include future residents, maintenance workers, and ecological receptors.

There is a potential, albeit low, that the usage of groundwater within the site, would be utilised for irrigation across the site footprint following redevelopment and as such, further consideration of this value may be warranted pending the findings of the supplementary contamination assessment.

5.11 Aquatic Ecosystems

Surface water courses within and proximal to the site include an unnamed tributary of Kelso Creek, located approximately 300 m south of the site, Kelso Creek located approximately 600 m south of the site, and Georges River located approximately 1.3 km south-west of the site.

Based on the observations made by AG (2022) and SE (SE 2024), there is a moderate potential for groundwater contamination at the site, related to surrounding landfill and/or industrial activities. Further consideration of this value may be required pending the findings of a supplementary contamination to be undertaken.

6. SITE ASSESSMENT AND REMEDIATION ACCEPTANCE CRITERIA

6.1 Site Assessment Criteria

Previous contamination assessments prepared for the site identified the following:

- Asbestos contamination in soils at the Site at concentrations exceeding site assessment criteria for Residential A land use;
- Soils at some areas of the Site had an unknown contamination risk that needed to be investigated for the COPCs; and
- An unknown risk of LFG migrating into the Site across the southern boundary that needed to be investigated.

Taking into consideration the objectives of this project, and the conceptual site model and land use setting presented in **Section 5** of this project, a summary of the assessment criteria adopted for this project are presented in **Table 6.1.1** below.

Table 6.1.1 Site Assessment Criteria

AEC ID	Risk	Criteria	Reference
AEC01a **AEC04** **AEC05** **AEC07**	Human Health Direct Contact	HIL A – Residential	Table 1A(1) in NEPC (2013) HILs in Table 1A (1) in NEPM ASC 2013 and HSLs in Table A4 of CRC Care Technical Report no. 10 (2011) Table 2 in HEPA (2020)
AEC04 **AEC05** **AEC06** **AEC07**	Human Health Inhalation/Intrusion	HSL A – Residential	Table 1A(2) in NEPC (2013) Table 1A(3) in NEPC (2013) Table 1A(4) in NEPC (2013) Table 1A(5) in NEPC (2013)
AEC01 **AEC02** **AEC03** **AEC05**	Human Health (Asbestos)	HSL A – Residential	Table 7 in NEPC (2013)
AEC01 **AEC02** **AEC03** **AEC04** **AEC05**	Aesthetics	Residential	Characteristics and processes in Section 3.6.2 and 3.6.3 in NEPC (2013)
AEC01a **AEC04** **AEC05**	Soil – Ecological	Urban residential / public open space	Table 1B(1) in NEPC (2013) Table 1B(2) in NEPC (2013) Table 1B(3) in NEPC (2013) Table 1B(4) in NEPC (2013) Table 1B(5) in NEPC (2013) Table 1B(6) in NEPC (2013)
AEC04 **AEC05**	Management Limits (petroleum hydrocarbons)	Residential, parkland and public open space	Table 1B(7) in NEPC (2013)
AEC06 **AEC07**	Ground Gas	-	Section 4.3.4in NSW EPA (2020a)

6.2 Soil Criteria

The proposed future site use is redevelopment under a low-density residential land use setting, as such EGA considers it appropriate to adopt the 'HIL A – Low-Density Residential' criteria since this setting defines the soils that need to be remediated. Additionally, the proposed development comprises open space parkland areas where the 'HIL C – Open Space / Parkland' criteria will be applied as well as roadways and their associated corridors where the 'HIL D – Commercial / Industrial' criterial will be applied.

The criteria and their application are:

- Off-site disposal for soil contaminated above Commercial / industrial HIL D criteria;
- Re-use of treated soils as fill along road corridors if contaminated at or below Commercial / industrial HIL D criteria;
- Re-use of treated soils as fill in public open spaces / parkland if contaminated at or below Recreational EIL C criteria if placed at a depth of 0 to 2m below the final ground level5;
- Re-use of treated soils as fill in public open spaces / parkland if contaminated at or below Recreational HIL C and EIL C criteria if placed at a depth of more than 2m below the final ground level;
- Re-use of treated soils as fill on low-density residential land if contaminated at or below Residential EIL A criteria if placed at a depth of 0 to 2m below the final ground level; and
- Re-use of treated soils as fill on low-density residential land if contaminated at or below Residential HIL A and EIL A criteria if placed at a depth of more than 2m below the final ground level.

6.2.1 Human Health Based Investigation and Screening Levels

Table 6.2.1 Health-based Investigation Levels

	Health-based Investigation Level		
Analyte	**HIL A (mg/kg)**	**HIL C (mg/kg)**	**HIL D (mg/kg)**
Arsenic	100	300	3,000
Cadmium	20	90	900
Chromium (VI)	100	300	3,600
Copper	6000	17,00	240,000
Lead	300	600	1,500
Mercury (Inorganic)	40	80	730
Nickel	400	1,200	6,000
Zinc	7400	30,000	400,000
Carcinogenic PAHs (as B(a)P TEQ)	3	3	40
Total PAHs	300	300	4,000
DDT + DDE + DDD	240	400	3600
Aldrin + Dieldrin	6	10	45
Chlordane	50	70	530
Endosulfan	270	340	2,000
Endrin	10	20	100
Heptachlor	6	10	50
Methoxychlor	300	400	2,500
Chlorpyrifos	160	250	2,000
PCBs (Total)	1	1	7

Table 6.2.2 Health Screening Levels for Vapour Intrusion

	Health Screening Level (mg/kg) - HIL A / C / D			
Depth / Analyte	0 m to < 1 m	1 m to < 2 m	1m to < 4 m	4 m +
SAND – HIL A / C / D				
Toluene	160 / NL / NL	220 / NL / NL	310 / NL / NL	540 / NL / NL
Ethylbenzene	55 / NL / NL	NL / NL / NL	NL / NL / NL	NL / NL / NL
Xylenes	40 / NL / 230	60 / NL / NL	95 / NL / NL	170 / NL / NL
Naphthalene	3 / NL / NL	NL / NL / NL	NL / NL / NL	NL / NL / NL
Benzene	0.5 / NL / 3	0.5 / NL / 3	0.5 / NL / 3	0.5 / NL / 3
TRH F1	45 / NL / 260	70 / NL / 370	110 / NL / 630	200 / NL / NL
TRH F2	110 / NL / NL	240 / NL / NL	440 / NL / NL	NL / NL / NL
SILT – HIL A / C / D				
Toluene	390 / NL / NL	NL / NL / NL	NL / NL / NL	NL / NL / NL
Ethylbenzene	NL / NL / NL	NL / NL / NL	NL / NL / NL	NL / NL / NL
Xylenes	95 / NL / NL	210 / NL / NL	NL / NL / NL	NL / NL / NL
Naphthalene	4 / NL / NL	NL / NL / NL	NL / NL / NL	NL / NL / NL
Benzene	0.6 / NL / 4	0.7 / NL / 4	1 / NL / 6	2 / NL / 10
TRH F1	40 / NL / 250	65 / NL / 360	100 / NL / 590	190 / NL / NL
TRH F2	230 / NL / NL	NL / NL / NL	NL / NL / NL	NL / NL / NL
CLAY – HIL A / C / D				
Toluene	480 / NL / NL	NL / NL / NL	NL / NL / NL	NL / NL / NL
Ethylbenzene	NL / NL / NL	NL / NL / NL	NL / NL / NL	NL / NL / NL
Xylenes	110 / NL / NL	310 / NL / NL	NL / NL / NL	NL / NL / NL
Naphthalene	5 / NL / NL	NL / NL / NL	NL / NL / NL	NL / NL / NL
Benzene	0.7 / NL / 4	1 / NL / 6	2 / NL / 9	3 / NL / 20
TRH F1	50 / NL / 310	90 / NL / 480	150 / NL / NL	290 / NL / NL
TRH F2	280 / NL / NL	NL / NL / NL	NL / NL / NL	NL / NL / NL

Soil materials treated ex-situ for non-friable asbestos as part of the remedial scope for site will be assessed against the criteria most appropriate for the land-use where the materials are proposed for re-use within the site. Treated non-friable asbestos soils are not proposed for re-use within residential lots.

Table 6.2.3 Health Screening Levels for Asbestos

Analyte	Health Screening Level Residential A (Residential Lots)	Health Screening Level Residential C (Parkland)	Health Screening Level Residential D (Roadways)
Non-friable Asbestos	0.01 (% w/w)	0.02 (% w/w)	0.05 (% w/w)
Friable Asbestos (Asbestos Fines / Fibrous Asbestos)	0.001 (% w/w)		
All Forms of Asbestos	No visible asbestos on surface soils		

6.3 Ecological Investigation and Screening Levels

Ecological Investigation Levels (EIL) have been derived in accordance with NEPM (2013), Schedule B1, EILs for urban residential and public open spaces. Site specific EILs are derived for copper, nickel, chromium III and zinc, while generic EILs are applicable for arsenic, DDT and naphthalene.

In accordance with NEPC 2013, the EIL is calculated as the sum of the Added Contaminant Limit (ACL) and the Ambient Background Concentration (ABC) (i.e. EIL = ACL + ABC). ABCs have been based on the 25th percentile values for aged, urban settings, high traffic, NSW by Olszowy.

The derived EIL criteria for copper, nickel, chromium III, and zinc are based on high traffic volume and aged contamination (>2 years). Background concentrations and other input parameters were calculated from the background sample collected within AG 2020. EILs were calculated using the Ecological Investigation Level Calculation Spreadsheet provided on the National Environment Protection Council website (www.nepc.gov.au/nepms/assessment-site-contamination/toolbox).

Table 6.3.1 Ecological Screening Limits – Urban Residential / Public Open Space

Analyte	Ecological Screening Limit Urban Residential / Public Open Space (mg/kg)
FINE (SILT and CLAY)	
TRH F1 (C_6 - C_{10})	180
TRH F2 (C_{10} - C_{16})	120
TRH F3 (C_{16} - C_{34})	1300
TRH F4 (C_{34} - C_{40})	5600
Benzene	65
Toluene	105
Ethylbenzene	125
Xylenes	45
Benzo(a)pyrene	0.7

Table 6.3.2 Site Specific Ecological Investigation Limits – Urban Residential / Public Open Space

Analyte	Site Specific Ecological Investigation Limit Urban Residential / Public Open Space (mg/kg)
Arsenic	100
Copper	150
Chromium (III)	190
Lead	1100
Nickel	30
Zinc	320
DDT	180
Naphthalene	170

Anthropogenic Material/Aesthetics

The site adopted criteria for Anthropogenic Material and Aesthetic risks is based on the NEPM 2013 guidelines. Non-hazardous inert foreign materials are permitted within soil or fill materials subject to compliance within the site adopted criterial and aesthetic suitability (malodorous soils, discoloured chemical deposits, stained soil, large monolithic deposits/large inert foreign matter, putrescible refuse and animal remains). No specific trigger values are outlined within the guidelines, however, a criteria of 5% or less by weight has been adopted for acceptability.

In addition to the above criteria, consideration must be given to odour (e.g. hydrocarbon and solvents) where adoption of lower threshold criteria may be required if causes significant nuisance.

6.4 Groundwater Assessment

In-line with ANZECC (2000), results will be compared to Freshwater 95% criteria (ANZECC, 2000 / WQA 2018), stormwater reuse criteria (NSW DECC, 2006), irrigation trigger values (ANZECC, 2000), and recreational secondary contact trigger values (ANZECC, 2000).

For PFAS compounds (per-and polyfluoroalkyl substances):

'HEPA 2025, PFAS National Environmental Management Plan 3.0. National Chemicals Working Group of the Heads of EPA Australia and New Zealand 2025.'

Groundwater is not considered a resource for consumption at or adjacent to the site due to poor regional water quality resulting from industrial land-uses and salinity associated with Ashfield shales which underly the site. As such drinking water guidelines were not considered relevant for this project.

6.5 Landfill Gases

The interpretation of the landfill gas measurements will be based on the guidance in:

'NSW EPA 2020, *Assessment and management of hazardous ground gases Contaminated Land Guidelines'*

6.6 Soil Import

Imported soil materials to the site must meet the criteria for classification as VENM or ENM in-line with the *NSW EPA 2014 Waste Classification Guidelines* or *NSW EPA 2014 'The excavated Natural Material Order'.*

landscaping soils imported to the Site as part of development work must meet the following requirements:

- The Australian Standard AS4454 for compost, soil conditioners, and mulches;
- Contain no asbestos;
- Meet all NSW EPA and Council requirements; and
- Be managed under the NSW Resource Recovery Framework, which includes:
    1. Processing: Wastes must be processed appropriately before they can be reused.
    2. Testing: Products must be tested to ensure they are fit-for-purpose and free from harmful contaminants.
    3. Specifications: Processors and users must adhere to specifications outlined in Resource Recovery Orders and Exemptions regarding the end product and its use.

7. SUPPLEMENTARY CONTAMINATION ASSESSMENT

In light of data-gaps identified within AG (2022) and SE (2024), it has been concluded that a supplementary contamination assessment is required to sufficiently characterise the site and meet statutory requirements per relevant legislation and guidelines.

7.1 Objectives and Scope of Work

The objectives of the supplementary contamination assessment are to:

- Assess data-gaps identified in previous contamination assessments undertaken for the site (AG 2022 & SE 2024);
- Undertake an intrusive site investigation to facilitate the collection of representative soil samples;
- Undertake an intrusive site investigation to facilitate the installation of groundwater monitoring wells and collection of representative groundwater samples;
- Undertake an intrusive site investigation to facilitate the installation of ground gas monitoring wells and collection of representative ground gas samples;
- Engage a NATA accredited laboratory to analyse selected samples collected during the field investigation;
- Provide a thorough and conclusive assessment of the contamination status of the fill materials, ground gas (if present) and groundwater within the site;
- Provide updated advice to inform this RAP and detail any further investigation, management and/or remediation (if warranted);

7.2 Site Assessment Criteria

Taking into consideration the objectives of this project, and the conceptual site model and land use setting presented in **Section 5** of this project, the assessment criteria within **Section 6** have been adopted for this project.

7.3 Potential Areas of Environmental Concerns for Investigation

A review of the previously prepared contamination assessments prepared for the site identified potential areas of environmental concern (PAECs) and contaminants of potential concern (COPC) which require further assessment. The PAECs identified are presented in attached **Figure 7** and associated contaminants of concern are presented in **Table 7.3.1.**

Table 7.3.1 Potential Areas of Environmental Concern for Further Investigation

ID	Potential Area of Environmental Concern	Source	Contaminants of Concern	Affected mediums	Exposure risk
PAEC04	Former Underground Storage or Petroleum-Based Product Onsite	Unleaded Petrol & Diesel Tanks	Heavy Metals, TRH, PAH, VOC/SVOC, Phenols	Soil & Groundwater	Human Health, Ecological Health & Aesthetics
PAEC05	Building Footprints (pending assessment)	Uncontrolled Demolition/Filling	Metals, PAH, BTEX, TRH, PCB, OCP/OPP, Phenols and Asbestos	Soil	Human Health & Aesthetics
	Stockpiled Non-Friable Asbestos Impacted Soils	Uncontrolled Demolition/Filling	Metals, PAH, BTEX, TRH, PCB, OCP/OPP, Phenols and Asbestos	Soil	Human Health & Aesthetics
PAEC06	Migration of Landfill Gas	Landfill Activities South of the Site	Methane, Carbon Dioxide, Carbon monoxide, Hydrogen sulphide	Ground Gas	Human Health

ID	Potential Area of Environmental Concern	Source	Contaminants of Concern	Affected mediums	Exposure risk
PAEC07	Adjacent Industrial Land Use to the North and North-East of the Site	Industrial Activities North and North-East of the Site	Heavy Metals, TRH, BTEX, PAH, VOC, OCP/OPP, PCB, PFAS, inorganic compounds	Groundwater	Human Health

8. SUPPLEMENTARY CONTAMINATION ASSESSMENT DATA QUALITY OBJECTIVES

Appendix B of NEPM ASC 2013 provides guidance on the development of data quality objectives (DQO) using a seven-step process.

The DQO for this project are set out in **Sections 0** to **8.7** of this report.

8.1 Step 1: State the problem

The first step involves summarising the contamination problem that will require new data and identifying the resources available to resolve the problem.

The objective of this project is to assess whether the remedial goal has been achieved, and whether the site presents an unacceptable human health exposure risk, for the proposed land use setting.

This project is being undertaken because:

- The site is the subject of proposed redevelopment works;
- Historically identified areas of environmental concern on within site, have the potential to present an unacceptable human health and ecological exposure risk in the context of the proposed land use setting; and
- Previous investigations undertaken within the site were considered insufficient to characterise the site.

The project team identified for this project includes Sydney Environmental Group Pty Ltd, the client and the planning consent authority.

The regulatory authorities identified for this investigation include NSW EPA and the Local Council.

8.2 Step 2: Identify the decision/goal of the study

The second step involves identifying decisions that need to be made about the contamination problem and the new environmental data required to make them.

The decisions that need to be made during this investigation include:

- Is the environmental data collected for the project, suitable for assessing relevant land contamination exposure risks?
- Do concentrations of identified contaminants of potential concern (COPC) present an unacceptable exposure risk to identified receptors, for the proposed land use setting?
- Have the contaminated soils been effectively isolated by the remedial strategy?
- Is the site suitable for the proposed land use setting, in the context of land contamination as a result of the chosen remedial strategy?

8.3 Step 3: Identify the information inputs

The third step involves identifying the information needed to support decisions and whether new environmental data will be needed.

The inputs required to make the decisions set out in **Section 8.2** for this investigation, will include:

- Data obtained in previous contamination assessments;
- The nature and extent of sampling at the site, including both density and distribution;
- Samples of relevant site media;
- The measured physical and/or chemical parameters of the site media samples (including field screening and laboratory analysis, where relevant); and
- Assessment criteria adopted for each of the media sampled.

8.4 Step 4: Define the boundaries of the study

The fourth step involves specifying the spatial and temporal aspects of the environmental media that the data must represent to support decisions.

The spatial extent of the project will be limited to the site as defined by its boundaries.

The temporal boundaries of the project include:

- The project timeframes by EGA for this project, and subsequent remediation contractor works program;
- Unacceptable weather conditions at the time of undertaking fieldwork, including rainfall, cold and/or heat;
- Access availability of the site (to be defined by the site owner/representative); and
- Availability of EGA field staff (typically normal daylight working hours, Monday to Friday).

The lateral extent that contamination is expected to be distributed across, based on the conceptual site model, is defined by the inferred boundaries of the areas of environmental concern (AEC) and may be altered based on the data collected during the supplementary contamination assessment.

The vertical extent that contamination is expected to be distributed across, based on the conceptual site model, is defined by the inferred boundaries of the previously identified areas of environmental concern (AEC) and may be altered based on the data collected during the supplementary contamination assessment.

The scale of the decisions required will be based on the entire site.

Constraints which may affect the carrying out of this investigation may include access limitations, presence of above and below ground infrastructure, and hazards creating health and safety risks.

8.5 Step 5: Develop the analytical approach (or decision rule)

The fifth step involves defining the parameter of interest, specifying the action level, and integrating information from Steps 1 to 4 into a single statement that gives a logical basis for choosing between alternative actions.

8.5.1 Rinsate Blank

One rinsate blank sample will be collected and scheduled for analysis, for each day of sampling undertaken, if non-disposable equipment is used during the sampling works. Rinsate blank samples will be analysed for at least one of the analytes that the parent sample is being scheduled for analysis for (with the exception of asbestos).

8.5.2 Trip Spikes and Trip Blank Samples

One trip spike and trip blank sample will be used and scheduled for analysis, for each day of sampling undertaken, if site samples being collected that day are being analysed for volatile contaminants of concern (typically BTEX and/or TRH C_6-C_{10}).

8.5.3 Intra-Laboratory and Inter-Laboratory Duplicates

Intra-laboratory and inter-laboratory field duplicates will be collected at a rate of one per twenty (5%) site samples collected. The duplicates collected will be analysed for at least one of the analytes that the parent sample of the duplicate/triplicate is being scheduled for analysis for (with the exception of asbestos).

The relevant percent difference (RPD) of concentrations of relevant analytes, between the parent sample and the duplicate will be calculated.

8.5.4 Laboratory Analysis Quality Assurance / Quality Control

The analytical laboratory QA/QC program will typically include laboratory method blank samples, matrix spike samples, surrogate spike samples, laboratory control samples, and laboratory duplicate samples.

8.5.5 If/Then Decision Rules

EGA has adopted the following 'if/then' decision rules for this investigation:

- If the result of the assessment of field data and laboratory analytical data is considered acceptable, then that field data and laboratory analytical data is suitable for interpretation within the scope of this investigation; and

- If the field data and laboratory analytical data is within the constraints of the assessment criteria adopted for this investigation (refer **Section 8.3**), then the contamination exposure risks to identified receptors, are considered acceptable.

In the event the assessment of field data and/or laboratory analytical data results in the data being not suitable for interpretation, then EGA will determine if additional data is required to allow interpretation to be undertaken.

In the event that field data and/or laboratory analytical data exceeds the assessment criteria adopted for this investigation (refer **Section 7.2**), EGA will undertake an assessment of the exceedance in the context of the project objectives to determine if additional data is required and whether management and/or remediation is required.

8.6 Step 6: Specify the performance or acceptance criteria

The sixth step involves specifying the decision maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data. When assessing contaminated land, there are generally two types of errors in decision making:

- Contamination exposure risks for a specific land use setting are acceptable, when they are not; and

- Contamination exposure risks for a specific land use setting are not acceptable, when they are.

EGA will mitigate the risk of decision error by:

- Calculation of the 95% upper confidence limit (UCL) statistic to assess the mean concentration of relevant contaminants of potential concern (excluding asbestos);

- Assignment of fieldwork tasks to suitably experienced EGA consulting staff, and suitably experienced contractors;

- Assignment of laboratory analytical tasks to reputable NATA accredited laboratories; and

- Assignment of data interpretation tasks to suitably experienced EGA consulting staff, and outsourcing to technical experts where required.

EGA will also adopt a range of data quality indicators (DQI) to facilitate assessment of the completeness, comparability, representativeness, precision and accuracy (bias).

Table 8.6.1 Performance and Acceptance Criteria Summary

Completeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Critical locations sampled	Refer **Section 8.4**	Critical samples analysed according to DQO	Refer **Section 8.7.1**
Critical samples collected	Refer **Section 8.4**	Analytes analysed according to DQO	Refer **Section 8.7.1**
SOPs appropriate and complied with	100%	Appropriate laboratory analytical methods and LORs	Refer **Section 8.7.7**
Field documentation complete	All sampling point logs, calibration logs and chain of custody forms	Sample documentation complete	All sample receipt advices, all certificates of analysis
Sample Holding Times	Laboratory holding times provided by laboratory	Sample extraction and holding times complied with	Refer **Section 8.7.12**
Comparability			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Same SOPs used on each occasion	100%	Same analytical methods used by primary laboratory	Refer **Section 8.7.7**
Climatic conditions	Samples stored in 500ml zip-lock bags	Same LORs at primary laboratory	Refer **Section 8.7.7**
Same types of samples collected, and handled/preserved in same manner	All soil samples same size, all stored in 500ml zip-lock bags	Same laboratory for primary sample analysis	All primary samples to Eurofins | Environmental Testing
Analytical measurement units consistent	All measurement units the same between same analytes	Same analytical measurement units	Refer **Section 8.7.12**
Representativeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Appropriate media sampled according to SAQP	Refer **Section 8.4**	Samples analysed according to SAQP	Refer **Section 8.7.12**
Media identified in SAQP sampled	Refer **Section 8.4**	Nil	Nil
Precision			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Field duplicate / triplicate RPD (Metals & PAH only)	Minimum 5% duplicates No limit for results <10 times LOR 50% for results 10-20 times LOR 30% for results >20 times LOR	Laboratory duplicates	No exceedances of laboratory acceptance criteria
SOPs appropriate and complied with	100%	Nil	Nil
Accuracy (bias)			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Rinsate blanks	Analyte concern <LOR None collected for asbestos.	Nil	No exceedances of acceptance criteria

Field trip spikes (BTEX only)	Recoveries between 60% and 140%	Matrix spike recovery	No exceedances of acceptance criteria
Field trip blanks (BTEX only)	Analyte concentration <LOR None collected for asbestos.	Surrogate spike recovery	No exceedances of acceptance criteria

8.7 Step 7: Develop the plan for obtaining data

The seventh step involves identifying the most resource effective sampling and analysis design for generating the data that is required to satisfy the DQOs.

8.7.1 Supplementary Contamination Assessment Sampling and Methodology

Table A in NSW EPA (2022) provides guidance on minimum sampling point densities required for site characterisation, based on detecting circular hot spots of defined diameter using a systematic sampling pattern. This guidance assumes the investigator has little knowledge about the probable locations of the contamination, the distribution of the contamination is expected to be random (e.g. land fill sites) or the distribution of the contamination is expected to be fairly homogenous (e.g. agricultural lands).

However, Section 3.1 of NSW EPA (2022) states that a judgemental sampling pattern can be used where there is enough information on the probable locations of contamination. Further to this, Section 6.2.1 of NEPM ASC 2013 states that the number and location or sampling points is based on knowledge of the site and professional judgement. Sampling should be localised to known or potentially contaminated areas identified from knowledge of the site either from site history or an earlier phase of site investigation. Judgemental sampling can be used to investigate sub-surface contamination issues in site assessment.

Table 4 in WA DOH (2021) indicates that where the 'likelihood of asbestos' is assessed as "possible" or "suspect", the investigation regimen should include a sampling density that is either judgemental or the same as that set out in Table A of NSW EPA (2022) for assessing asbestos.

As this project has included gathering data which provides a reasonable understanding of site history (in the context of potential areas of environmental concern on the site) and taking into consideration Table 4 in WA DOH (2021), it is considered reasonable to adopt a judgemental sampling pattern. A preliminary sampling plan is provided in **Figure 7**.

The location of actual sampling points will be recorded by hand on a site plan.

The supplementary DSI assessment and hazardous building material survey sampling arrangements for this project are presented in **Table 8.7.1** below.

Table 8.7.1 Supplementary Contamination Assessment Methodology

AEC	Contamination Risk	Supplementary Contamination Assessment Methodology
AEC01a	Fill Materials impacted by lead, cadmium and zinc with the potential for asbestos containing materials to be present.	Six (6) test pits are to be advanced by an excavator to facilitate the collection of six (6) 10L samples screened for fragments of ACM >7mm and a subsequent 500 mL sample for quantitative asbestos. Sampling is to be undertaken every 1 m vertically, starting with the top 100 mm of soil and extending 0.3 m into natural materials. A grid-based walkover across the AEC footprint, to assess whether the top 100 mm of soil is visually free of asbestos is to be undertaken.

AEC	Contamination Risk	Supplementary Contamination Assessment Methodology
AEC03	Previously inaccessible non-friable asbestos impacted soils	Following completion of the outstanding demolition works at the site, a total of nineteen (19) test pits are to be advanced within the previously inaccessible portions of AEC03 via excavator. Test pits are to be advanced 0.3 m into natural materials and samples are to be collected from near surface and at ~0.5 m intervals within the soil profile or with changes in strata. To assess for asbestos, collection of one (1) 10L samples screened for fragments of ACM >7mm and a subsequent 500 mL sample for quantitative asbestos are to be collected from each test pit, totalling nineteen (19).
AEC04	Soil and groundwater potentially impacted by formerly decommissioned and removed underground storage tanks	Six (6) boreholes are to be advanced by a track-mounted drill rig to facilitate the collection of discrete soil samples, with two (2) boreholes to be advanced to groundwater to facilitate the installation of groundwater monitoring wells. Soil samples are to be collected from near surface and at ~0.5 m intervals within the soil profile or with changes in strata. Boreholes will be advanced to a maximum 4 m bgsl or 0.3 m into natural materials (whichever occurs first). Boreholes utilised for groundwater monitoring well installation are to be advanced to a target depth of 6 m bgsl, 2 m below inferred standing water level or practical refusal (whichever occurs first).
AEC05	Soil materials beneath building footprints that have not yet been assessed	Following completion of the outstanding demolition works at the site, a total of seventeen (17) test pits are to be advanced across existing hardstand areas within the site via excavator. Test pits are to be advanced 0.3 m into natural materials and samples are to be collected from near surface and at ~0.5 m intervals within the soil profile or with changes in strata. To assess for asbestos, collection of one (1) 10L samples screened for fragments of ACM >7mm and a subsequent 500 mL sample for quantitative asbestos are to be collected from each test pit, totalling seventeen (17).
	Stockpiled soils as part of make safe works during demolition	Prior to the remediation of stockpiled soils associated with AEC05, sampling to be completed in line with tables 3 and 4 of the sampling design guidelines (Part 1 - 2022) to chemically characterise the materials and confirm their suitability for re-use on-site at depth following treatment for non-friable asbestos.
AEC06	Hazardous ground gas migration from the adjacent Kelso landfill	Two (2) ground gas monitoring wells are to be installed along the southern boundary of the site via track-mounted drill rig. The wells are to be installed to depths ranging 3.5 – 6.0 m bgsl depending upon the gauged depth to groundwater, as detected in existing MW02 and MW03 prior to installation.
AEC07	Groundwater impacted by adjacent industrial land uses north and north-east of the site	Re-development and sampling of the existing groundwater monitoring wells at the site (MW01-MW08) will be undertaken. If groundwater wells MW06 and MW07 are observed to be dry during the sampling event, additional groundwater monitoring wells may need to be installed.

8.7.2 Sampling Methodology

Soil samples will be obtained by excavating test-pits with the use of a hydraulic excavator. Grab soil samples will be collected at each required sampling point directly from the base and walls of the excavation. Depending on the depth of the excavation footprint, an excavator may be required to obtain samples. In these instances, samples will be collected from soils in the centre of the excavator bucket, to avoid cross contamination from the excavator bucket.

Sampling will be guided by a combination of visual evidence (e.g. visible ACM, staining, etc), olfactory evidence (hydrocarbon odours) and field analytical instrumentation (e.g. portable PID soil headspace screening) where applicable.

Observations of the materials encountered during sampling will be recorded on the relevant field observation log with photographic record.

8.7.3 Groundwater Monitoring Well Installation Methodology

Groundwater monitoring wells are to be advanced to depths of groundwater where natural materials are not encountered prior. Groundwater monitoring wells are to be drilled at least two (2) metres below inferred standing water level (SWL), or practical refusal, whichever occurs first.

Monitoring wells will be constructed using 50 mm Class 18 PVC machine slotted screen and casing, gravel pack from the base to approximately 0.2 m above the top of the screen, followed by approximately 0.5 m of hydrated bentonite and grout to the surface.

8.7.4 Groundwater Monitoring Event Methodology

Depths to groundwater and the presence or absence of non-aqueous phase liquids are to be gauged using an interface probe prior to the monitoring event.

Low flow sampling will be adopted and groundwater will be extracted from the monitoring well at a rate so that the drawdown of water is minimised. Water quality meters will be used for stability to indicate the change from stagnant well water to representative formation water. The depth of sampling will be the middle of the water column within the screened interval, as determined prior to sampling.

Groundwater parameters will be monitored every 5 minutes for a minimum of three (3) rounds until concentrations have stabilised. If readings are still fluctuating, the concentrations will continue to be monitored for additional 5 minute intervals until conditions have stabilised. Field filtering of groundwater samples will be undertaken using 0.45 micron filters for metals analysis.

8.7.5 Ground Gas Monitoring Well Installation Methodology

Ground gas monitoring wells are to be advanced to depths approximately 1 m above the SWL at the site. The gauged SWL in surrounding groundwater monitoring wells will infer the depth of ground gas monitoring well installation.

Monitoring wells will be constructed using 50mm Class 18 PVC machine slotted screen and casing, gravel pack from the base to approximately 0.1 m above the top of screen, followed by approximately 0.3 m hydrated bentonite, grout to the surface and standpipe sticking above ground with gas cap tapped to take a quick-connect nipple.

Following installation, the monitoring wells will be developed using a landfill gas meter (or similar). Each well will be developed for a minimum of three (3) minutes.

8.7.6 Ground Gas Monitoring Event Methodology

Leak testing will be undertaken after 48 hours following installation of the ground gas monitoring wells. Ground gas monitoring will be undertaken during falling atmospheric pressure using a landfill gas analyser.

Prior to the sampling event, the ground gas meter will run for approximately 1 minute in ambient air and ambient air readings recorded. The ground gas meter will then be attached to the monitoring well and the relative and atmospheric pressure readings recorded.

The monitoring event will be undertaken by tapping a quick-connect nipple fitted with airtight tubes onto the gas cap at each well. Readings will be collected every 30 seconds for approximately 5 minutes at each gas well until the concentrations have stabilised. If readings are still fluctuating, the pump will continue to run and concentration readings recorded at one minute intervals until equilibrium is reached.

If high ground gas concentrations are recorded on the meter, then monitoring of the bore will be extended a further two (2) minutes to further assess the persistence of the gas detected within the bore. Ground gas parameters to be measured will include methane, carbon dioxide, oxygen, carbon monoxide, hydrogen sulphide, VOCs, differential pressure and borehole gas flowrate.

The ground gas meter will be purged between monitoring well sampling events to avoid cross contamination.

8.7.7 Identification, Storage and Handling of Samples

Sample identifiers will be used for each sample collected, based on the AEC, the number of samples collected and the depth/interval the sample was collected from, e.g. a sample collected from AEC01 from the excavation footprint base, would be identified as AEC01-Base.

Project soil samples will be stored in laboratory prepared glass jars or zip-lock bags (if collected for asbestos). Project groundwater samples will be stored in laboratory prepared bottles.

Soil samples in glass jars will be placed in insulated container/s with ice.

Samples will be transported to the relevant analytical laboratory, with chain of custody (COC) documentation that includes the following information:

- EGA project identification number
- Each sample identifier
- Date each sample was collected
- Sample type (e.g. soil or water)
- Container type/s for each sample collected
- Preservation method used for each sample (e.g. ice)
- Analytical requirements for each sample and turnaround times
- Date and time of dispatch and receipt of samples (including signatures)

8.7.8 Soil Vapour Screening

Where the contaminants of potential concern include volatiles, project soil samples will be subjected to field screening for ionisable volatile organic compounds (VOC), using a photo-ionisation detector (PID). The results of field screening will be recorded on a field sampling point log and presented in test-pit logs.

8.7.9 Decontamination

In the unlikely event that non-disposable sampling equipment is used, that equipment will be decontaminated before and in between sampling events, to mitigate potential for cross contamination between samples collected. The decontamination methodology to be adopted for this project will include:

- Washing relevant sampling equipment using potable water with a phosphate free detergent (i.e. Decon 90 or similar) mixed into the water;
- Rinsing the washed non-disposable sampling equipment with distilled or de-ionised water; and
- Air drying as required.

8.7.10 Laboratory Selection

The analytical laboratories used for this project will be NATA accredited for the analysis undertaken.

8.7.11 Laboratory Analytical Schedule

Project samples will be scheduled for NATA accredited laboratory analysis, using a combination of:

- Observations made in the field of the media sampled;
- Headspace screening results (where available); and
- The contaminants of potential concern (COPC) identified for the area of environmental concern that the sample was collected from.

Based on the site history, EGA has adopted the following laboratory analytical schedule for the supplementary contamination assessment. Project specific information is presented in **Table 8.7.2** below.

Table 8.7.2 Laboratory Analytical Schedule (Supplementary Contamination Assessment)

ID	Area of Environmental Concern	Analytical Schedule	No. of samples
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils with the potential for asbestos impacted soils to be present	Asbestos (0.001 %)	Minimum six (6) soil samples
AEC03	Previously inaccessible non-friable asbestos impacted soils	Asbestos (0.001 %)	Minimum nineteen (19) soil samples
AEC04	Underground Storage or Petroleum-Based Product Onsite	Heavy Metals, TRH, PAH, VOC, SVOC, Phenols	Minimum six (6) soil samples Two (2) groundwater samples
AEC05	Soil Materials Beneath Existing Building Footprints	Heavy Metals, TRH, BTEX, PAH, OCP and Asbestos (0.001 %)	Minimum seventeen (17) soil samples
	Stockpiled soils associated with AEC05	Heavy Metals, TRH, BTEX, PAH and OCP	Sampling in line with table 3 and table 4 of the sampling design guidelines part 1 (2022)
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of Site	Nil (refer to **Section 8.7.6**)	N/A
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	Heavy Metals, TRH, BTEX, PAH, VOC, OCP, OPP, PCB, PFAS and inorganic compounds	Eight (8) groundwater samples

8.7.12 Laboratory Holding Times, Analytical Methods and Limits of Reporting

The laboratory holding times, analytical methods and limits of reporting (LOR) being used for this project, are presented in **Table 8.7.3** to **Table 8.7.6**.

Table 8.7.3 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (Eurofins – Soil).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
Asbestos Bulk ID	No limit	AS4964:2004	0.01% w/w
Asbestos Quantitative	No limit	WA DOH 2021 / NEPM 2013	0.001% w/w
BTEX and TRH C_6-C_{10}	14 days	NEPM Schedule B3	0.1-20
Metals	6 months	USEPA 6010, 6020	0.1-5

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
TRH >C_{10}-C_{40}	14 days	NEPM Schedule B3	20-100
OCP	14 days	USEPA 8081	0.2
PAH	14 days	USEPA 8270	0.1-0.5
VOC	14 days	USEPA 8260	0.1-0.5

Table 8.7.4 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (ALS – Soil).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
Asbestos	No limit	PLM/Disp. Stain.	Absence / presence
Asbestos	No limit	WA-DER	0.001% w/w
BTEX and TPH C_6-C_{10}	14 days	USEPA 8260	0.2-0.5
Metals	6 months	USEPA 200.8/3050/6010B	0.1-3
TPH >C_{10}-C_{40}	14 days	USEPA 8270	20-100
OCP/OPP	14 days	USEPA 8270	0.1-0.2/0.2-1
PAH	14 days	USEPA 8270	0.1
VOC	14 days	USEPA 8260	0.2-0.5
E.Coli	3 days	AS/NZS 4276.7	10 (cfu/g)
Faecal Coliforms	3 days	AS/NZS 4276.5	10 (cfu/g)

Table 8.7.5 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (Eurofins – Water).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/L)
BTEX and TRH C_6-C_{10}	14 days	USEPA 5030, 8260B and 8020	0.001-0.02
TRH >C_{10}-C_{40}	7 days	USEPA 8015B & C	0.1
VOC	14 days	USEPA 8260	0.001-0.005
SVOC	14 days	USEPA 8260	0.001-0.005
PAH	7 days	USEPA 8270	0.001
OCP	7 days	USEPA 8081	0.0002-0.005
Metals	6 months	USEPA 8015B & C	0.0001-0.005
Cyanide	14 days	USEPASW 8469010	0.005
PCB	7 days	USEPA 8270	0.005
Phenols	7 days	USEPA 8260	0.001-0.005

Table 8.7.6 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (ALS – Water).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/L)
BTEX and TRH C_6-C_{10}	14 days	EP080	0.001-0.02
TRH >C_{10}-C_{40}	7 days	EP080 and EP071	0.05-0.1
VOC	14 days	EP074E	0.005-0.05
SVOC	14 days	EP074E	0.005-0.05
PAH	7 days	EP075(SIM)B	0.0005-0.001
OCP	7 days	EP068A	0.0005
Metals	6 months	EG020F and EG035F	0.0001-0.005
PCB	7 days	EP066	0.001
Phenols	7 days	EP074E	0.005-0.05

9. REMEDIATION STRATEGY OPTIONS DISCUSSION

The primary contaminant of concern at the Site is asbestos because of the potentially large quantity of soil likely to be impacted at the Site and the high cost of disposing asbestos waste to landfill in NSW.

The remediation of asbestos impacted soils is complex due to the practical constraints in locating and treating asbestos contamination. These practical constraints arise because of:

- The difficulty in predicting where asbestos fragments are located across the ground surface and in fill; and
- The difficulty in identifying the location and extent of asbestos contamination using discrete sampling methods.

Strategies have been adopted in this RAP to minimise, to the extent practicable, the potential impact of these constraints:

- Designing the preferred remediation strategy and preparing this RAP after comprehensive investigations have been conducted across the Site, which have identified the main areas of asbestos contaminated fill that require remediation. These investigations have also identified the areas of the Site where there is a low risk of significant asbestos contamination;
- Having practically all the above ground buildings demolished as permitted by the Development Consent, which has allowed hazardous buildings materials to be disposed off-site, the presence of visible asbestos cleared from building footprints, and the condition of the soils across the building footprints investigated;
- Developing a methodical sequencing of remediation tasks;
- Tracking excavated soils from cradle-to-grave;
- Adopting remediation criteria for treated soils based on managing risk in accordance with EPA guidance; and
- Following the removal and remediation of known asbestos contamination in an area, protocols are adopted by the bulk earthworks / civil works to manage and remove isolated, infrequent ACM fragments as they are found.

9.1 Remedial Goal

The remedial goal for this site is to remediate potential soil contamination (where identified) to a level that does not present an unacceptable human health exposure or environmental risks, making the site suitable for the proposed development. During remediation, consideration will be given to the following:

- Principles of ecologically sustainable development in line with Section 9 of the Contaminated Land Management Act 1997;
- Minimising waste generation under the Waste Avoidance and Resource Recovery Act 2001;
- Management of site contingencies; and
- Protection of worker health and safety, environmental management, and community relations.

9.2 Remediation Strategy Development Rationale

In general, the preferred hierarchy of options for site remediation and/or management specified by NSW EPA7 guidance is set out in s.6(16) Assessment of Site Contamination Policy Framework of Schedules A and B of the NEPM. This preferred hierarchy 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 option should be considered, in terms of achieving an appropriate balance between the benefits and effects of undertaking the option.

These options were considered in light of the known conditions on the site and the practicality and cost associated with on-site treatment, off-site treatment and wholesale excavation. In the case of the latter removal of all materials would simply burden another site and comprise a waste of diminishing landfill resources and would in any event be contrary to the principals of waste minimisation and sustainability espoused by the NSW EPA. Moreover, the ability to reuse treated soils on-site complies with NSW EPA's waste hierarchy as follows:

- Waste Avoidance - including action to reduce the amount of waste generated by households, industry and all levels of government;
- Resource recovery - including re-use, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources; and
- Waste disposal - including management of all disposal options in the most environmentally responsible manner.

The RAP has evaluated remediation options for the main type of contaminated soil needing to be remediated, being non-friable asbestos impacted fill. For other types of soil contamination that may be found at the Site, appropriate remediation strategies will be developed, if required.

9.3 Remediation Options for Impacted Soil

The potential list of remediation options associated with impacted soil is extensive. Consequently, only relevant remediation strategies that have been considered which include the following:

- On-site Treatment and Beneficial Reuse; and
- Off-site landfill disposal – excavation / removal and disposal.

A summary of the advantages and disadvantages to these remediation options is provided overleaf in Table 9.4.1.

EGA notes that the client would prefer that the remedial works be undertaken in a manner that does not result in the need for:

- Notation on a planning certificate for the site;
- A covenant registered on the title to the land; or
- A long-term environmental management plan (EMP).

As such, the following remedial options were not considered for this project:

- Excavation and on-site containment; and
- Leave in-situ and cover with a clean soil cap.

9.4 Remediation Options for Impacted Groundwater and Ground Gas

As a supplementary contamination assessment for groundwater and ground gas at the site is required, remediation options relating to groundwater and landfill gas migration have not been assessed as the current contamination status and requirement of remediation is currently unknown. If the assessment of ground gas or groundwater risks indicates that remediation or management is required, preparation of a revised RAP setting out remedial and management options for those contamination risks will be undertaken.

Table 9.4.1 Remedial Options Summary

Treatment Option	Description	Advantages			Disadvantages		
		Technical	Financial	Logistical	Technical	Financial	Logistical
On-site Treatment	Soil raked and picked of physical contaminants. Treated and validated materials beneficially reused within the site.	Direct access to soil will be restricted by local roadways, foot paths and park areas with the appropriate mitigation measures	Potentially lower costs through with efficient / strategical methodology	Moderate excavation is required to remove all the AECs across the entire site Limited environmental management required during the works (e.g. dust, noise)	Treated and validated materials would remain on-site. Materials to be beneficially re-used within limited access areas (beneath roadways, parks, and footpaths)	Moderate to high labour costs during raking / picking of soils	Treated and validated material would remain on-site indefinitely.
Excavation and Offsite Disposal	Removal of contaminated soil to an EPA licensed facility. Validation sampling to demonstrate the conditions of the residual soil impact. Reinstatement of excavated areas with material validated as suitable for the intended land use.	Protective of human health including future tenants and construction workers. Facilitate future development of the entire site. No long-term EMP will be required.	No onsite operation and maintenance required.	No ongoing management required as the impacted soil will have been removed offsite.	Based on the soil investigation results, for off-site disposal purposes, the impacted soil to be excavated and removed offsite would require waste classification in accordance with the NSW EPA *Waste Classification Guidelines 2014.*	High remedial cost incurred to remediate the entire site.	Major excavation is potentially required. Odour, vapour and dust management required during the excavation works. May increase truck traffic in area to transport contaminated soil for a short period of time.

9.5 Summary of Preferred Remediation Options

Based on SE's assessment detailed above, the most suitable remedial strategy will comprise a combination of treatment options consistent the ultimate end land use of the site. **Table 9.5.1** below summarises the preferred remediation strategies with regards to the identified contamination within the site.

Table 9.5.1 Selected Remediation Strategies

AEC ID	Contamination Risk	Selected Remediation Strategy
AEC01	Friable Asbestos Impacted Fill Soils	Excavation and Off-Site Disposal
	Non-Friable Asbestos Impacted Fill Soils	On-Site Treatment and Beneficial Re-Use
AEC02	Non-Friable Asbestos Impacted Fill Soils	On-Site Treatment and Beneficial Re-Use
AEC03	Non-Friable Asbestos Impacted Fill Soils	On-Site Treatment and Beneficial Re-Use
AEC05	Soil Materials Beneath Existing Building Footprints	On-Site Treatment and Beneficial Re-Use
-	Direct Contact Risks in Soil Materials (*if identified*)	Excavation and Off-Site Disposal
-	Ecological Risks in Soil Materials (only) (*if identified*)	Excavation and Beneficial Re-Use at depths > 2 m bgsl
-	Aesthetic Risks (*if identified*)	Excavation and On-Site Treatment to Remove Foreign Materials; or Off-Site Disposal

Areas subject to remediation are provided in **Figure 2.**

Excavation and disposal off-site is considered as a contingency remedial strategy for all contamination risks as this is the most conservative option.

9.6 Overview of Remediation Options

The following method presents a guide for a qualified environmental consultant and specialised civil works and/or remediation contractor engaged to undertake the remediation works. All remediation works should be performed under the on-site guidance of a contaminated land consultant with sufficient experience in soil remediation activities.

Table 9.6.1 Proposed Remedial Works

AEC	Contamination Risk	Proposed Remedial Strategy
AEC01	Friable ACM in soil	Sampling targeting the depths of the previously identified impacts (0.5 m bsgl) to the north, south, east and west of 'EBH1' to delineate the lateral extent of friable asbestos. Excavation vertically to the base of impacted fill and laterally to the AEC edge or site boundary (whichever occurs first). Disposal offsite to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines. The remediation contractor will retain transport and disposal records for all wastes removed off site.
AEC01 **AEC02** **AEC03** **AEC05**	Non-friable ACM in soil	In-situ soils to be excavated vertically and laterally beyond the extent of asbestos impacts, spoil to be relocated to the designated asbestos treatment area. Previously stockpiled soils associated with AEC05 and AEC02 to be relocated to the designated asbestos treatment area. Ex-situ soils once at the treatment area to be spread out to a maximum thickness of 100 mm on a suitably prepared pad and subjected to mechanical raking, the licensed asbestos removalist will traverse the raked material in a systematic grid-based pattern removing fragments of bonded ACM by hand. At least two passes of raking and picking shall be undertaken, with a 90 ° direction change between each pass. Following successful validation, soil materials will be buried a minimum of 2 m below the finishing surface level (FSL). Alternatively, Excavation vertically to base of fill and laterally to the edge of fill or to the site boundary (whichever occurs first). Disposal off-site to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines. The remediation contractor will retain transport and disposal records for all wastes removed off site.
-	Direct Contact Risks in Soil (*if identified*)	Excavation vertically to the base of impacted fill and laterally to the AEC edge or site boundary (whichever occurs first). Disposal offsite to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines. The remediation contractor will retain transport and disposal records for all wastes removed off site.
-	Ecological Risks in Soil (only) (*if identified*)	Excavation vertically to the base of impacted fill and laterally to the AEC edge or site boundary (whichever occurs first). Soil materials will be buried a minimum of 2 m below the finishing surface level (FSL).
-	Aesthetic Risks (*if identified*)	Removal of aesthetic risks and disposal offsite to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines. The remediation contractor will retain transport and disposal records for all wastes removed off site.

10. REMEDIAL ACTION PLAN

10.1 Remediation Extents

The extent of contamination within the site is considered to is outlined within **Table 10.1.1** below.

Table 10.1.1 Approximate Remedial Extents

ID	Area of Environmental Concern	Approximate Extent
AEC01	Friable Asbestos Impacted Fill Soils	25 m^2 x 0.5 m bgsl Total ≈ 12.5 m^3 / 22.5 tonnes
	Non-Friable Asbestos Impacted Fill Soils	3,950 m^2 x (0.2 to 0.7 m / average 0.5 m bgsl) 1,975 m^3 / 3,555 tonnes
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils	1,000 m^2 x 0.25 m bgsl 250 m^3 / 450 tonnes *(Extent may vary following supplementary assessment)*
AEC02	Non-Friable Asbestos Impacted Fill Soils	10,425 m^2 x (0.1 to 1.2 m / average 0.5 m bgsl) 5,212.5 m^3 / 9,382.5 tonnes
	Stockpiled Non-Friable Asbestos Impacted Soils	Stockpiled: *4,156 m^3 / 7,480 tonnes*
AEC03	Non-Friable Asbestos Impacted Fill Soils	15,480 m^2 x (0.3 to 1.4 m / average 0.6 m bgsl) 9,288 m^3 / 16,718 tonnes
AEC05	Building Footprints (Assessed)	14,050 m^2 x (0.3 to 1.0 m / average 0.6 m bgsl) *8,430 m^3 / 15,174 tonnes*
	Stockpiled Non-Friable Asbestos Impacted Soils	Stockpiled: *7,626 m^3 / 13,726 tonnes*
AEC08	Risk of redundant fibre cement conduits and septic tanks within the site footprint	Site Footprint
AEC09	Risk of asbestos contamination within the site footprint	Site Footprint

Refer to **Figure 3, 4, 5** and **6** which indicates the areas which will be subject to remediation.

The extent of remediation identified in **Table 10.1.1** represents the known contamination at the site based on the previous contamination assessments undertaken at the site. There may be a risk of additional, presently unknown contamination being present at the site that may need to be remediated. Unknown contamination may be uncovered during the supplementary contamination assessment and bulk earthworks, requiring remediation.

It is noted that the lateral extent of remediation may be altered, during remedial works based on site observations and validation soil sample analytical laboratory results. EGA further notes that the extent of remediation required in AEC01a will be confirmed following the supplementary contamination assessment.

10.2 Overview

A methodical sequencing of remediation phases is an important strategy adopted by this RAP to minimise, to the extent practicable, the potential impact of the constraints associated with remediation of asbestos contamination listed in Sectio 9.

A generic sequencing of remediation phases have been developed so that each can be applied to any stage of the development. The sequencing of tasks has sought to provide a logical order that remediation work should be undertaken irrespective of the type and extent of contamination that may be present in a stage. Where a remediation phase is not relevant for a particular Development Stage, then the next remediation phase is considered and so on until the particular Development Stage has been fully remediated and validated. At this final time this area of land will be considered to be suitable for the proposed land use/s and a validation report will be prepared for that area, which will allow a Section A SAS / SAR to be issued followed by the commencement of above ground construction work.

The remediation of contamination in an area of the Site and the validation of its final condition as being suitable for the proposed land uses can only be completed when final site levels have been reached and no further bulk earthworks are required. This is because of the need to ensure that:

- All soils used as backfill at the Site have been tracked from cradle-to-grave;
- Only treated soils that have been validated as meeting the remediation criteria listed in Section 6 are used as backfill in areas of the Site having a land use consistent with the remediation criteria;
- Any isolated fragment of asbestos found during the excavation of soil not requiring remediation has been removed and validated;
- Surface soils that form the final site level contain no visible asbestos, as required by the remediation acceptance criteria listed in Section 6; and
- Imported soils used in bulk earthworks meet the EPA criteria for VENM and ENM as outlined in Section 6; and
- Imported landscaping soils meet the remediation acceptance criteria in Section 6.

It is critical for the contractor to fully understand the requirements of this RAP and to manage the remediation and movement of soils at the Site in accordance with this RAP.

Both remediation work and bulk earthworks will need to be undertaken in parallel at different parts of the Site and sequenced in a manner to facilitate the staging plan of the proposed development.

Validation reports will need to be prepared by the environmental consultant and site audit documentation will need to be prepared by the Site Auditor progressively as final site levels are achieved at a particular stage of the development.

10.3 Sequence of Remediation Works

The remediation works will be separated into phases to allow for the remediation contractor and the environmental consultants to plan the work. The staged remediation works will be as follows:

- Phase 1: Early Works and Protection of Trees
- Phase 2: Investigation of groundwater and LFG Risk (AEC06 and AEC07)
- Phase 3: Demolition Works and Supplementary Assessment within AEC01a, AEC03, AEC04, AEC05
- Phase 4: Remediation of Asbestos Contamination & Heavy Metal Contamination
- Phase 5: Management of contamination risks during bulk earthworks
    - 5.1 Excavate Remaining Soils to Final Excavation Level
    - 5.2 Backfill Excavated / Treated On-Site Soils in Fill Areas

5.3 Import VENM or ENM Soil to Fill Areas
5.4 Final Surface Soil Inspection

These phases are expanded in detailed below.

10.4 Phase 1 Early Works and Tree Protection

Prior to any works being undertaken at the site, a site-specific Safe Work Method Statement (SWMS) will need to be developed for the site tasks. A site-specific Work Health & Safety (WHS) Plan will need to be prepared for the site by the Principal Contractor. A Construction Environmental Management Plan (CEMP) will need to be developed for the site.

All environmental and WHS measures will need to be established and implemented at the site (e.g. erosion sediment control measures). The Principal Contractor will also need to establish a material tracking system to track all contaminated soil and sediment materials from cradle-to-grave.

Based on the extent and complexity of soil materials treatment, an estimated timeframe for remedial works is considered to be 12-18 months following the commencement of works. Referral to a remediation contractor should be made to better estimate remediation timeframes. It is expected that remediation timeframes will be further refined following appointment of the remediation contractor, and the staging of the remediation tasks in the contractor's works program.

The Civil contractor engaged to undertake the bulk earthworks scope at the site will need to prepare the following documentation prior to the commencement of works:

- A Construction Environmental Management Plan (CEMP); and
- A materials tracking plan as required by the remediation work.

Tree protection zones (TPZ) will be established around the drip line of existing trees within the site. Exclusion fencing will be utilised as a physical barrier demarcating TPZ's. No works will be undertaken within the tree protection zones as part of the Category 2 remedial scope.

Prior to the commencement of works, a project inception meeting will need to be held between the developer, Remediation / Civil Contractor, Environmental Consultant and Site Auditor. The inception meeting should cover, amongst other things, the requirements of this RAP and the roles and responsibilities of the relevant parties.

10.4.1 Notifications and Approvals

Notification of an intention to undertake remediation works on the site, will be submitted to the relevant planning consent authority, 30 days prior to remediation works commencing. The proposed remediation works are consistent with Category 2 under SEPP Resilience and Hazards 2021, which does not require consent from the planning authority. Approval for Category 1 works under the SEPP Resilience and Hazards 2021 is being sought for the client as part of the proposed future bulk earthworks scope for the site.

The following information will also be provided to the planning consent authority, 14 days prior to the commencement of remediation works:

- Copies of the contamination assessment report and this RAP; and
- Contact details of the contractor appointed to undertake the remediation works; and
- Contact details of the parties responsible (if not the remediation contractor) for ensuring remediation works comply with relevant regulatory requirements.

The Principal Contractor will need to obtain specific related approvals as necessary to implement the works. A notification will be submitted to SafeWork NSW at least 5 days in advance to undertaking any asbestos removal works. The removal works will be undertaken by a suitably licensed contractor.

It should be noted that:

- Removal of friable asbestos will require the contractor to hold a Class A licence; and
- Removal of non-friable asbestos will require the contractor to hold a Class B licence.

Within one month of completion of remediation and validation works, a notification will be submitted to the planning consent authority.

10.4.2 Existing Trees

Remedial works will be carried out, up to the boundary of tree protection zones, or where root systems are encountered, whichever occurs first. Where contamination is found to extend within the TPZ, further management will be required as part of future works completed under Category 1 approvals during the bulk earthwork stage for the project.

The north-east portion of site associated with the childcare centre is mapped as an environmental conservation zone (refer to **figure 2**), no works will be undertaken within this area as part of the Category 2 remedial works. The required investigatory and remedial scopes within the environmental conservation zone will be completed under the appropriate approvals as part of the future Category 1 works proposed during bulk earthworks. Land Identified on the Biodiversity Values Mapping will remain undisturbed as part of the Category 2 remedial works.

10.4.3 Phase 1 Hold Point

No Phase 3 work in any part of the Site is to occur until the environmental consultant has advised the Site Auditor in writing that all other Phase 1 early work has been completed, and the Site Auditor has reviewed and approved the Phase 1 documentation and issued a written approval for Phase 3 work to proceed.

10.5 Phase 2: Further Investigation of Groundwater and Land Fill Gas (AEC06 and AEC07)

AEC06: A supplementary contamination assessment will be undertaken within AEC06 to determine whether migration of off-site hazardous ground gases are migrating onsite requiring further management. Two ground gas monitoring wells will be installed within the southern portion of the site and will undergo a gas monitoring event to determine whether further management is required.

AEC07: A supplementary contamination assessment will be undertaken to address AEC07 and determine whether migration of contaminants associated with off-site industrial activities are migrating onsite requiring further management. The existing eight groundwater monitoring wells will undergo a groundwater monitoring event as part of the supplementary assessment.

Section 8.7.3 and **8.7.4** detail the requirements for investigation of ground water and land fill gas at the site.

10.5.1 Phase 2 Hold Point

Phase 3 works are not to commence until the following occur:

- The environmental consultant has issued a contamination assessment report prepared in accordance with EPA guidance documenting the LFG investigation and assessment;
- In the event that LFG concentrations exceed the site assessment criteria, the investigation will also need to determine the risk that LFG poses to the proposed development and detail any remedial measures required.

10.6 Phase 3: Demolition and Supplementary Contamination Assessment within AEC01a, AEC01, AEC03, AEC04 and AEC05.

10.6.1 Demolition Works

With the exception of the childcare centre in the north-east of site, the demolition scope for site is complete. A pre-demolition hazardous building materials survey was undertaken for the site by EGA (2024b). The identified asbestos containing materials were removed by a licensed asbestos removal contractor across 2024 and 2025. Following removal of identified asbestos containing building materials, the structures were inspected by an occupational hygienist to confirm the removal of hazardous building materials prior to demolition. A demolition completion letter was prepared by EGA in 2025 detailing the assessment, removal and clearance of asbestos containing building materials from on-site structures prior to demolition.

Portions of site remain covered by hard stand and asphalt, following completion of demolition works in these areas the underlying soils will be subject to assessment.

All demolition works to be completed in accordance with the site CEMP and the requirements set out in section 13 of the RAP. Structures to be visually assessed for hazardous building materials prior to demolition and following removal of hazardous building materials prior to demolition. Residual surface soils within the footprint of all structure and hardstand areas to be visually assessed following the completion of demolition works.

10.6.2 Supplementary Contamination Assessment

AEC01a: A supplementary contamination assessment will be undertaken within AEC01a, within the previously identified lead, cadmium and zinc area to determine whether asbestos is also a contaminant of concern associated with AEC01a requiring additional controls and assessment during the remediation and validation scope of works.

AEC01: Delineation of the friable asbestos soils previously identified at sampling point 'EBH1' within AEC01. Four test pits to be advance north, south, east and west of 'EBH1' with 500ml soil samples collected from 0.5 m bsgl and submitted for quantitative asbestos analysis (WA DOH 0.001%). In the event friable asbestos impacts are identified beyond the soils immediately adjacent 'EBH1' (5 m x 5 m) further sampling should be undertaken to fully characterise the lateral extents of the impacts.

AEC03: The assessment of previously inaccessible fill materials within AEC03 is largely complete. At the time of the previous assessments within AEC03 approximately 9,300 m^2 remained covered by hard stand and will require assessment prior to the commencement of remediation in these areas. Nineteen test pits will be advanced across the hardstand footprints as part of the supplementary assessment.

AEC04: A supplementary contamination assessment will be undertaken within AEC04, within the footprint of the previously decommissioned and removed underground storage tanks (UST). Six boreholes will be advanced within the vicinity of AEC04 with two extended to depth of groundwater as part of the supplementary assessment. Soil materials up to 4 m bgsl and groundwater will be assessed in the vicinity of the current extent of AEC04 to determine whether any residual contamination presides within the AEC as a result of the former UST.

AEC05: The assessment of previously inaccessible fill materials beneath on-site structures (AEC05) is largely complete. At the time of writing approximately 6,500 m^2 of AEC05 associated with asphalt carparking and the childcare centre remained covered by hard stand and will require assessment prior to the commencement of remediation in these areas. Seventeen test pits will be advanced across the hardstand footprints as part of the supplementary assessment.

Pending the results of the supplementary assessment, further remediation areas may be identified and remediated under an unexpected finds protocol or may be outlined within an additional addendum letter.

10.6.3 Phase 3 Hold Point

Phase 4 work in the conservation area surrounding the child care centre will not occur until:

- The environmental consultant has issued a Demolition and Contamination Assessment report prepared in accordance with EPA guidance documenting the demolition work and investigation of soil contamination under the building footprint of the former childcare centre. In the event that contamination is found to exceed the site assessment criteria, the report will need to detail any remedial measures required; and

- The Site Auditor has reviewed and issued a written approval of the Demolition and Contamination Assessment report and issued a written approval for Phase 4 work to proceed.

10.7 Phase 4: Remediation of Asbestos Contamination

Following the supplementary contamination assessment of AEC01a, AEC04, AEC05, AEC06 and AEC07, the remediation areas for known asbestos contamination identified within AEC01, AEC02, AEC03 and AEC05 will need to be marked out by the Environmental Consultant in conjunction with the Remediation Contractor.

10.7.1 Stockpile Non-Friable Asbestos Impacted Fill Materials

Non-friable asbestos impacted soils encountered within AEC05 during completion of the demolition scope for site across 2024 and 2025 were partially remediated to facilitate continuation of the works in those areas. These partial remediation works generated approximately 7,626 m^3 of non-friable asbestos impacted spoil which is stockpiled on site atop a geofabric layer throughout the north and south of site. As these materials were excavated and stockpiled prior to the completion of supplementary assessment works within AEC05 they cannot be considered characterised, as such sampling will be required to confirm their suitability for treatment and re-use on-site.

Non-friable asbestos impacted soils associated with AEC02 were partially excavated during construction of a sediment basin in the south of site. These partial remediation works generated approximately 4,156 m^3 of non-friable asbestos impacted spoil which is stockpiled on site atop a geofabric layer.

Stockpiled soils are catalogued in **Table 10.7.1** and illustrated within **Figure 6**, movement of these materials must be tracked from cradle to grave in accordance with the materials tracking plan.

Table 10.7.1 Stockpiled Asbestos Soils Associated with AEC02 and AEC05

Stockpile ID	Figure	Approximate Estimated Volume (m^3)
AEC02		
AEC02-SP01	Figure 8	3,164
AEC02-SP02	Figure 8	992
AEC05		
AEC05-SP01	Figure 8	600
AEC05-SP02	Figure 8	98
AEC05-SP03	Figure 8	105
AEC05-SP04	Figure 8	275
AEC05-SP05	Figure 8	5,010
AEC05-SP06	Figure 10	70
AEC05-SP07	Figure 10	140
AEC05-SP08	Figure 10	70
AEC05-SP09	Figure 10	130
AEC05-SP10	Figure 10	25

Stockpile ID	Figure	Approximate Estimated Volume (m^3)
AEC05-SP11	Figure 10	40
AEC05-SP12	Figure 10	415
AEC05-SP13	Figure 10	265
AEC05-SP14	Figure 10	80
AEC05-SP15	Figure 10	3
AEC05-SP16	Figure 10	60
AEC05-SP17	Figure 10	215
AEC05-SP18	Figure 10	25

The stockpiled soil materials will be relocated to a designated treatment area for remediation ex-situ prior to re-use onsite at depth. Soils will be treated in batches of 10 to 30 m^3, soil materials will be spread out to a thickness of approximately 100 mm on a designated 'treatment pad'. The soil materials will then be raked, and any fragments of presumed asbestos picked by a suitably appropriate asbestos removalist. The licensed asbestos removalist will traverse the raked material in a systematic grid-based pattern removing fragments of bonded ACM by hand. At least two passes of raking and picking will be undertaken, with a 90° direction change between each pass.

The raked materials will be subject to a visual inspection by the supervising environmental consultant, only once all visible fibre cement fragments have been removed will soils be re-stockpiled for the purpose of validation sampling.

Following treatment and removal of all visible asbestos fibre cement fragments, the soil materials will then be stockpiled in 30 m^3 volumes and re-assessed against the adopted site assessment criteria. A visual inspection of the stockpiles and validation samples submitted for quantitative asbestos analysis (0.001 %) will need to be collected from the treated soil material stockpiles (one sample per 10-30 m^3 stockpile). If the materials meet the adopted site assessment criteria, the soil materials will be retained onsite. The soil materials will be buried beneath proposed roadways or within open space parkland areas planned for the site.

Until the receipt of validation results confirming suitability for re-use within the site, stockpiled treated materials are not to be mix or consolidated.

In the event that soil materials exceed the adopted site assessment criteria, a waste classification based on NSW EPA Waste Classification Guidelines 2014 must be prepared for disposal offsite to a licensed waste receiving facility.

Following removal/treatment of impacted materials, validation sampling (per **Section 11**) is to be undertaken.

10.7.2 Friable Asbestos Impacted Fill Materials

Friable asbestos was previously identified within two sampling locations within AEC02 identified as 'EBH24' and 'EBH25'. The soils associated with these locations were excavated and disposed off-site prior to validation sampling and require no further works in regards to the friable asbestos hazard (refer to **Section 4.9.2**).

Friable asbestos was previously identified within six sampling locations within AEC01 identified as 'EBH1', 'EBH2', 'EBH3', 'EBH5', 'SS10' and 'BH39'. Five of these locations 'EBH2', 'EBH3', 'EBH5', 'SS10' and 'BH39' were excavated and disposed off-site prior to validation sampling and require no further works in regards to the friable asbestos hazard (refer to **Section 4.9.1**).

Prior to remediation, the lateral extent of friable asbestos impacts associated with sampling location 'EBH1' should be delineated with sampling to the north, south, east and west.

The soil materials will be excavated and disposed off-site to a licensed waste receiving facility in line with the NSW EPA Waste Classification Guidelines 2014.

A SafeWork NSW Licensed Asbestos Assessor will need to inspect the residual soil surface of the excavation no later than 5 days following the completion of works and provide a visual clearance certificate of the excavation footprint. The soils within the surrounding area (10 m) are to remain undisturbed until the results of the validation sampling have been returned and the clearance report prepared.

Validation samples will need to be collected from the base of the excavation footprint and analysed for quantitative asbestos analysis (0.001 %) to confirm the removal of asbestos containing materials. If asbestos is observed or detected within the samples submitted, additional scraping of the ground surface and additional validation samples will need to be collected until no asbestos remains across the remediation area.

Following removal of impacted materials, validation sampling (per **Section 11**) is to be undertaken.

Should spoil generated during remediation of 'EBH1' need to be temporarily stockpiled within the site prior to load out, the following controls must be in place to mitigate the risk of cross contamination:

- Plant carrying out the transport must be underloaded and covered to avoid spills;
- Spoils to be temporarily stockpiled atop a geofabric layer and must not exceed a height of 2 m. Stockpiles will be covered with geofabric at all times, Geofabric to be suitably secured against strong winds and inspected regularly by the supervising environmental consultant;
- Following relocation or load out, stockpiled soils to be over excavated so that the soils within the footprint of the stockpile are removed 100 mm bsgl;
- Visual inspection of the stockpile footprint and transit routes following relocation or load out of stockpiled to be prepared by the supervising environmental consultant.

10.7.3 AEC01, AEC02, AEC03 and AEC05 – Non-Friable Asbestos Impacted Fill Materials

With the exception of soils surrounding 'EBH1' fill materials within AEC01, AEC02, AEC03 and AEC05 are impacted with non-friable asbestos and require remediation prior to re-use within site at depth. The fill materials should be excavated using an excavator, or similar, to the depth of impact outlined in **Table 10.1.1.**

EGA understands that the asbestos contamination is likely to be limited to fill clayey sand materials overlying fill CLAY materials.

In-situ fill materials will be excavated vertically to the depth of the previously identified asbestos impacts, or beyond the extend of observed fibre cement fragments if encountered passed this point. Spoil will be loaded directly into trucks and relocated to a designated treated area for remediation ex-situ prior to re-use onsite at depth. Soils will be treated in batches of 10 to 30 m^3, soil materials will be spread out to a thickness of approximately 100 mm on a designated 'treatment pad'. The soil materials will then be raked, and any fragments of presumed asbestos picked by a suitably appropriate asbestos removalist. The licensed asbestos removalist will traverse the raked material in a systematic grid-based pattern removing fragments of bonded ACM by hand. At least two passes of raking and picking will be undertaken, with a 90° direction change between each pass.

The raked materials will be subject to a visual inspection by the supervising environmental consultant, only once all visible fibre cement fragments have been removed will soils be re-stockpiled for the purpose of validation sampling.

Following treatment and removal of all visible asbestos fibre cement fragments, the soil materials will then be stockpiled in 30 m^3 volumes and re-assessed against the adopted site assessment criteria. A visual inspection of the stockpiles and validation samples submitted for quantitative asbestos analysis (0.001 %) will need to be collected from the treated soil material stockpiles (one sample per 10-30 m^3 stockpile). If the materials meet the adopted site assessment criteria, the soil materials will be retained

onsite. The soil materials will be buried beneath proposed roadways or within open space parkland areas planned for the site.

Until the receipt of validation results confirming suitability for re-use within the site, stockpiled treated materials are not to be mix or consolidated.

In the event that soil materials exceed the adopted site assessment criteria, a waste classification based on NSW EPA Waste Classification Guidelines 2014 must be prepared for disposal offsite to a licensed waste receiving facility.

Following removal/treatment of impacted materials, validation sampling (per **Section 12**) is to be undertaken. A competent person will need to inspect the residual soil surface of the excavation no later than 5 days following the completion of works and provide a visual clearance certificate of the excavation footprint. The soils within the surrounding area (10 m) are to remain undisturbed until the results of the validation sampling have been returned and the clearance report prepared

All materials must be tracked from cradle to grave in accordance with the materials tracking plan.

10.7.4 Other Types of Contamination and Unexpected Finds

Should results from the supplementary contamination assessment indicate the need for further assessment or remediation, the environmental consultant would decide if treatment under the unexpected finds protocol is sufficient or if there is a need to develop an addendum letter to report on site specific methodologies to remediate the newly identified AEC. The decision will be based on the extent of impact, access constraints, and any other observations.

During Phase 3 or Phase 4 works other types of contamination that are known or suspected of being present at the Site may be encountered, including but not limited to the following:

- Contaminated soil across the former hardstand areas or building footprints;
- Redundant septic tanks associated with the past rural use of the Site that may contain pathogens, asbestos, chemical residues, other hazardous building materials and waste;
- Asbestos fibre cement conduits associated with redundant services; and
- USTs that were not removed in the western part of the Site together with associated petroleum hydrocarbon contamination.

Table 9.6.1 outlines the preferred remedial options for addressing new contamination finds. Should a vapour intrusion risk associated with the former underground storage tanks in the south-west of site be identified an addendum to the Remedial Action Plan will be required detailing an assessment of the risks in addition a discussion on the most suitable management strategies.

Soils impacted by friable asbestos above the adopted site criteria or identified to present a human health risk will be excavated, subject to waste classification and disposed off site to a licensed waste receiving facility.

Soils identified to be ecologically unsuitable will be excavated and re-used on site beneath roadways or within residential lots at depths greater than 2m.

Redundant asbestos fibre cement conduits will be carefully exposed using a hydraulic excavator and removed in 2 m section by hand, separating section at the joins. Sections to be wrapped in two layers of polyethylene sheeting (200 µm thickness) prior to disposed off-site as asbestos waste. If the soils surrounding the conduit removal area are observed to be impacted with debris by the supervising environmental conduit, the impacted materials should be remediated in-line with **section 11.7.3**.

Redundant septic tanks if encountered will be removed in line with the following sequence of works:

- The tank will be exposed by careful excavation and examined for potential leaks and general condition by the supervising Environmental Consultant;
- Prior to the removal of the tank, any residual product (liquid or solids) will be removed from the tank and disposed of appropriately;
- The tank will be removed and the structures disposed of by a qualified contractor. Disposal records will be provided to an Environmental Consultant for inclusion in a validation report; and
- All associated infrastructure (i.e. the remnants including lines, respiration pits etc.) will be removed and disposed in a similar manner, if present.
- If evidence of leaks is observed in the tank and / or tank pit then excavate and stockpile impacted materials for waste classification prior to off-site disposal.

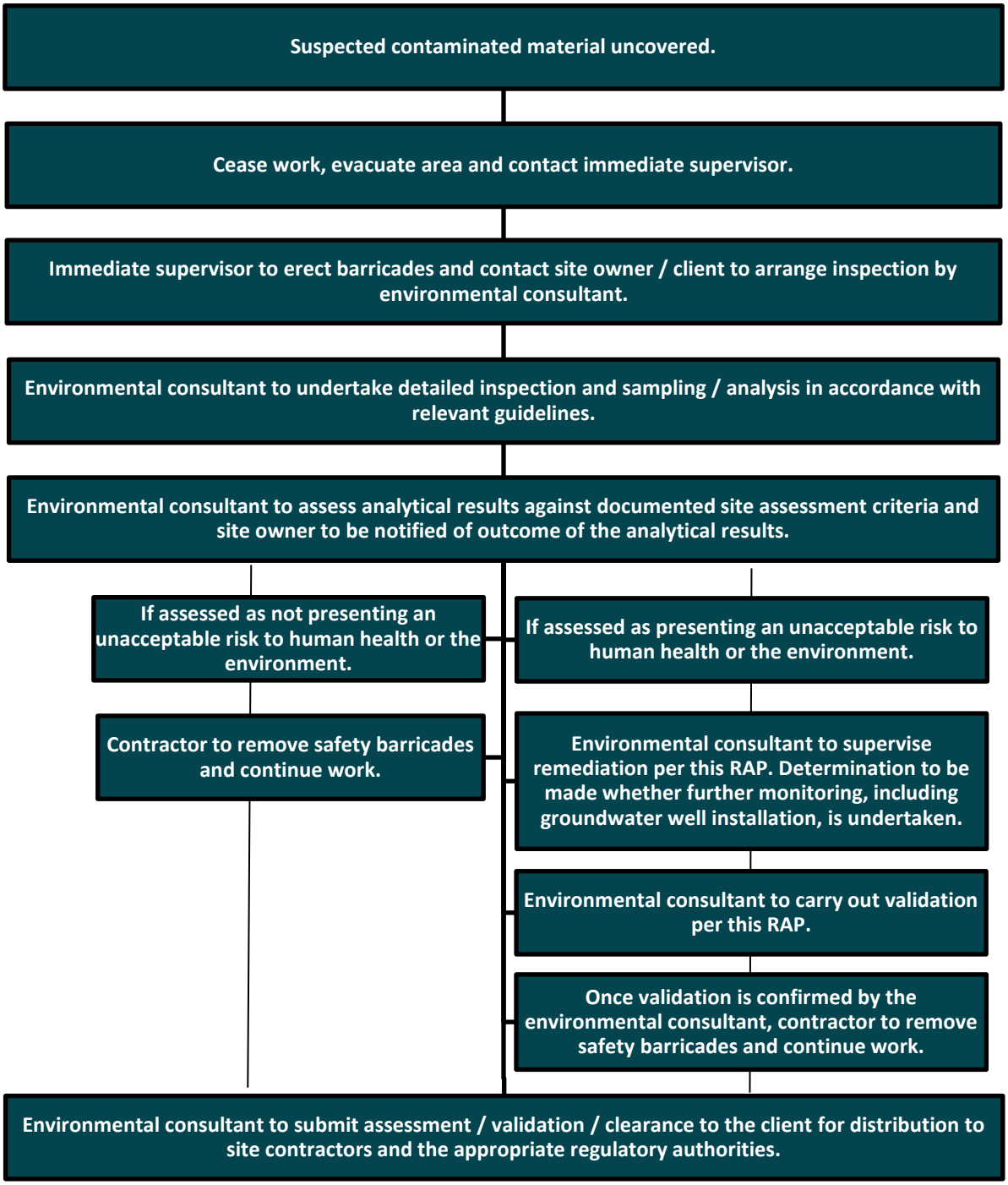
Movement of all materials within site must be tracked from cradle to grave in accordance with the materials tracking plan.

Site work may find contamination and buried materials not anticipated and addressed by the conceptual Site Model (CSM), which are referred to as Unexpected Finds. Prior to bulk earthworks starting at the site, all workers are to be advised of the potential presently unknown contamination which they may come across. Presently unknown contamination may include:

- Other USTs not recorded in the available historical information;
- Buried containers and drums; and
- Powders and other suspicious buried material.

In the event that any material suspected of containing potentially hazardous substances is found during remediation works, the following Unexpected Finds Protocol is to be followed:

Unexpected Finds Protocol



10.7.5 Decommissioning Asbestos Treatment Area

Following the completion of the treatment scope for the site, and after placement of temporarily stockpiled treated soils the designated area will require remediation to manage the residual asbestos risk from the treatment process.

Remediation of the treatment area will comprise of a scrape covering the entire treatment area footprint, extending vertically 100 mm bsgl. Spoil generated from the scrape will be stockpiled in 30 m^3 volumes within the treatment area footprint and re-assessed against the adopted site assessment criteria. Validation samples submitted for quantitative asbestos analysis (0.001 %) will need to be collected from the soil material stockpiles. If the materials meet the adopted site assessment criteria, the soil materials will be re-used on site at depth. The soil materials will be buried beneath proposed roadways or within open spaces planned for the site.

Stockpiles will be over excavated 100 mm into the underlying soils during relocation to ensure no residual soil remains within the treatment area.

The soil surface of the treatment area will be subject to a systematic grid based inspection and validation sampling in line with section 11.7.2.

10.7.6 Remediation Contingencies

Should validation samples / observations on-site indicate further contamination, additional remediation will be required. The additional vertical and lateral extents will be determined by the environmental consultant in attendance. Generally, a further 0.2-0.3 m of depth to be excavated vertically and 0.2-0.3 m of additional lateral excavation is considered reasonable prior to additional validation sampling. Following further removal of material, additional validation samples will be taken. This will be continued until validation samples meet the validation criteria.

Should spoil generated during remediation need to be temporarily stockpiled prior to disposal off site, the following controls must be in place to mitigate the risk of cross contamination:

- Plant carrying out the transport must be underloaded and covered to avoid spills;
- Spoils to be temporarily stockpiled atop a geofabric layer and must not exceed a height of 2 m. Stockpiles will be covered with geofabric at all times, Geofabric to be suitably secured against strong winds and inspected regularly by the supervising environmental consultant;
- Following relocation or load out, stockpiled soils to be over excavated so that the soils within the footprint of the stockpile are removed 100 mm bsgl; and
- Visual inspection of the stockpile footprint and transit routes following relocation or load out of stockpiled to be prepared with the supervising environmental consultant.

Following removal/treatment of impacted materials, validation sampling (per **Section 11**) is to be undertaken.

10.7.7 Phase 4 Hold Point

No phase 5 work is to occur in the particular Development Stage until:

- All asbestos impacted fill in the particular Development Stage has been removed and the remaining soils validated as meeting the asbestos Remediation Acceptance Criteria. This work need to be documented by the Environmental Consultant in an interim report; and

- The Site Auditor has reviewed and approved the Phase 4 interim report; and

- All phase 4 work in the particular Development Stage has been completed and the Site Auditor has issued a written approval for phase 5 work to proceed in the particular Development Stage where contaminated soil has been removed.

10.8 Phase 5: Management of contamination risks during bulk earthworks

There is a high likelihood that isolated asbestos fragments will be found in fill not located in designated remediation areas. To manage the safe removal of these fragments the procedures outlined below must be followed.

10.8.1 Phase 5.1 Excavate Remaining Soils to Final Excavation Level

All site workers are to attend regular toolbox meeting where the likelihood of isolated fragments of bonded asbestos being found in fill outside designated remediation areas is discussed along with the procedures that need to be taken by workers to dealing with such fragments.

In the event asbestos impacted fill materials are encountered, works are to stop and the unexpected finds protocol implemented.

Full time supervision of bulk earthworks will be required by an environmental consultant in order to maintain detailed records on the following:

- Condition of the soils encountered during bulk earthworks;
- Excavation procedures used during works;
- Types of machinery used to transport soils within site;
- Condition of stockpiled soils;
- Condition of geofabric layers and their fixtures;
- Document environmental procedures, their maintenance and efficacy;
- Copies of field records and photos for works completed;
- Documentation of the materials tracking procedures employed by the civil contractor;
- Documentation of the variation and thickness of fill types throughout the site;
- Monitor transport of materials by a contractor licensed to transport the waste; and
- Monitor transit routes and assessment of cross contamination risks.

Placement/re-use of treated soils at depth is not to occur in the particular Development Stage until:

- All Phase 5.1 work has been completed in the particular Development Stage;
- The Environmental Consultant has prepared an interim report on the Phase 4 works and concluded that no contamination remains in the particular Development Stage exceeding Remediation Acceptance Criteria; and
- The Site Auditor has inspected all final excavation surfaces in a particular Development Stage and issued a written approval for placement / re-use work to proceed in the particular Development Stage.

10.8.2 Phase 5.2 Placement / Re-use of Treated soils On-site at Depth

While the treated soils may be re-used within site based on the ACM concentration in the validation samples being less than the adopted land use criteria, ACM may still be present within the treated soil materials. As such, these soils must be re-used at depths within site which ensure they will not be disturbed and potentially left exposed as part of reasonable future land use scenarios. The following position has been adopted for these activities:

- Treated soils will not be re-used within residential lots;
- Treated soils will not be placed within the proposed alignment of services deeper than 2.5 m bsgl;
- No deep footings are proposed as part of the designs within open space parkland areas;
- EGA considers it reasonable to assume that any landscaping or tree removal activities within the future parkland areas is unlikely to disturb soils deeper than 1 m bsgl; and
- EGA considers it reasonable to assume that any disturbances to the soils within the proposed roadway corridors will be limited to maintenance of services.

EGA considers these assumptions to be sufficiently conservative, in the context of the potential risk that asbestos may remain within the soil materials following treatment. As such, the following conditions will be applied to the re-use of treated materials within the site:

- Treated soils will not be placed in the alignment of services deeper than 2.5 m bsgl;
- Re-use of treated materials within proposed road corridors will be limited to depths 0.5 m below the deepest expected service;
- Re-use of treated materials within open space parkland portions of the site will be limited to depths 0.5 m below the deepest expected service or 1.0 m bsgl whichever is greater; and
- No further excavation or bulk earthworks are to occur following the completion of placement works within a given development stage.

10.8.3 Phase 5.3 Import VENM or ENM Soil to Fill Areas

Material proposed to be imported to site as engineered fill, will be limited to materials certified as:

- Virgin Excavated Natural Material (VENM); or
- Excavated Natural Material (ENM).

VENM certification will be undertaken with reference to NSW EPA (2022). ENM certification will be undertaken with reference to NSW EPA Excavated Natural Material Exemption (2014).

All waste classification reports for proposed fill to be imported to the site are to be formally reviewed by the environmental consultant prior to importation to the site.

The remediation contractor will maintain detailed records of all fill imported to the site, including details of the supplier, the source of the fill, the quantities of the fill, vehicle registration numbers and the dates/times the fill was received on site.

The remediation contractor will inspect every load of material imported to site, to check the material is consistent with the material described in the VENM/ENM certification and each load is free of visual anthropogenic materials, staining or odours. The remediation contractor will maintain a documented record of each inspection.

The Protocol for import of VENM and ENM is to be as follows:

- VENM / ENM soil is to be tested, validated and documented in accordance with EPA guidance, with copies of this documented to be included in validation reports;
- Only VENM / ENM soil approved in writing by the environmental consultant is to be imported to the Site;
- All VENM / ENM imported to the Site is to be tracked from source to Site;
- The Contractor is to ensure that only approved trucks are used to import VENM / ENM soil to the Site;
- All VENM / ENM soil is to be inspected upon delivery to the Site by the Contractor. Any materials that are suspected of being contaminated or are inconsistent with EPA standards for VENM / ENM are to be rejected by the Contractor and are to be removed from the Site; and
- The Environmental Consultant is to validate VENM / ENM soil imported to the Site.

10.8.4 Phase 5.4 Final Surface Soil Inspection

Following the completion of bulk earthworks, the soil surface of the final finish level must be visually inspected by a competent person and an asbestos materials clearance inspection report prepared for inclusion in the validation reporting for that development stage.

The following methodology will be utilised for the visual clearance of residual soil surfaces:

- Subject area and immediate surroundings visually inspected for suspected asbestos containing materials, comprising systematic grid-based walkover with 2 m lane spacing; and
- Subject area photographed.

11 REMEDIATION AND VALIDATION DATA QUALITY OBJECTIVES

Appendix B of NEPM ASC 2013 provides guidance on the development of data quality objectives (DQO) using a seven-step process. In line with AG (2022), the following DQO for this project are set out in **Sections 11.1** to **11.7** of this report.

11.1 Step 1: State the problem

The first step involves summarising the contamination problem that will require new data and identifying the resources available to resolve the problem.

The objective of this project is to assess whether the remedial goal has been achieved, and whether the site presents an unacceptable human health exposure risk, for the proposed land use setting.

This project is being undertaken because:

- The site is the subject of redevelopment works comprising subdivision for residual land use; and
- Historically identified areas of environmental concern on the site, have the potential to present an unacceptable human health risk in the context of the proposed land use setting.

The project team identified for this project includes Environmental Group Australia Pty Ltd, and the client.

The regulatory authorities identified for this investigation include NSW EPA and the Local Council.

11.2 Step 2: Identify the decision/goal of the study

The second step involves identifying decisions that need to be made about the contamination problem and the new environmental data required to make them.

The decisions that need to be made during this investigation include:

- Is the sampling adequate to determine the risk of contamination at the site, including any potential offsite migration?
- If the data does not provide enough information, what data gaps require closure to enable the suitability of the site to be determined, or selection and design of an appropriate remedial strategy.

11.3 Step 3: Identify the information inputs

The third step involves identifying the information needed to support decisions and whether new environmental data will be needed.

The inputs required to make the decisions set out in **Section 11.2** for this investigation, will include:

- Data obtained in previous contamination assessments and the proposed development plans;
- Understanding of the current site use and historic activities that have occurred;
- Geological and hydrogeological data relevant to the area, including physiochemical parameters for calculating ecological criteria;
- Site observations for the presence of visual/olfactory contamination indicators;
- Contaminant concentrations in soil at the site indicating the distribution of contaminants; and
- Further input to the decision will be sample collection and handling, field and laboratory QAQC and confirmation that data quality indicators (DQIs) were achieved.
- Survey dimensions of remediated areas and stockpiled quantities;
- Documentation tracking excavation of contaminated materials from cradle-to-grave (e.g. stockpile movements, trucking records, waste disposal records); and
- Assessment criteria are provided in **Section 6**.

11.4 Step 4: Define the boundaries of the study

The fourth step involves specifying the spatial and temporal aspects of the environmental media that the data must represent to support decisions.

The spatial extent of the project will be limited to the site as defined by its boundaries.

The temporal boundaries of the project include:

- The 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 on to site from off-site sources;
- The project timeframes by EGA for this project, and subsequent remediation contractor works program;
- Unacceptable weather conditions at the time of undertaking fieldwork, including rainfall, cold and/or heat;
- Access availability of the site (to be defined by the site owner/representative); and
- Availability of EGA field staff (typically normal daylight working hours, Monday to Friday).

The lateral extent that contamination is expected to be distributed across, based on the conceptual site model, is defined by the inferred boundaries of the areas of environmental concern (AEC) and may be altered based on the data collected during the supplementary contamination assessment.

The vertical extent that contamination is expected to be distributed across, based on the conceptual site model, is defined by the inferred boundaries of the previously identified areas of environmental concern (AEC) and may be altered based on the data collected during the supplementary contamination assessment.

The scale of the decisions required will be based on the entire site.

Constraints which may affect the carrying out of this investigation may include access limitations, presence of above and below ground infrastructure, and hazards creating health and safety risks.

11.5 Step 5: Develop the analytical approach (or decision rule)

The fifth step involves defining the parameter of interest, specifying the action level, and integrating information from Steps 1 to 4 into a single statement that gives a logical basis for choosing between alternative actions.

11.5.1 Rinsate Blanks

One rinsate blank will be collected and scheduled for analysis, for each day of sampling undertaken, if non-disposable sampling equipment was used on that day. The rinsate blank will be analysed for the analytes the sample/s collected that day are being scheduled for analysis for (with the exception of asbestos).

For the purpose of waste classification assessment, collection / analysis of rinsate blank samples will not be required.

11.5.2 Trip Spikes and Trip Blank Samples

One trip spike and trip blank sample will be used and scheduled for analysis, for each day of sampling undertaken, if site samples being collected that day are being analysed for volatile contaminants of concern (typically BTEX and/or TRH C_6-C_{10}).

For the purpose of waste classification assessment, collection / analysis of trip spike/blank samples will not be required.

11.5.3 Intra-Laboratory and Inter-Laboratory Duplicates

Intra-laboratory and inter-laboratory field duplicates will be collected at a rate of one per twenty (5 %) site samples collected. The duplicates collected will be analysed for the analytes that the parent sample of the duplicate/triplicate is being scheduled for analysis for (with the exception of asbestos).

The relevant percent difference (RPD) of concentrations of relevant analytes, between the parent sample and the duplicate will be calculated.

11.5.4 Laboratory Analysis Quality Assurance / Quality Control

The analytical laboratory QA/QC program will typically include laboratory method blank samples, matrix spike samples, surrogate spike samples, laboratory control samples, and laboratory duplicate samples.

11.5.5 If/Then Decision Rules

EGA has adopted the following 'if/then' decision rules for this investigation:

- If the result of the assessment of field data and laboratory analytical data is considered acceptable, then that field data and laboratory analytical data is suitable for interpretation within the scope of this investigation; and
- If the field data and laboratory analytical data is within the constraints of the assessment criteria adopted for this investigation (refer **Section 11.3**), then the contamination exposure risks to identified receptors, are considered acceptable.

In the event the assessment of field data and/or laboratory analytical data results in the data being not suitable for interpretation, then EGA will determine if additional data is required to allow interpretation to be undertaken.

In the event that field data and/or laboratory analytical data exceeds the assessment criteria adopted for this investigation (refer **Section 11.2**), EGA will undertake an assessment of the exceedance in the context of the project objectives to determine if additional data is required and whether management and/or remediation is required.

11.6 Step 6: Specify the performance or acceptance criteria

The sixth step involves specifying the decision maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data. When assessing contaminated land, there are generally two types of errors in decision making:

- Contamination exposure risks for a specific land use setting are acceptable, when they are not; and
- Contamination exposure risks for a specific land use setting are not acceptable, when they are.

EGA will mitigate the risk of decision error by:

- Calculation of the 95 % upper confidence limit (UCL) statistic to assess the mean concentration of relevant contaminants of potential concern (excluding asbestos);
- Assignment of fieldwork tasks to suitably experienced EGA consulting staff, and suitably experienced contractors;
- Assignment of laboratory analytical tasks to reputable NATA accredited laboratories; and
- Assignment of data interpretation tasks to suitably experienced EGA consulting staff, and outsourcing to technical experts where required.

EGA will also adopt a range of data quality indicators (DQI) to facilitate assessment of the completeness, comparability, representativeness, precision and accuracy (bias).

Table 11.6.1 Performance and Acceptance Criteria Summary

Completeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Critical locations sampled	Refer **Section 11.4**	Critical samples analysed according to DQO	Refer **Section 11.7.8**
Critical samples collected	Refer **Section 11.4**	Analytes analysed according to DQO	Refer **Section 11.7.8**
SOPs appropriate and complied with	100%	Appropriate laboratory analytical methods and LORs	Refer **Section 11.7.8**
Field documentation complete	All sampling point logs, calibration logs and chain of custody forms	Sample documentation complete	All sample receipt advices, all certificates of analysis
Sample Holding Times	Laboratory holding times provided by laboratory	Sample extraction and holding times complied with	Refer **Section 11.7.8**
Comparability			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Same SOPs used on each occasion	100%	Same analytical methods used by primary laboratory	Refer **Section 11.7.8**
Climatic conditions	Samples stored in 500ml zip-lock bags	Same LORs at primary laboratory	Refer **Section 11.7.8**
Same types of samples collected, and handled/preserved in same manner	All soil samples same size, all stored in 500ml zip-lock bags	Same laboratory for primary sample analysis	All primary samples to Eurofins | Environmental Testing
Analytical measurement units consistent	All measurement units the same between same analytes	Same analytical measurement units	Refer **Section 11.7.8**
Representativeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Appropriate media sampled according to SAQP	Refer **Section 11.4**	Samples analysed according to SAQP	Refer **Section 11.7.8**
Media identified in SAQP sampled	Refer **Section 11.4**	Nil	Nil
Precision			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Field duplicate / triplicate RPD (Metals & PAH only)	Minimum 5% duplicates and triplicates No limit for analytical results <10 times LOR 50% for analytical results 10-20 times LOR 30% for analytical results >20 times LOR	Laboratory duplicates	No exceedances of laboratory acceptance criteria
SOPs appropriate and complied with	100%	Nil	Nil
Accuracy (bias)			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Rinsate blanks	Analyte concentration <LOR. None collected for asbestos.		No exceedances of acceptance criteria

Field trip spikes (BTEX only)	Recoveries between 60% and 140%	Matrix spike recovery	No exceedances of acceptance criteria
Field trip blanks (BTEX only)	Analyte concentration <LOR None collected for asbestos.	Surrogate spike recovery	No exceedances of acceptance criteria

11.7 Step 7: Develop the Plan for Obtaining Data

The seventh step involves identifying the most resource effective sampling and analysis design for generating the data that is required to satisfy the DQOs.

11.7.1 Remediation Monitoring Records

A daily record is to be maintained by the remediation contractor and supervising environmental consultant detailing daily remedial activities, estimated treatment quantities, and all bulk soil movements.

11.7.2 Validation Sampling

Validation should focus on collecting clear evidence to assess whether the key objectives have been met. Validation sampling programs should identify and delineate the lateral and vertical extent of contamination (if any) and arrive at a scientifically defensible and statistically valid data set which characterises the chemical concentrations and human health risk present at the site.

An appropriately experienced environmental consultant should be present onsite at all stages of the remediation works, to assess the extent of remediation required to render the site suitable for the proposed development. Site observations and field screening equipment can be used to assist in decision-making in relation to:

- The location and extent of any excavations to trace contamination or whether to remove additional soil;
- Create a more focused sample collection (number and location) and laboratory analysis; and
- The need to consider (or implement) any specific health and safety measures.

A systematic validation sampling pattern will be carried out, with one soil sample collected from the floor (per 25 m^2) and one soil sample collected from each wall (per 10 linear meters) of the remedial excavation footprints.

The validation sampling arrangements for this project are presented in **Table 11.7.1** overleaf.

Table 11.7.1 Validation Methodology

AEC ID	Contamination Risk	Validation Methodology
AEC01	Friable ACM in Fill Soils	1 x 500 mL soil sample per 5 linear metres of excavation wall, with a minimum of 1 per wall and one 500 mL soil sample per 25 m^2 of excavation footprint. Photographic record of excavation footprint.
AEC01 **AEC02** **AEC03** **AEC05**	Non-friable ACM in or on Fill Soils	Treated soils: Visual inspection of treated materials prior to stockpiling in < 30 m^3. 1 x 10L sample per 30 m^3 of treated material, screened for fragments of ACM > 7mm and a subsequent 500 mL sample for quantitative asbestos analysis. Excavation footprints: Visual inspection of excavation footprint to confirm removal of fill. Following removal: 1 x 500 mL soil sample per 10 linear metres of excavation wall, with a minimum of 1 per wall and one 500 mL soil sample per 25 m^2 of excavation footprint. Photographic record of excavation. A spatial survey must be undertaken by a certified surveyor following beneficial re-use of soil materials within the placement area to confirm suitable depth of cover has been achieved (> 2 m).
Potential New or Unexpected Finds		
-	Direct Contact Risks in Soil (*if Identified)*	1 x 250 mL soil sample per 5 linear metres of excavation wall, with a minimum of 1 per wall and one 250 mL soil sample per 25 m^2 of excavation footprint. Photographic record of excavation footprint.
-	Ecological Risks in Soil (only) (*if identified*)	1 x 250 mL soil sample per 10 linear metres of excavation wall, with a minimum of 1 per wall and one 250 mL soil sample per 100 m^2 of excavation footprint. Photographic record of excavation footprint. A spatial survey must be undertaken by a certified surveyor following beneficial re-use of soil materials within the placement area.
-	Aesthetic Risks (*if identified*)	Photographic record of former aesthetic risk footprint.
-	Imported Fill (VENM/ENM)	Formal review of the waste classification report to be undertaken by the environmental consultant engaged followed by visual inspection on receipt of material to site OR 1 soil sample per 500 tonnes of imported material (minimum 3 samples) submitted for analysis of Asbestos (Bulk ID), Metals (8), BTEX, TRH, PAH, OCP and PCB.

The quantity and movement of all waste materials excavated and removed offsite with be tracked by the remedial contractor. All waste disposal dockets issued by the suitably licensed waste receiving facility will be retained by the remedial contractor for reconciliation against the material tracking records, and for inclusion in the validation report. This will demonstrate that the waste was appropriately disposed to licensed facilities.

If visual or olfactory observations indicated a potential for soil contamination to be present, then collection of additional validation samples will be considered.

11.7.3 Validation Sampling Methodology

Grab soil samples will be collected at each required sampling point directly from the base and walls of the excavation. Depending on the depth of the excavation footprint, an excavator may be required to obtain samples. In these instances, samples will be collected from soils in the centre of the excavator bucket, to avoid cross contamination from the excavator bucket.

Sampling will be guided by a combination of visual evidence (e.g. visible ACM, staining, etc), olfactory evidence (hydrocarbon odours) and field analytical instrumentation (e.g. portable PID soil headspace screening) where applicable.

Observations of the materials encountered during sampling will be recorded on the relevant field observation log with photographic record.

11.7.4 Identification, Storage and Handling of Samples

Sample identifiers will be used for each sample collected, based on the AEC, the number of samples collected and the depth/interval the sample was collected from, e.g. a sample collected from AEC01 from the excavation footprint base, would be identified as AEC01-Base.

Project samples will be stored in laboratory prepared glass jars or zip-lock bags (if collected for asbestos).

Soil samples in glass jars will be placed in insulated container/s with ice.

Samples will be transported to the relevant analytical laboratory, with chain of custody (COC) documentation that includes the following information:

- EGA project identification number
- Each sample identifier
- Date each sample was collected
- Sample type (e.g. soil or water)
- Container type/s for each sample collected
- Preservation method used for each sample (e.g. ice)
- Analytical requirements for each sample and turnaround times
- Date and time of dispatch and receipt of samples (including signatures)

11.7.5 Soil Vapour Screening

Where the contaminants of potential concern include volatiles, project soil samples will be subjected to field screening for ionisable volatile organic compounds (VOC), using a photo-ionisation detector (PID). The results of field screening will be recorded on a field sampling point log and presented in test-pit logs.

11.7.6 Decontamination

In the unlikely event that non-disposable sampling equipment is used, that equipment will be decontaminated before and in between sampling events, to mitigate potential for cross contamination between samples collected. The decontamination methodology to be adopted for this project will include:

- Washing relevant sampling equipment using potable water with a phosphate free detergent (i.e. Decon 90 or similar) mixed into the water;
- Rinsing the washed non-disposable sampling equipment with distilled or de-ionised water; and
- Air drying as required.

11.7.7 Laboratory Selection

The analytical laboratories used for this project will be NATA accredited for the analysis undertaken.

11.7.8 Laboratory Analytical Schedule

Project samples will be scheduled for NATA accredited laboratory analysis, using a combination of:

- Observations made in the field of the media sampled;

- Headspace screening results (where available); and
- The contaminants of potential concern (COPC) identified for the area of environmental concern that the sample was collected from.

Based on the site history, EGA has adopted the laboratory analytical schedule for the supplementary contamination assessment and the validation sampling. Project specific information is presented in **Table 11.7.2.**

Table 11.7.2 Laboratory Analytical Schedule (Validation Sampling)

AEC ID	Area of Environmental Concern	Analytical Schedule	Sample Quantity
AEC01	Friable and Non-Friable Asbestos Impacted Fill Soils	Quantitative Asbestos (0.001%)	Per **Section 11.7.2**
AEC02	Non-Friable Asbestos Impacted Fill Soils	Quantitative Asbestos (0.001%)	Per **Section 11.7.2**
AEC03	Non-Friable Asbestos Impacted Fill Soils	Quantitative Asbestos (0.001%)	Per **Section 11.7.2**
AEC04	Underground Storage or Petroleum-Based Product Onsite	*TBC Following receipt of the supplementary assessment*	Per **Section 11.7.2**
AEC05	Soil Materials Beneath Existing Building Footprints (unassessed)	*TBC Following receipt of the supplementary assessment*	Per **Section 11.7.2**
	Soil Materials Beneath Existing Building Footprints	Quantitative Asbestos (0.001%)	Per **Section 11.7.2**
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of the Site	*TBC Following receipt of the supplementary assessment*	Per **Section 11.7.2**
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	*TBC Following receipt of the supplementary assessment*	Per **Section 11.7.2**
Imported Fill – VENM	Imported soils (if required)	In absence of a VENM validation report, each sample will be subjected to TRH, BTEX, PAH, 8 metals, OCP and asbestos.	Per **Section 11.7.2**
Imported Fill – ENM	Imported soils (if required)	In absence of an ENM validation report, each sample will be subjected to TRH, BTEX, PAH, 8 metals, EC, pH, foreign materials and asbestos.	Per **Section 11.7.2**

11.7.9 Laboratory Holding Times, Analytical Methods and Limits of Reporting

The laboratory holding times, analytical methods and limits of reporting (LOR) being used for this project, are presented below in **Table 11.7.3** and **Table 11.7.4**

Table 11.7.3 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (Eurofins - Soil).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
Asbestos	No limit	AS4964:2004	Absence / presence
Asbestos	No limit	Inhouse Method	0.001% w/w
BTEX and TPH C_6-C_{10}	14 days	NEPM Schedule B3	0.1-20
Metals	6 months	USEPA 6010, 6020	0.1-5
TPH >C_{10}-C_{40}	14 days	NEPM Schedule B3	20-100
OCP/OPP	14 days	USEPA 8081	0.2
PAH	14 days	USEPA 8270	0.1-0.5
VOC	14 days	USEPA 8260	0.1-0.5

Table 11.7.4 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (ALS - Soil).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
Asbestos	No limit	PLM/Disp. Stain.	Absence / presence
Asbestos	No limit	WA-DER	0.001% w/w
BTEX and TPH C_6-C_{10}	14 days	USEPA 8260	0.2-0.5
Metals	6 months	USEPA 200.8/3050/6010B	0.1-3
TPH >C_{10}-C_{40}	14 days	USEPA 8270	20-100
OCP/OPP	14 days	USEPA 8270	0.1-0.2/0.2-1
PAH	14 days	USEPA 8270	0.1
VOC	14 days	USEPA 8260	0.2-0.5

11.8 Validation Sampling and Testing programs

11.8.1 Classification of Waste to be Disposed Off-site

Removal of materials from site for recycling and/or disposal, will be undertaken with reference to the relevant provisions of the Protection of the Environment Operations Act (1997) and NSW EPA Waste Classification Guidelines (2014).

If waste classification is required for site material, the following is required (as a minimum):

- Waste classification documentation;
- Material source and description;
- Sampling density, pattern, COPCs;
- Result summary, including appropriate table with comparison to acceptance criteria; and
- Waste classification.

If offsite disposal is required for site material, the following is required (as a minimum):

- Source location;
- Estimated volume (based on excavation size;
- Actual volume of disposal;
- Waste classification;
- Transporter;
- Final destination, POEO license;
- Reconciliation of waste dockets with actual disposal volume; and
- Reconciliation of actual disposal volume and the estimated volume of disposal (based on excavation size.

The remediation contractor will maintain detailed records of materials removed from the site, including date/time of removal, quantities of materials, transport company details and vehicle registration details.

The remediation contractor will retain records verifying lawful disposal of the materials, including date / time the waste left site, approximate volume per load, the classified of the waste contained in each individual load, transport vehicle registration details, weighbridge / tipping dockets with receipt dates / times and tipped waste classification from the waste receiving facility.

Material placed onsite (stockpiles or moved to other location) must be tracked so that the source of material can be identified should unexpected finds be encountered.

11.8.2 Former Building Footprints and Hardstand Areas

Following demolition of structures or hardstand areas the residual soil surface will be subject to a visual inspection by a suitable qualified and experienced environmental consultant for contamination indicators such as foreign materials, potential asbestos containing materials, staining or odours.

The following methodology will be utilised for the visual clearance of residual soil surfaces:

- Subject area and immediate surroundings visually inspected for suspected asbestos containing materials, comprising systematic grid-based walkover with 2 m lane spacing; and
- Subject area photographed.

11.8.3 Existing soil stockpiles

Following relocation of existing stockpiled soils to the designated asbestos treatment area, materials within the former stockpile footprint to be removed 100 mm bsgl. Visual asbestos clearance inspection reports of the stockpile footprint and transit routes following relocation or load out of stockpiles to be prepared by the supervising environmental consultant in line with the methodology below:

- Subject area and immediate surroundings visually inspected for suspected asbestos containing materials, comprising a systematic grid-based walkover with 2 m lane spacing;
- Subject area photographed; and
- Transit route visually inspected for suspected asbestos containing materials comprising systematic grid-based walkover with 2m lane spacing.

11.8.4 Excavations in Asbestos Remediated Areas

Following the completion of asbestos removal works, the following methodology will be utilised for the visual clearance of residual soil surfaces within the resultant excavation:

- Subject area and immediate surroundings visually inspected for suspected asbestos containing materials, comprising a systematic grid-based walkover with 2 m lane spacing;
- Subject area photographed; and
- Transit route visually inspected for suspected asbestos containing materials comprising a systematic grid-based walkover with 2m lane spacing.

A systematic validation sampling pattern will be carried out, with one soil sample (500ml) collected from the floor (per 25 m^2) and one soil sample (500ml) collected from each wall (per 10 linear meters) of the remedial excavation footprints. All samples submitted to a Nata Accredited laboratory for Quantitative Asbestos (0.001%) analysis.

11.8.5 Treated Asbestos Impacted Soil

Treated materials will be subject to a visual inspection by the supervising environmental consultant following completion of two passes of raking and picking, only once all visible fibre cement fragments have been removed will soils be re-stockpiled for the purpose of validation sampling.

Following treatment and removal of all visible asbestos fibre cement fragments, the soil materials will then be stockpiled in 30 m^3 volumes and re-assessed against the adopted site assessment criteria. One 10L soil sample per 30 m^3 of treated material will be collected and screened for fragments of ACM > 7mm in addition to a subsequent 500 mL sample submitted to a Nata Accredited laboratory for Quantitative Asbestos (0.001%) analysis.

Until the receipt of validation results confirming suitability for re-use within the site, stockpiled treated materials are not to be mix or consolidated.

In the event that soil materials exceed the adopted site assessment criteria, a waste classification based on NSW EPA Waste Classification Guidelines 2014 must be prepared for disposal offsite to a licensed waste receiving facility in line with **section 12.7.4**.

11.8.6 Buried Asbestos Conduits

Following the removal of redundant asbestos fibre cement conduits, the residual soil surface in the former location of the pipes will be subject to a systematic visual inspection by a competent person. Visual clearance inspections will follow the below protocol:

- Subject area and immediate surroundings visually inspected for suspected asbestos containing materials, comprising a systematic grid-based walkover with 2 m lane spacing;
- Subject area photographed; and

- Transit route visually inspected for suspected asbestos containing materials comprising a systematic grid-based walkover with 2m lane spacing.

11.8.7 Excavations for Pits and USTs

Redundant septic tanks if encountered will be exposed by careful excavation and examined for potential leaks and general condition. Following removal validation samples will be collected from the residual soil surfaces of the resultant excavation, one 250 mL soil sample per 5 linear metres of excavation wall, with a minimum of 1 per wall and one 250 mL soil sample per 25 m^2 of excavation footprint. Sample submitted to a Nata Accredited laboratory for analysis of Metals, PAH, BTEX, TRH, Asbestos, OCPs, E.Coli and Thermotolerant Coliforms.

Photographic record of excavation footprint must be maintained.

Underground storage tanks if encountered will be exposed by careful excavation and examined for potential leaks and general condition. Following excavation surrounding the UST to expose the tank structure, visual inspection for leaks and assessment of the tank integrity. Following removal of the tank, visual inspection of excavation footprint for leaks, staining or odours.

Following removal of impacted soil materials surrounding the tank, one 250 mL soil sample per 5 linear metres of excavation wall, with a minimum of 1 per wall and one 250 mL soil sample per 25 m^2 of excavation footprint. Following removal of fuel lines (if identified), one 250 mL jar sample per 5 lineal meters. Sample submitted to a Nata Accredited laboratory for analysis of Heavy Metals, TRH, PAH, VOC/SVOC, Phenols.

Photographic record of excavation.

If visual or analytical evidence of leaks is observed in the tank and / or tank pit then further groundwater monitoring may be required as advised by an Environmental Consultant.

11.8.8 Unexpected Finds

Site work may find contamination and buried materials not anticipated and addressed by the conceptual Site Model (CSM), which are referred to as Unexpected Finds. In the event that unexpected finds are encountered and remediated, validation sampling will be guided by the seven-step data quality objectives laid out in section **11.1** to **11.7** above.

12 REPORTING

12.1 Interim Reporting

The Environmental Consultant will be required to undertake various types of reporting throughout the remediation and bulk earthworks program. These types of reporting include:

- Site inspection reports;
- Interim Completion Reports at the end of specified remediation tasks completed for a particular Development Stage; and
- Interim validation reports prepared at the completion of remediation and bulk earthworks for a particular Development Stage.

12.1.1 Site Inspection Report

Site inspection reports will be prepared during remediation and bulk earthworks to document details on the following:

- Condition of the soils encountered during bulk earthworks;
- Excavation procedures used during works;
- Types of machinery used to transport soils within site;
- Condition of stockpiled soils;
- Condition of geofabric layers and their fixtures;
- Document environmental procedures, their maintenance and efficacy;
- Copies of field records and photos for works completed;
- Documentation of the materials tracking procedures employed by the civil contractor;
- Documentation of the variation and thickness of fill types throughout the site;
- Monitor transport of materials by a contractor licensed to transport the waste; and
- Monitor transit routes and assessment of cross contamination risks.

12.1.2 Interim Completion Report

Interim completion reports will be prepared at the completion of remediation task to document details on the following:

- Condition of the soils encountered during remediation;
- Excavation procedures used during works;
- The depth and laterally extent of the excavations completed;
- Volumes of soil generated during remediation;
- Types of machinery used to transport soils within site;
- Condition of stockpiled soils;
- Condition of geofabric layers and their fixtures;
- Document environmental procedures, their maintenance and efficacy;
- Copies of field records and photos for works completed;
- Documentation of the materials tracking procedures employed by the civil contractor;
- Documentation of the variation and thickness of fill types throughout the site;
- Transport of materials by a contractor licensed to transport the waste;
- Transit routes and assessment of cross contamination risks;
- Results of airborne asbestos monitoring completed during the works undertaken;
- Detailed description of the procedures used for clearance inspections;
- Detailed description of the procedures used during validation sampling;
- Comparison of validation results against the remediation acceptance criteria;
- An assessment of field and laboratory quality assurance / quality control data; and
- Information on any ongoing management or investigation requirements.

12.1.3 Interim Validation Report

At the completion of remediation works for a given development stage, an interim validation report will be prepared with reference to the relevant sections of NSW EPA 2020, 'Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites'.

The site validation report must include:

- Document control;
- An executive summary;
- The scope of reporting work undertaken;
- Site identification details;
- A summary of site history;
- A summary of site condition and the surrounding environment;
- A summary of geology and hydrogeology;
- Conceptual site model;
- Validation criteria;
- Information on the remediation works undertaken for the 5 remedial phases outlined in section 10;
- Summary of the details provided as part of the interim completion and site inspection reporting;
- Import documentation;
- The results of field and laboratory work;
- An assessment of field and laboratory quality assurance / quality control data;
- Waste management (waste classification reports, tipping dockets, and review of import fill (if applicable);
- A discussion on site validation;
- Materials tracking documentation;
- Details of earthworks completed for the particular development stage;
- Final survey plans of the particular development stage;
- Information on ongoing site monitoring requirements (if any); and
- Conclusions and recommendations.

12.2 Final Site Validation Report

At the completion of remediation works for the site and following the final site surface inspection, a validation report will be prepared for the project. This report will bring together the information included as part of the Interim validation reporting prepared for the individual development stages with the addition of the details on the final site surface inspection.

13 SITE MANAGEMENT PLAN

The following site management plan will apply during undertaking of the remediation tasks.

13.1 Soil and Stormwater Management

13.1.1 Site Access/Egress

Vehicle access and egress to the site will be stabilised to prevent tracking of sediment onto roads and footpaths. Soil, mud and other similar materials will be removed from the roadway adjacent the access/egress point by sweeping, shovelling or a means other than washing, on a daily basis, or as required.

Trucks will be loaded adjacent to the remediation excavation (where practical). Spills of excavated soil will be scraped / swept up and combined with the soil being disposed offsite.

Soil and sediment will be broomed or washed off vehicle/plant tyres and tracks, prior to vehicles/plant leaving the remediation works zone. This soil and sediment will be scraped / swept up and managed onsite or disposed of, depending on its contamination status.

A site-specific sediment and erosion control plan will be prepared and maintained by the remediation contractor, to suit staging of the remediation works. Erosion and sediment control measures will be maintained in a functional condition. Sediment laden stormwater runoff will be controlled using measures outlined in Landcom 2004, '*Managing Urban Stormwater - Soils and Construction*' (the Blue Book).

13.1.2 Stockpiles

Stockpiles of soil or other materials:

- Will not be placed on footpaths or nature strips, unless approved by Council;
- Will be placed away from gutters, stormwater pits and other drainage lines;
- Will be stored in a secure area and be covered if remaining on site for more than 24 hours; and
- Will generally be constructed as low elongated mounds on level surfaces.

13.1.3 Excavation Pump Out

Should excavations require pumping out, water will be analysed for total suspended solids, pH, metals and petroleum hydrocarbons. Should analytical results be less than relevant marine ecosystem groundwater investigation levels in ANZ (2018), excavation water may be discharged to stormwater. Further assessment would be required should these levels be exceeded.

EGA note that the principal contractor may have additional obligations (i.e. permitting) to fulfill prior to discharge. EGA recommend consultation with the relevant authority (local council) prior to any discharge occurring.

Should analytical results exceed ANZ (2018) criteria, other options for disposal will be considered, including:

- Discharge to sewer (with prior approval from Sydney Water with a Trade Waste Agreement); and
- Removal and offsite disposal by a liquid waste contractor.

13.1.4 Rehabilitation and Landscaping

Stabilisation of exposed areas on the site, where required, will be undertaken in a progressive manner, as stages of remediation works are completed. Stabilisation will be maintained until such time as site redevelopment works commence.

As site redevelopment works are expected to be undertaken in conjunction with remediation works, revegetation of the site is considered unlikely to be required.

13.2 Asbestos Management

For non-friable asbestos removal works, a SafeWork NSW Class A or B licensed asbestos removalist contractor must be engaged to undertake the works. Works should be supervised by a suitably qualified and experienced and experienced occupational hygienist.

For friable asbestos removal works, a SafeWork NSW Class A licensed asbestos removalist contractor must be engaged to undertake the works. Works must be supervised by a SafeWork NSW licensed asbestos assessor.

EGA note that based on the current conditions at the site, at the time of this RAP, both friable and non-friable asbestos has been identified within the site.

13.3 Regulatory Notification

A notification of intent to remove asbestos containing materials must be submitted to the regulator (SafeWork NSW) at least 5 days prior to commencing asbestos removal works.

An Asbestos Removal Control Plan is to be prepared by the asbestos removalist contractor engaged for the works.

13.4 Airborne Asbestos Monitoring

For non-friable asbestos removal works, airborne asbestos monitoring is to be undertaken by a suitably experienced occupational hygienist.

For friable asbestos removal works, airborne asbestos monitoring must be undertaken by a SafeWork NSW licensed asbestos assessor.

Airborne fibre monitoring will be implemented during all remedial works involving friable asbestos at the site, and will be carried out in accordance with SafeWork NSW (2022) *Code of Practice – How to Safely Remove Asbestos*. EGA recommend that airborne fibre monitoring be implemented during works involving non-friable asbestos within the site, this however is not explicitly required but is highly recommended by SafeWork NSW.

Portable battery-operated air monitors are to be placed within static positions approximately 1.5m above the ground surrounding the work/removal area. The air sample analysis shall be carried out by a NATA-accredited laboratory. The results of asbestos air monitoring should be provided to the Site Project Management Representative the day following the removal or handling works. Project management will display results of air monitoring on the site's safety notice board for a period of 24hr.

The following actions are to be undertaken based on the results of daily air monitoring.

Table 13.1 Airborne Asbestos Fibre Concentration Action Levels

Action Level (airborne asbestos fibres/ml)	Action
< 0.01 fibres/ml	Continue with control measures
≥ 0.01 fibres/ml **< 0.02 fibres/ml**	Review control measures, Investigate the cause, Implement new controls to prevent further release.
≥ 0.02 fibres/mL	Stop removal works,

	Notify the relevant regulator that work has ceased, Investigate the cause, Extend the isolation area and implement controls to minimise further exposure, Do not recommence work until fibre levels are at or below 0.01 fibres/ml.

13.5 Clearance Inspection and Certificates

Following the successful removal of asbestos impacted soils, the occupational hygienist or licensed asbestos assessor (as must be the case for any friable asbestos removal works) will undertake a visual inspection of the works area and provide an asbestos materials clearance report detailing that the asbestos has been successfully removed. Further in the case of friable asbestos, validation samples will be taken and analysed for quantitative asbestos per NEPM/WA DoH and will form part of the clearance report.

Clearance reports are to be included in the site validation report.

13.6 Groundwater Management

Should dewatering of the site be required, development consent may be required from the planning consent authority. Dewatering may also require approvals from the NSW Department of Planning and Infrastructure, and the NSW Department of Primary Industry – Water.

Further, should unexpected significant contamination be encountered during remediation that may affect groundwater (e.g. the presence of unknown underground storage tanks), additional groundwater assessment will be required.

13.7 Noise Control

Noise levels from the site during the project will not exceed the limits indicated in AS2436-1981.

No 'offensive noise' as defined under the Protection of the Environment Operations Act 1997 will be created during remediation works/activities.

Plant and equipment will be fitted with noise attenuation devices (e.g. mufflers on exhausts). Consideration will be given to use of reversing alarms other than the standard pulsed tonal alarms.

Vehicle access roads will be designed in such a way to minimise the need for plant and vehicles to reverse (e.g. provision of a turning circle adjacent to the remediation works zone).

13.8 Dust Control

Dust may be generated during remediation works and associated tasks. To mitigate risk of dust emissions migrating beyond the site boundary, consideration will be given to implementing the following procedures:

- Erection of dust screens around the perimeter of the site (e.g. fencing with shade cloth attached);
- Securely covering all loads entering or exiting the site;
- Use of water sprays across the site to suppress dust;
- Covering stockpiles of contaminated soil remaining on site for more than 24 hours;
- Keeping excavation surfaces moist;
- Wetting down of placed fill material during spreading;
- Sweeping of hardstand surfaces;
- Minimising soil disturbance works during windy days; and

- Retaining stabilised site access/egress points for vehicles.

13.9 Odour Control

Generation of significant odours during the remediation works is considered to be unlikely.

If odours are generated, odours will be monitored at the site boundary. Should unacceptable odours be detected at the site boundary, consideration will be given to implementing the following procedures:

- Use of appropriate covering techniques such as plastic sheeting to cover excavation faces or stockpiles;
- Use of fine mist sprays (which may incorporate deodorizing agents);
- Use of hydrocarbon mitigating agents on impacted areas/materials; and
- Adequate maintenance of equipment and machinery to minimise exhaust emissions.

A record of unacceptable odours and corrective/preventative action taken, will be maintained by the remediation contractor.

13.10 Traffic Management

Haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site will be selected by the remediation contractor and will meet the following objectives:

- Compliance with all traffic road rules;
- Minimisation of noise, vibration and odour to adjacent premises; and
- Utilisation of state roads and minimisation of use of local roads.

The remediation contractor will ensure that site vehicles:

- Conduct deliveries of soil, materials, equipment or machinery during the hours of remediation work identified in **Section 13.15**;
- Securely cover all loads to prevent dust or odour emissions during transportation;
- Exit the site in a forward direction; and
- Do not track soil, mud or sediment onto the road.

13.11 Vibration Management

Vibration emissions during remediation works will be controlled to mitigate risk of potential damage to assets on adjacent properties, and to mitigate unreasonable loss of amenity to nearby residents.

13.12 Work Health and Safety

13.12.1 Safe Work Method Statement

Each contractor and sub-contractor undertaking remediation works, or working within a remediation works zone, will prepare a project specific safe work method statement (SWMS), which will include, but not be limited to:

- The tasks to be undertaken;
- Hazards identified for each of the tasks to be undertaken;
- An assessment of risk for each hazard, considering likelihood and consequence; and
- Control measures to eliminate or mitigate risks associated with each identified hazard.

13.12.2 Personal Protective Equipment

The following minimum personal protective equipment (PPE) should be worn by all persons working in or visiting the remediation works zone:

- Long sleeves and long pants;
- High visibility vests (or clothing);
- Safety boots;
- Hard hats;
- Gloves; and
- Eye protection (e.g. safety glasses).

Additional PPE may be required in accordance with task specific control measures in SWMS (refer **Section 13.12.1**) for asbestos handling and removal works.

The following minimum personal protective equipment (PPE) are be worn by any persons entering a non-friable asbestos impacted remediation works zone:

- Disposable coveralls;
- Minimum P2 respirator;
- Disposable boot covers; and
- Disposable gloves.

Should friable asbestos be identified during the works, the following minimum PPE are to be worn by any persons entering a friable asbestos impacted remediation works zone:

- Disposable coveralls;
- Minimum P3 half-face respirator (Higher protection may be required during works. Refer to the licensed asbestos assessor on-site for further details);
- Disposable boot covers; and
- Disposable gloves.

Additionally, a 3 stage (minimum) decontamination unit must be present at the egress point to the friable asbestos works area and used by all personnel entering and exiting the area.

13.12.3 Decontamination of Personnel, Plant and Equipment

Personnel undertaking remediation tasks, or entering the remediation works zone, will be required to decontaminate upon exiting the remediation works zone. Decontamination of plant and equipment used to remediate will also need to be decontaminated upon exiting the remediation work zones. Decontamination procedures will include:

- Removal of all disposable PPE;
- Cleaning down of protective footwear (including removal of soil from the soles);
- Washing of hands and exposed dermal areas; and
- Decontamination of plant and equipment (as applicable).

13.13 Site Signage

A sign will be posted on the boundary of the site, adjacent to the site access point, which will include 24-hour contact details of the remediation contractor and appropriate notification of asbestos contamination/remediation works (in progress).

13.14 Site Security

Site security will be maintained throughout the duration of the remediation works, with appropriate boundary fencing and gate locks. Other security measures may be implemented, if the need arises.

13.15 Site Hours of Operation

Remediation works will be undertaken on Monday to Friday between the hours of 7:00am to 5:00pm, and Saturday between the hours of 8:00am and 1:00pm.

Remediation works will not be undertaken outside the hours stated above, or on Sundays or public holidays.

13.16 Community Relations and Complaints

Owners, occupants and tenants of properties adjoining the site and across the road from the site, will be provided with notification of remediation works, at least two days prior to those works commencing.

Personnel undertaking remediation works on the site, will direct all third-party communications and/or complaints to the Project Manager. The Project Manager will arrange for the communication/complaint to be assessed, a response prepared, corrective/preventative actions implemented (if necessary).

A register will be maintained on site for the recording of communications / complaints from third parties, including but not limited to, local residents and local businesses.

13.17 Emergency Preparedness

An emergency assembly point will be established at the site egress point. This point will be communicated to all site workers and visitors, during relevant site induction processes.

In the event of an emergency, site workers and visitors will assemble here and await further instructions from the site supervisor, project manager or emergency services.

Spill control kits and fire extinguishers will be located on site, as and where required.

Contact details to be used in the event of an emergency, are presented in **Section 13.18**.

13.18 Register of Contacts

A register of contacts for the project is presented in **Table 13.18.1** below.

Table 13.18.1 Register of Contacts

Project Role	Person	Organisation	Contact
Emergency Services	-	Fire / Police / Ambulance	000
Site Owner	TBC	Mirvac Residential (NSW) Developments Pty Ltd	TBC
Project Manager	Nibraas Ahmad	Mirvac Residential (NSW) Developments Pty Ltd	0406 006 792
Planning Consent Authority	-	City of Canterbury-Bankstown	9707 9000
WHS Regulatory Authority	-	SafeWork NSW	131 050
Environmental Regulatory Authority	-	NSW EPA	131 500
Remediation Contractor	TBC	TBC	TBC
Environmental Consultant	Steven Wallace	Environmental Group Australia	0434 215 998

13.19 Environmental Consultant Site Supervision

Full time supervision of bulk earthworks will be required in order to maintain detailed records on the following:

- Condition of the soils encountered during bulk earthworks;
- Excavation procedures used during works;
- Types of machinery used to transport soils within site;
- Condition of stockpiled soils;
- Condition of geofabric layers and their fixtures;
- Document environmental procedures, their maintenance and efficacy;
- Copies of field records and photos for works completed;
- Documentation of the materials tracking procedures employed by the civil contractor;
- Documentation of the variation and thickness of fill types throughout the site;
- Monitor transport of materials by a contractor licensed to transport the waste; and
- Monitor transit routes and assessment of cross contamination risks.

13.20 Interim Site Management Plan

Prior to the implementation of the remedial action plan, the following site management activities will be enforced to reduce the contamination risk to human health and the environment:

- Site Isolation:
  - Site access and egress will be limited to essential works to prevent the tracking of contaminants outside of the site boundaries.
  - Appropriate boundary fencing with locked gates will be installed (if not already present), regularly maintained and remained locked when site is not in use.
  - Signage will be posted on the boundary of the site, adjacent to the site access point, which will include 'keep out, asbestos contamination' (or similar).
- Safe Work Method Statement:
  - Each contractor and sub-contractor gaining access to the site, will prepare a project specific safe work method statement (SWMS), which will include, but not be limited to:
    - The tasks to be undertaken;
    - Hazards identified for each of the tasks to be undertaken;
    - An assessment of risk for each hazard, considering likelihood and consequence; and
    - Control measures to eliminate or mitigate risks associated with each identified hazard.
- Personal Protective Equipment:
  - The following minimum personal protective equipment (PPE) should be worn by all persons working in or visiting the remediation works zone:
    - Hard hat;
    - Long sleeves and long pants;
    - High visibility vest (clothing);
    - Safety boots;
    - Gloves;
    - Eye protection (safety glasses); and
    - Respiratory protection (Only within asbestos impacted remediation areas).
- Decontamination of Personnel equipment:
  - Cleaning down of protective footwear (including removal of soil from the soles); and
  - Washing of hands.

14 CONCLUSIONS

Based on the information presented in the historical contamination assessment reports, EGA concludes that the remedial goal can be achieved, and the site made suitable for the proposed land use setting, subject to:

- Implementation of the strategies, methodologies and measures set out in this remedial action plan;
- Should newly identified unacceptable land contamination risks be identified during the supplementary assessment and remediation works, a revision to this RAP may be required. The revision should be prepared by a suitably experienced environmental consultant;
- Prior to any removal of soils from site for offsite disposal during remedial works, a waste classification for those soils should be prepared by a suitably experienced environmental consultant;
- Future remedial works should be monitored and validated by a suitably experienced environmental consultant; and
- Following the completion of the remediation and validation work, the environmental consultant needs to prepare a site remediation and validation report that documents both the remediation and validation work as required by the EPA (2020) reporting guidelines.

This report must be read in conjunction with the limitations set out in **Section 15**.

15 STATEMENT OF LIMITATIONS

The findings presented in this report are based on specific searches of relevant, government historical databases and anecdotal information that were made available during the course of this investigation. To the best of our knowledge, these observations represent a reasonable interpretation of the general condition of the site at the time of report completion.

This report has been prepared solely for the use of the client to whom it is addressed and no other party is entitled to rely on its findings.

No warranties are made as to the information provided in this report. All conclusions and recommendations made in this report are of the professional opinions of personnel involved with the project and while normal checking of the accuracy of data has been conducted, any circumstances outside the scope of this report or which are not made known to personnel and which may impact on those opinions is not the responsibility of Sydney Environmental Group Pty Ltd. Should information become available regarding conditions at the site including previously unknown sources of contamination, EGA reserves the right to review the report in the context of the additional information.

This report must be reviewed in its entirety and in conjunction with the objectives, scope and terms applicable to EGA's engagement. The report must not be used for any purpose other than the purpose specified at the time EGA was engaged to prepare the report.

Logs, figures, and drawings are generated for this report based on individual EGA consultant interpretations of nominated data, as well as observations made at the time site walkover/s were completed.

Data and/or information presented in this report must not be redrawn for its inclusion in other reports, plans or documents, nor should that data and/or information be separated from this report in any way.

Should additional information that may impact on the findings of this report be encountered or site conditions change, EGA reserves the right to review and amend this report.

16 REFERENCES

Coffey (Coffey 2011), 'Phase 2 Environmental Site Assessment – Student Residence Development University of Western Sydney, Bankstown Campus', dated 25 August 2011, Ref: GEOTLCOV24163AG-AB;

Noel Arnold and Associates (NAA 2011), 'Soil Contamination Investigation, University of Western Sydney – Bankstown Campus Bullecourt Avenue, Milperra NSW', dated October 2011, Ref: SJ0085:95458;

Environmental Investigation Services (EIS 2016), 'Preliminary Contamination Screening and Waste Classification, Proposed Oval Facilities, UWS Bankstown Campus, 2 Bullecourt Avenue, Milperra' dated 7 April 2016, no report ref provided;

JBS&G (JBS&G 2018), 'Phase 1 Environmental Assessment Report, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-1-1;

Alliance Geotechnical (AG 2020), 'Detailed Site Investigation, Western Sydney University – Milperra Campus, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-1-1;

Alliance Geotechnical (AG 2022), 'Remedial Action Plan, Western Sydney University – Milperra Campus, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-2-1; and

Sydney Environmental Group (2024), 'Supplementary Detailed Site Investigation, Western Sydney University – Milperra Campus, Milperra NSW', dated 22 February 2024, Ref: 2300-DSI-01-220224.v1f.

ANZG 2018, '*Australian and New Zealand Guidelines for Fresh and Marine Water Quality*', 2018;

Landcom 2004, '*Managing Urban Stormwater - Soils and Construction*' (the Blue Book).

National Environment Protection Council (NEPC), '*Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013*';

National Environment Protection Council (NEPC), '*Schedule B(2) Guideline on Site Characterisation, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013*';

NSW EPA 2022, '*Sampling Design Guidelines for Contaminated Land*';

NSW EPA 2017, '*Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd edition)*';

NSW EPA 2020, '*Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*'; and

WA DOH 2021, '*Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*'

FIGURES

Scale :	150 m	Site Locality		
Client Name:	Mirvac Pty Ltd	N	Figure Number:	1
Project Name:	Remedial Action Plan		Figure Date:	7 August 2025
Project Location:	Western Sydney University – Milperra Campus, Milperra NSW		Report Number:	2300-RAP-01-300924.v1f

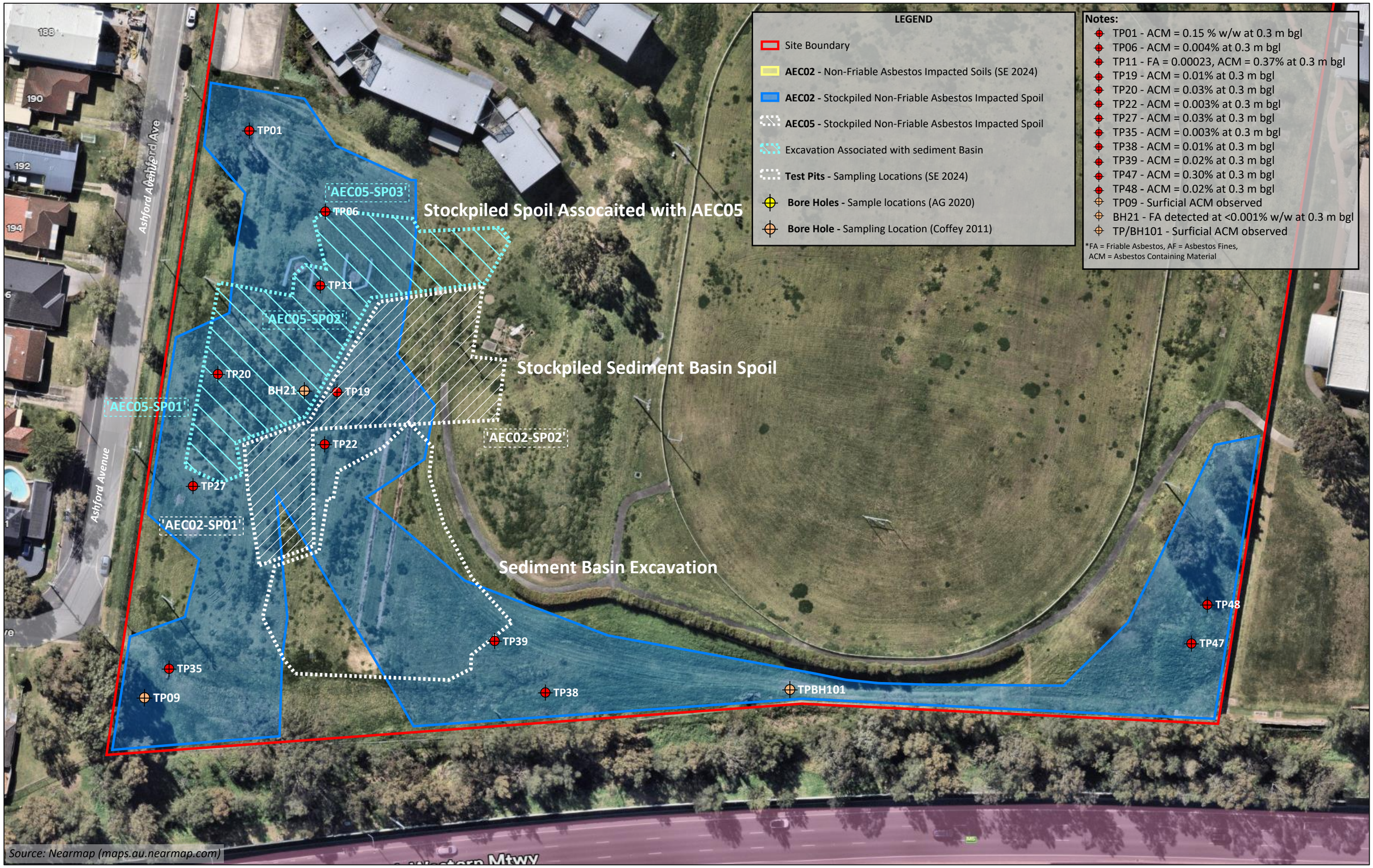
LEGEND

- Site Boundary
- **AEC01** - Friable Asbestos Impacted Soils (EBH1)
- **AEC01** - Non-friable Asbestos Impacted Soils
- **AEC01a** - Lead, Cadmium and Zinc Impacted Soils
- **AEC02** - Non-Friable Asbestos Impacted Soils
- **AEC03** - Asbestos Impacted Soils and Potential Asbestos Impacted Soil
- **PAEC04** - Former Underground Storage Tank
- **AEC05** - Non-friable asbestos impacted shallow fill soils
- Further Sampling Required in-line with updated RAP
- Environmental Conservation Zone

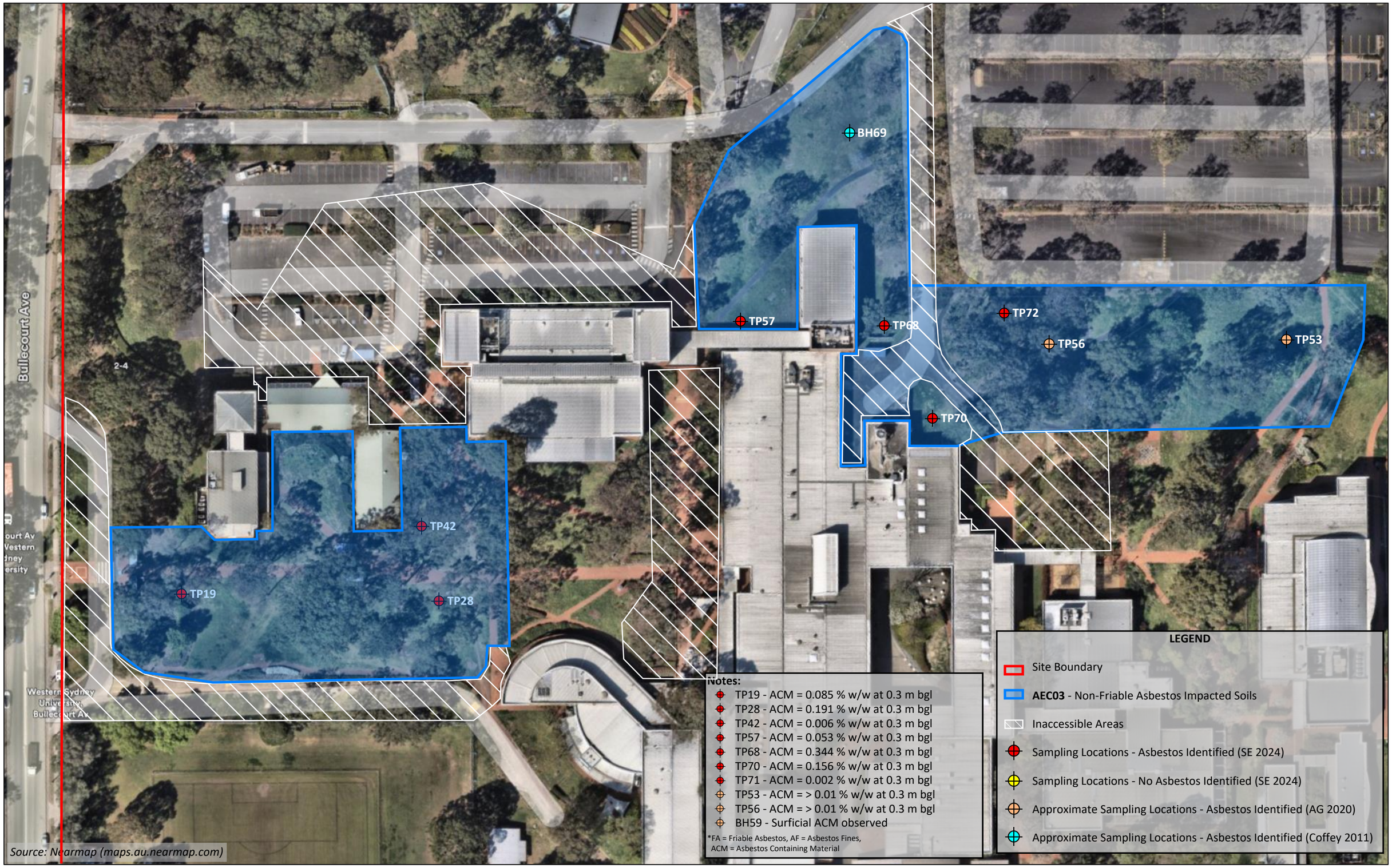
Source: Nearmap (maps.au.nearmap.com)

Scale :	62 m	Areas of Environmental Concern		
Client Name:	Mirvac Pty Ltd		Figure Number:	2
Project Name:	Remedial Action Plan		Figure Date:	7 August 2025
Project Location:	Western Sydney University – Milperra Campus, Milperra NSW		Report Number:	2300-ARAP-01-300924.v1f

Scale :	15 m	Approximate Remedial Extents - AEC01	
Client Name:	Mirvac Pty Ltd	Figure Number:	3
Project Name:	Remedial Action Plan	Figure Date:	7 August 2025
Project Location:	Western Sydney University – Milperra Campus, Milperra NSW	Report Number:	2300-RAP-01-300924.v1f

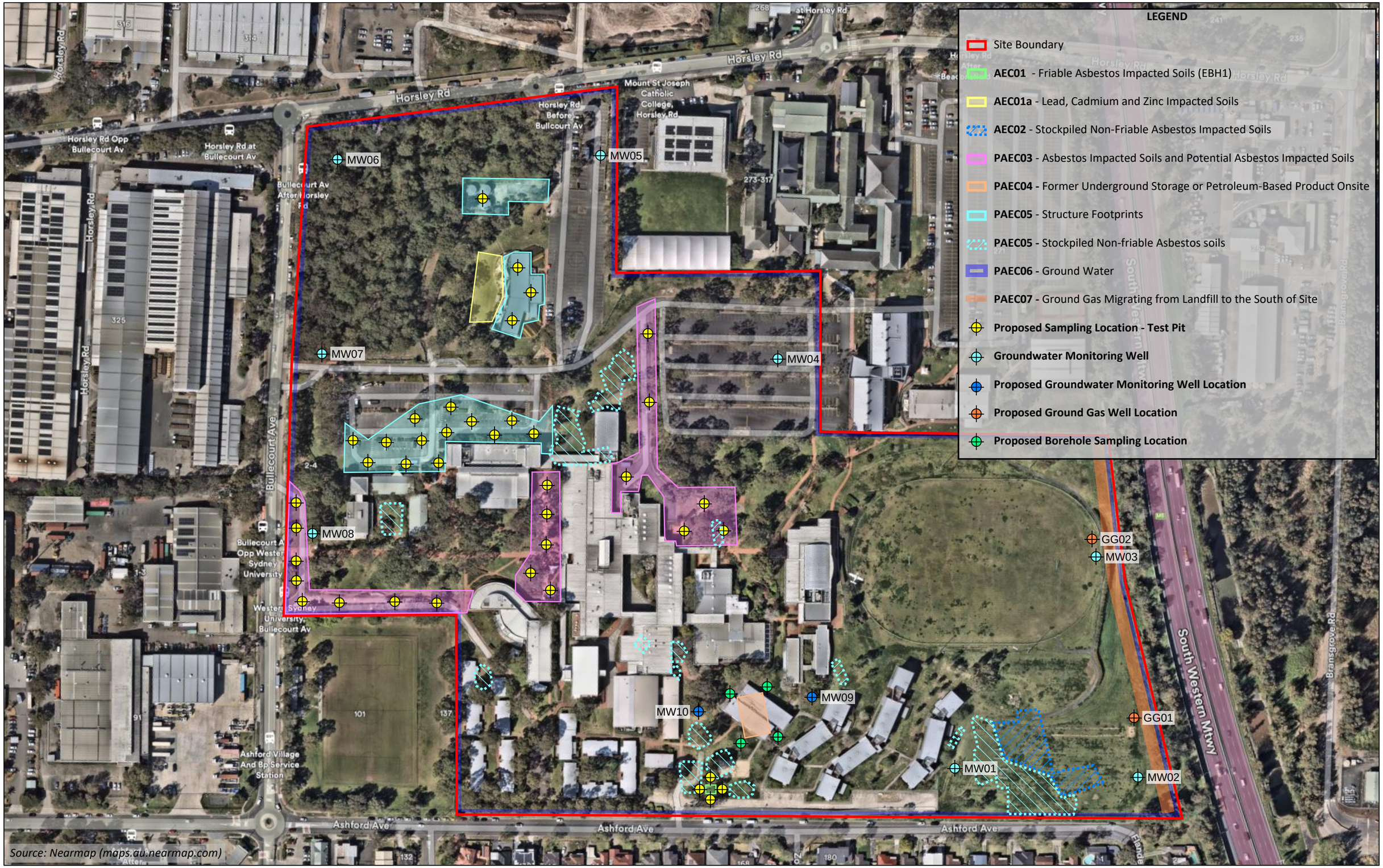


Scale :	21 m	Approximate Remedial Extents - AEC02		
Client Name:	Mirvac Pty Ltd	N	Figure Number:	4
Project Name:	Remedial Action Plan		Figure Date:	7 August 2025
Project Location:	Western Sydney University – Milperra Campus, Milperra NSW		Report Number:	2300-RAP-01-300924.v1f



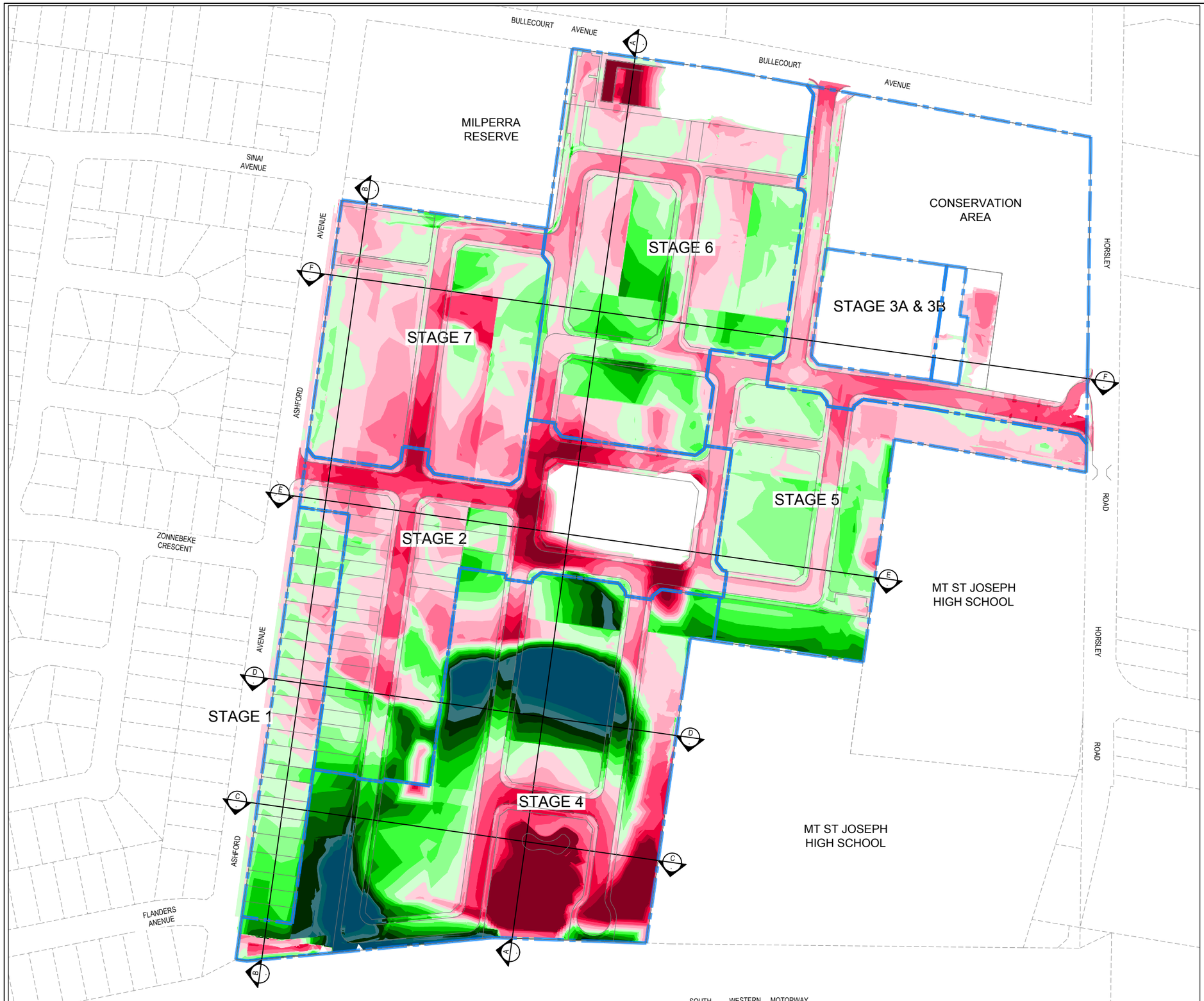
Scale :	25 m	Approximate Remedial Extents - AEC03	
Client Name:	Mirvac Pty Ltd	Figure Number:	5
Project Name:	Remedial Action Plan	Figure Date:	7 August 2025
Project Location:	Western Sydney University – Milperra Campus, Milperra NSW	Report Number:	2300-RAP-01-300924.v1f

Scale :	50 m	Approximate Remedial Extents - AEC05	
Client Name:	Mirvac Pty Ltd	Figure Number:	6
Project Name:	Remedial Action Plan	Figure Date:	7 August 2025
Project Location:	Western Sydney University – Milperra Campus, Milperra NSW	Report Number:	2300-RAP-01-300924.v1f



Scale :	65 m	Proposed Supplementary Sampling Locations		
Client Name:	Mirvac Pty Ltd	N	Figure Number:	7
Project Name:	Remedial Action Plan		Figure Date:	7 August 2025
Project Location:	Western Sydney University – Milperra Campus, Milperra NSW		Report Number:	2300-RAP-01-300924.v1f

APPENDIX A



CUT AND FILL LEGEND		
DEPTH RANGE (m)		COLOUR
>1.8m CUT		
-1.8	-1.5	
-1.5	-1.2	
-1.2	-0.9	
-0.9	-0.6	
-0.6	-0.3	
-0.3	0.0	
0.0	0.3	
0.3	0.6	
0.6	0.9	
0.9	1.2	
1.2	1.5	
1.5	1.8	
1.8	2.1	
2.1	2.4	
2.4	2.7	
>2.7m FILL		

APPROXIMATE EARTHWORKS VOLUMES:

CUT - 55,502m³
FILL - 60,584m³

BALANCE - 5,082m³ OF FILL

* THIS ESTIMATE IS BASED ON POST DEMOLITION EXISTING SURFACE TO BOXING DESIGN SURFACE

WARNING

BEWARE OF UNDERGROUND SERVICES

The locations of underground services are approximate only and their exact position should be proven on site.
No guarantee is given that all existing services are shown.
Locate all underground services before commencement of works

BEFORE YOU DIG

www.byda.com.au

PRELIMINARY PRINT
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRN.	APP.
C	ISSUED FOR REVIEW	28.08.25	GN	SG
B	ISSUED FOR REVIEW	18.08.25	GN	SG
A	ISSUED FOR PRELIMINARY REVIEW	08.08.25	GN	SG

REV	DESCRIPTION	DATE	DRN.	APP.

0 12.5 25 50 75 100
SCALE 1:1250 AT A1 SIZE

Designed	R. GOVENDER
Date	23.06.2025
Drawn	G.N.
Checked	-
Date	-
Approved	-
Reg. No.	-
Date	-
DA Number	DA1000

Beveridge Williams
Development & Infrastructure Consultants
Level 4, LPC House, Suite 4.05, 3 Fordham way
Oran Park NSW 2570
ph: 02 46255055
www.beveridgewilliams.com.au

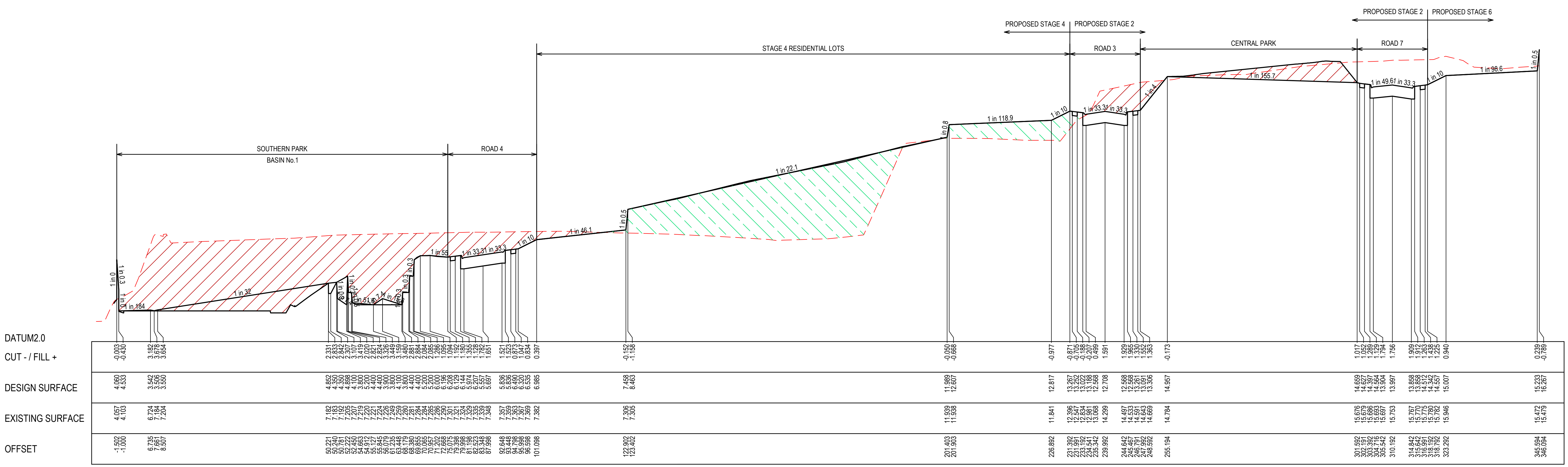
Project Details	WSU MILPERRA, LOT 1 IN DP101147 AND LOT 2 IN DP1291984 2A BULLECOURT AVENUE, MILPERRA
Drawing Title	BULK EARTHWORKS OVERALL PLAN

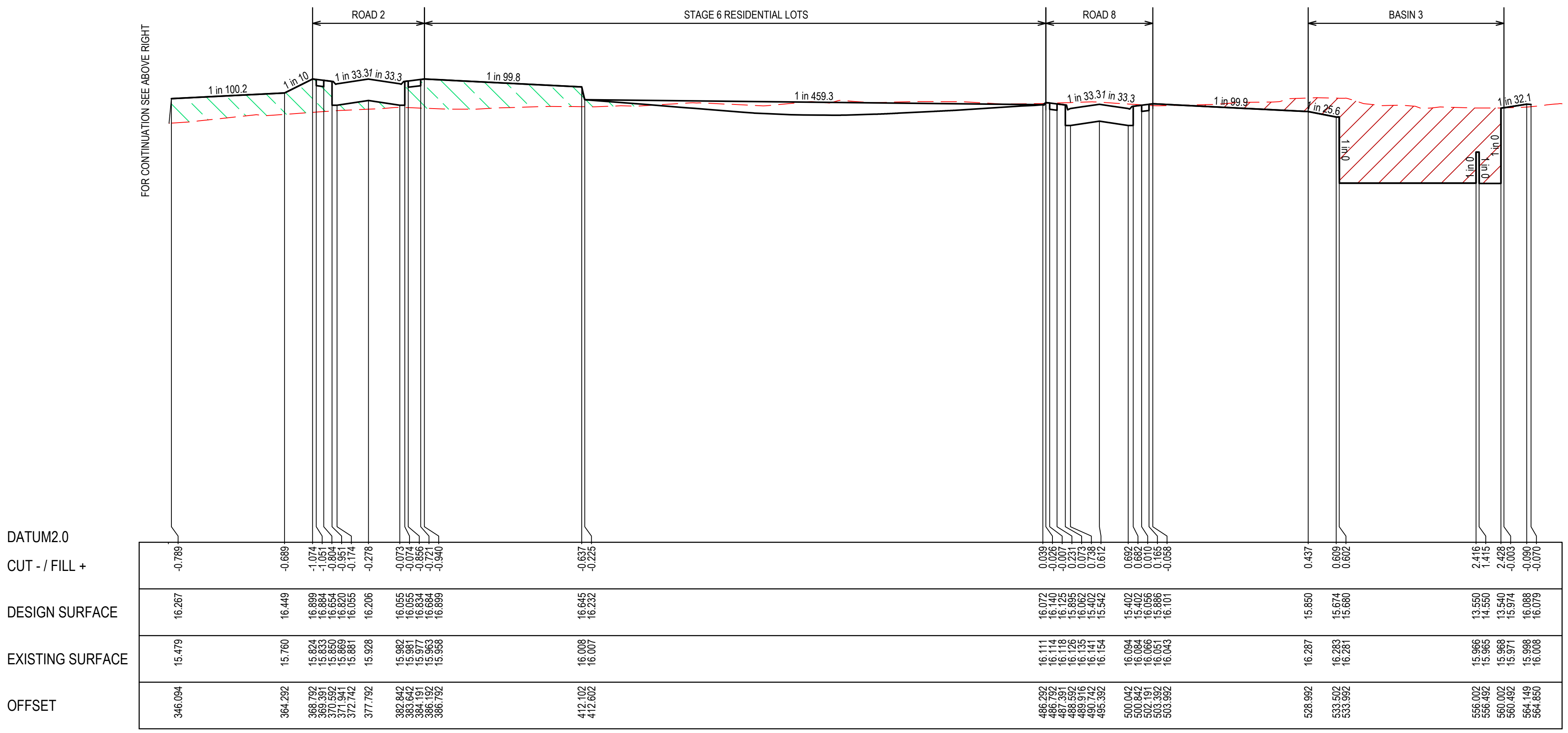
Sheet 30 of 145
Scale 1:1250 @ A1

Project Ref	Stage No	Drawing No	Rev
2301879	320	070	C

N

F:\synergyfemp\12dSynergy\12dSynergyServerService\4144\2e2244f9-37e7-476b-b847-cf1e1da8d8ed\2301879-320-070-BULK.dwg





LEGEND
- EXISTING SURFACE
- DESIGN LINE
- FILL HATCH
- CUT HATCH

WARNING

BEWARE OF UNDERGROUND SERVICES

The locations of underground services are approximate only and their exact position should be proven on site.
No guarantee is given that all existing services are shown.
Locate all underground services before commencement of works

BEFORE YOU DIG

www.byda.com.au

PRELIMINARY PRINT
NOT FOR CONSTRUCTION

SECTION A-A
CROSS SECTIONS

REV	DESCRIPTION	DATE	DRN.	APP.
C	ISSUED FOR REVIEW	28.08.25	GN	SG
B	ISSUED FOR REVIEW	18.08.25	GN	SG
A	ISSUED FOR PRELIMINARY REVIEW	08.08.25	GN	SG

HORIZ 1:500 — 0 5 10 20 30
VERT 1:100 — 0 1 2 4 6
SCALE AT A1 SIZE

Designed R. GOVENDER
Date 23.06.2025
Drawn G.N.
Checked -
Date -
Approved -
Reg. No. -
Date -
DA Number DA1000

Beveridge Williams
Development & Infrastructure Consultants
Level 4, LPC House, Suite 4.05, 3 Fordham way
Oran Park NSW 2570
ph: 02 46255055
www.beveridgewilliams.com.au

Project Details: WSU MILPERRA, LOT 1 IN DP101147 AND LOT 2 IN DP1291984
2A BULLECOURT AVENUE, MILPERRA

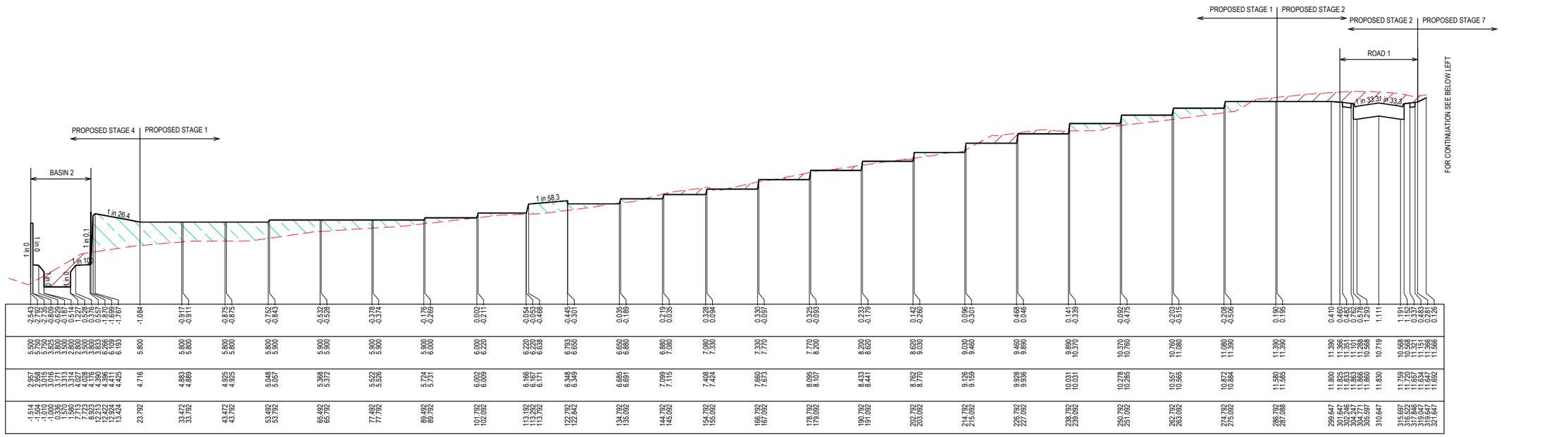
Drawing Title: BULK EARTHWORKS
SECTION A

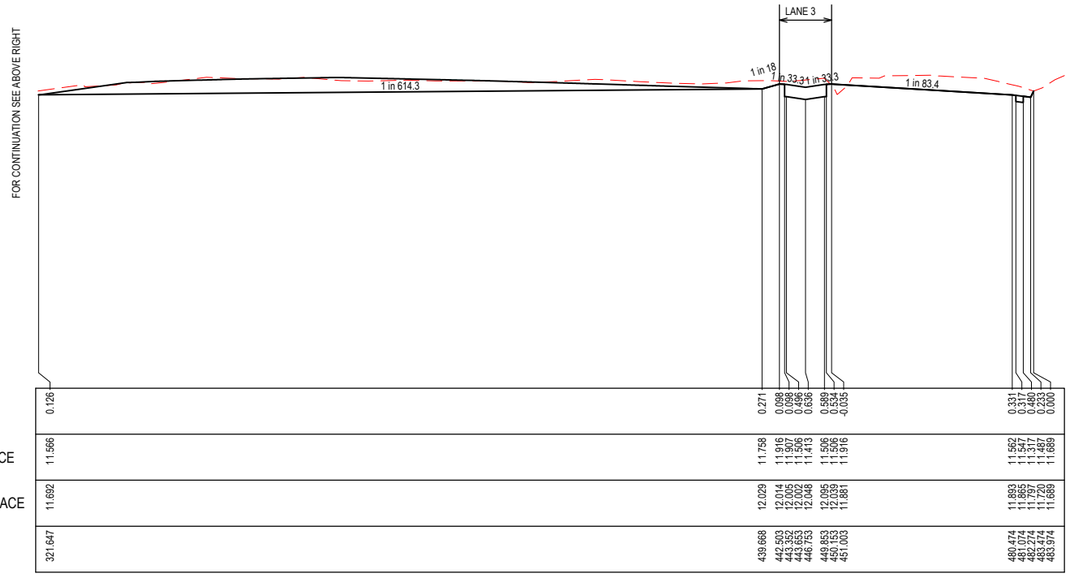
Sheet 31 of 145

Scale: 1:500 H 1:100 V @ A1

Project Ref	Stage No	Drawing No	Rev
2301879	320	071	C

F:\synergytemp\12dSynergy\12dSynergyServerService\4144\2e2244f9-37e7-476b-b847-cf1e1dafd8ed\2301879-320-070-BULK.dwg





SECTION B-B
CROSS SECTIONS

REV	DESCRIPTION	DATE	DRN.	APP.
C	ISSUED FOR REVIEW	28.08.25	GN	SG
B	ISSUED FOR REVIEW	18.08.25	GN	SG
A	ISSUED FOR PRELIMINARY REVIEW	08.08.25	GN	SG

HORIZ 1:500 0 5 10 20 30
VERT 1:100 0 1 2 4 6
SCALE AT A1 SIZE

Designed	R. GOVENDER
Date	23.06.2025
Drawn	G.N.
Checked	-
Date	-
Approved	-
Reg. No.	-
Date	-
DA Number	DA1000

Beveridge Williams
Development & Infrastructure Consultants
Level 4, LPC House, Suite 4.05, 3 Fordham way
Oran Park NSW 2570
ph: 02 46255055
www.beveridgewilliams.com.au

Project Details: WSU MILPERRA, LOT 1 IN DP101147 AND LOT 2 IN DP1291984
2A BULLECOURT AVENUE, MILPERRA

Drawing Title: BULK EARTHWORKS
SECTION B

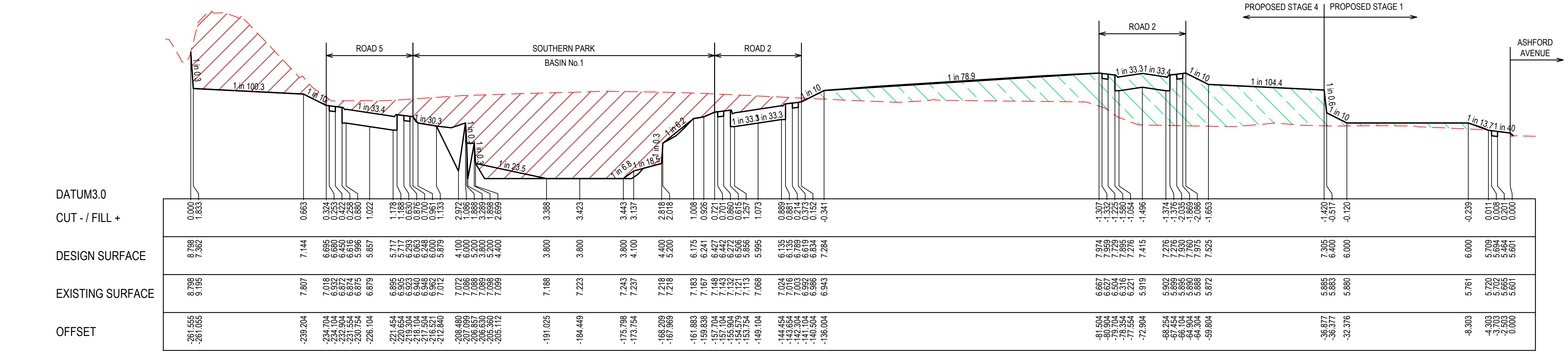
Sheet 32 of 145
Scale 1:500 H 1:100 V @ A1

Project Ref	Stage No	Drawing No	Rev
2301879	320	072	C

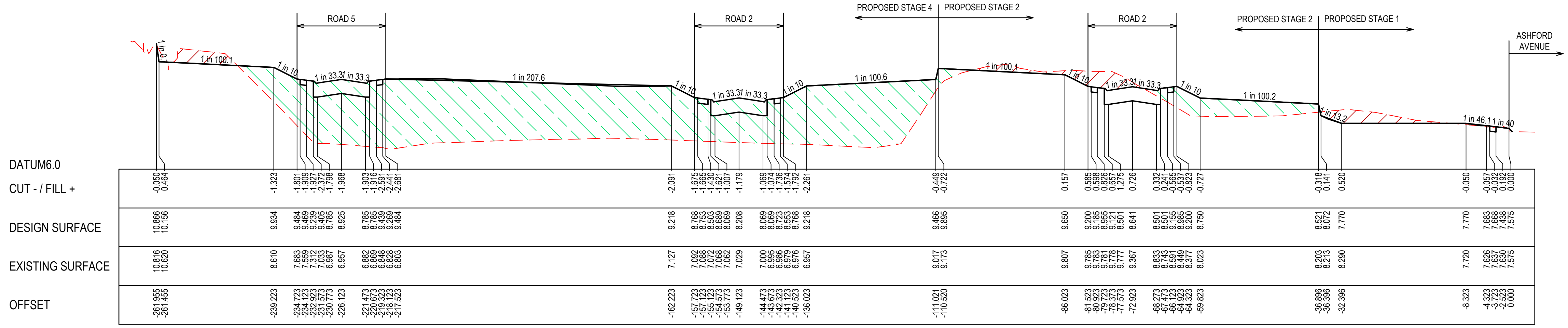
WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services are approximate only and their exact position should be proven on site.
No guarantee is given that all existing services are shown.
Locate all underground services before commencement of works
BEFORE YOU DIG
www.byda.com.au

PRELIMINARY PRINT
NOT FOR CONSTRUCTION

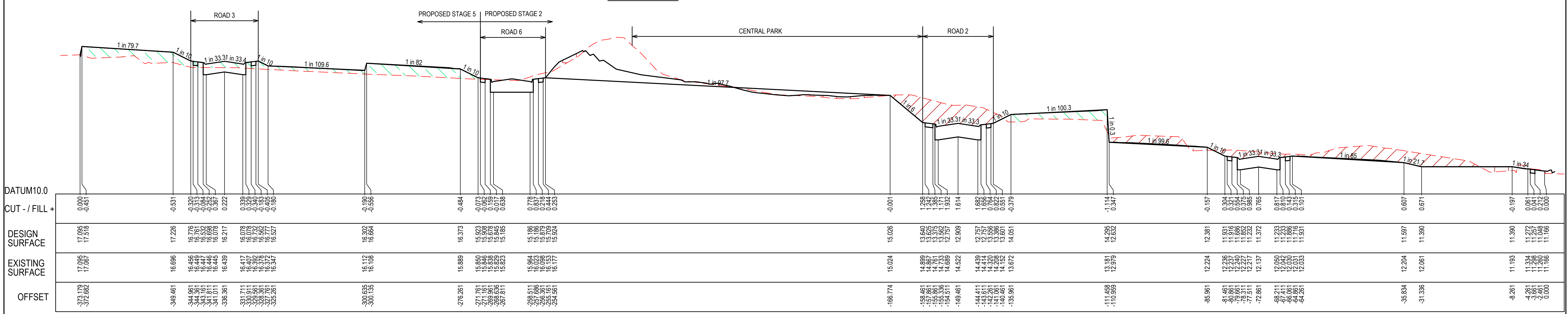
F:\synergytemp\12dSynergy\12dSynergyServerService\4144\2e2244f9-37e7-476b-b847-cf1e1dafd8ed\2301879-320-070-BULK.dwg



SECTION C-C
CROSS SECTIONS



SECTION D-D
CROSS SECTIONS



SECTION E-E
CROSS SECTIONS

LEGEND
EXISTING SURFACE
DESIGN LINE
FILL HATCH
CUT HATCH

WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services are approximate only and their exact position should be proven on site.
No guarantee is given that all existing services are shown.
Locate all underground services before commencement of works
BEFORE YOU DIG
www.byda.com.au

PRELIMINARY PRINT
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRN.	APP.
C	ISSUED FOR REVIEW	28.08.25	GN	SG
B	ISSUED FOR REVIEW	18.08.25	GN	SG
A	ISSUED FOR PRELIMINARY REVIEW	08.08.25	GN	SG

HORIZ 1:500 — 0 5 10 20 30
VERT 1:100 — 0 1 2 4 6
SCALE AT A1 SIZE

Designed R. GOVENDER
Date 23.06.2025
Drawn G.N.
Checked -
Approved -
DA Number DA1000

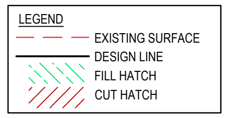
Beveridge Williams
Development & Infrastructure Consultants
Level 4, LPC House, Suite 4.05, 3 Fordham way Oran Park NSW 2570
ph: 02 46255055
www.beveridgewilliams.com.au

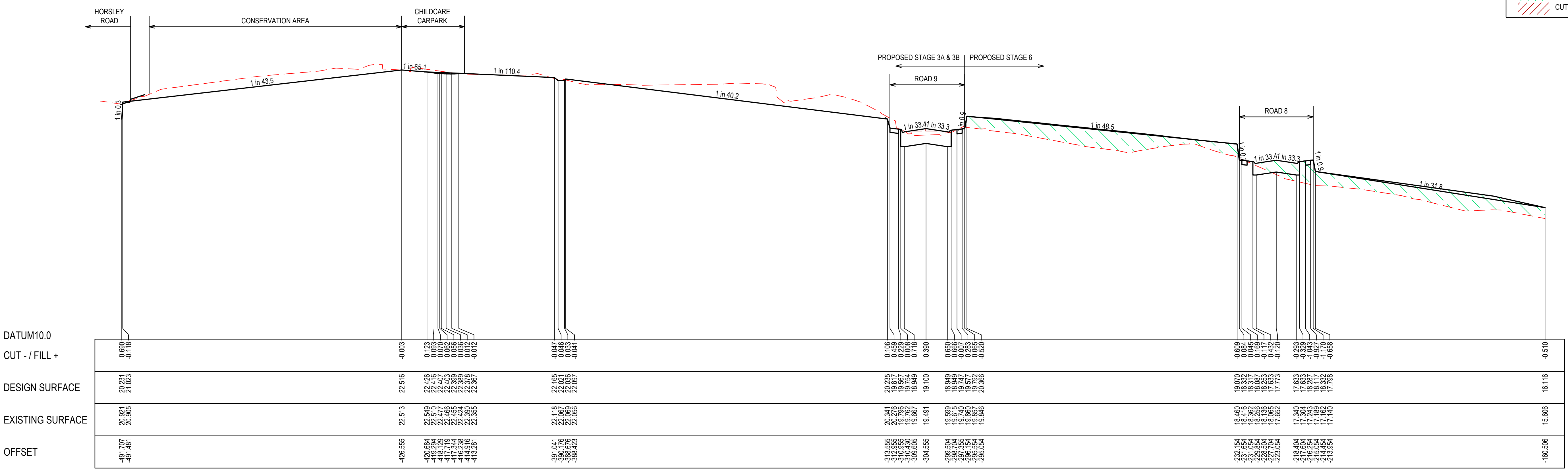
Project Details: WSU MILPERRA, LOT 1 IN DP101147 AND LOT 2 IN DP1291984
2A BULLECOURT AVENUE, MILPERRA

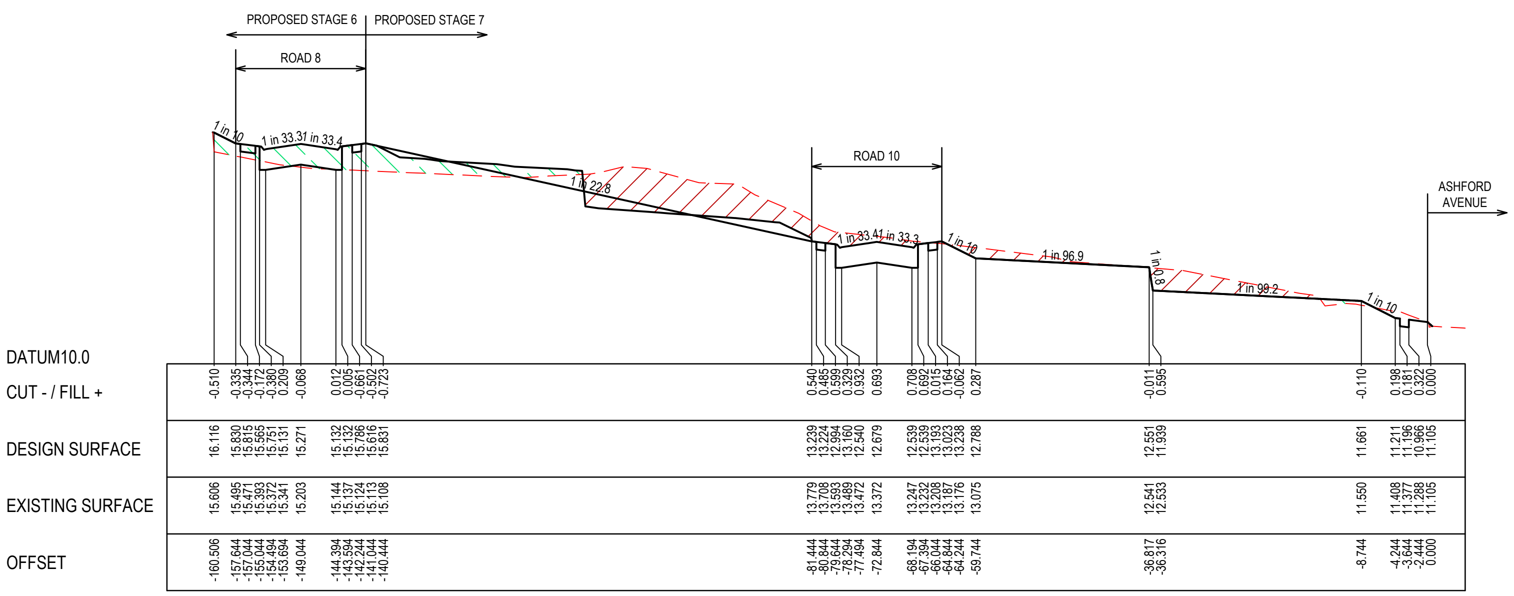
Drawing Title: BULK EARTHWORKS
SECTIONS C, D & E

Sheet 33 of 145
Scale 1:500 H 1:100 V @ A1
Project Ref 2301879 | Stage No 320 | Drawing No 073 | Rev C

F:\synergytemp\12dSynergy\12dSynergyServerService\4144\2e2244f9-37e7-476b-b847-cf1e1dafd8ed\2301879-320-070-BULK.dwg







SECTION F-F
CROSS SECTIONS

WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services are approximate only and their exact position should be proven on site.
No guarantee is given that all existing services are shown.
Locate all underground services before commencement of works
BEFORE YOU DIG
www.byda.com.au

PRELIMINARY PRINT
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRN.	APP.
C	ISSUED FOR REVIEW	28.08.25	GN	SG
B	ISSUED FOR REVIEW	18.08.25	GN	SG
A	ISSUED FOR PRELIMINARY REVIEW	08.08.25	GN	SG

HORIZ 1:500 — 0 5 10 20 30
VERT 1:100 — 0 1 2 4 6
SCALE AT A1 SIZE

Designed: R. GOVENDER
Date: 23.06.2025
Drawn: G.N.
Checked: -
Date: -
Approved: -
Reg. No.: -
Date: -
DA Number: DA1000

Beveridge Williams
Development & Infrastructure Consultants
Level 4, LPC House, Suite 4.05, 3 Fordham way
Oran Park NSW 2570
ph: 02 46255055
www.beveridgewilliams.com.au

Project Details: WSU MILPERRA, LOT 1 IN DP101147 AND LOT 2 IN DP1291984
2A BULLECOURT AVENUE, MILPERRA

Drawing Title: BULK EARTHWORKS
SECTION F

Sheet 34 of 145
Scale: 1:500 H 1:100 V @ A1
Project Ref: 2301879 | Stage No: 320 | Drawing No: 074 | Rev: C

F:\synergytemp\12dSynergy\12dSynergyServerService\4144\2e2244f9-37e7-476b-b847-cf1e1dafd8ed\2301879-320-070-BULK.dwg