



Remedial Action Plan, Finucane Reserve, 1 Finucane Crescent, Matraville NSW

Randwick City Council

Report

JBS&G 68409 | 165,244

25 March 2025





We acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community.

We pay respect to Elders past and present and in the spirit of reconciliation, we commit to working together for our shared future.

Caring for Country The Journey of JBS&G
Artist: Patrick Caruso, Eastern Arrernte



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Abbreviations

Term	Definition
ACM	Asbestos Containing Material
AECs	Areas of Environmental Concern
AF/FA	Asbestos Fines / Fibrous Asbestos
AHD	Australian Height Datum
ASS	Acid Sulfate Soils
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CLM Act	Contaminated Land Management Act 1997
COPCs	Contaminants of Potential Concern
CSM	Conceptual Site Model
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objectives
DSI	Detailed Site Investigation
EILs/ESL	Ecological Investigation/Screening Levels
EPA	NSW Environment Protection Authority
ha	Hectare
HGG	Hazardous Ground Gas
HILs/HSLs	Health Investigation/Screening Limits
IWTS	Integrated Waste Tracking Solution
JBS&G	JBS&G Australia Pty Ltd
LEP	Local Environmental Plan
LOR	Limit of Reporting
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
OCPs	Organochlorine Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PFAS	Per-and Polyfluoroalkyl substances
QA/QC	Quality Assurance / Quality Control
RCC	Randwick City Council
RPD	Relative Percent Difference
SAQP	Sampling Analysis and Quality Plan
TRH	Total Recoverable Hydrocarbons

Executive Summary

JBS&G Australia Pty Ltd (JBS&G) was engaged by Randwick City Council (RCC, the client) to prepare a Remedial Action Plan (RAP) for Finucane Reserve located at 1 Finucane Crescent, Matraville, NSW (the site). The site is legally identified as Lot 8 in Deposited Plan (DP) 113489, in addition to a small portion of land to the north comprising an undeveloped section of the Finucane Crescent road reserve. The site location and site layout are shown in **Figures 1** and **2** respectively. The combined area of the site is approximately 5,000m². The site as referred herein is defined as the lateral study boundaries as shown on **Figure 2**, with the vertical extent limited to a maximum depth of 0.5 metres below ground surface (m bgs).

The reserve was historically utilised as a dumping ground between 1942 to 1955, with the park established in the early 1980s. JBS&G understands that during previous works involving the removal of an area of the play facilities, asbestos containing material (ACM) was identified and works were halted and the area capped and covered with approximately 0.2 m of clean material (RCC 2024¹).

An upgrade to the playground and surrounding facilities is proposed. All works are proposed to occur in the northern extent of the site, in proximity to the existing play equipment. Based on the scope of proposed upgrades it is anticipated that works will only require shallow disturbance of soils for minor levelling and some trenching.

Given the ACM previously identified near the playground, RCC engaged JBS&G to complete a Detailed Site Investigation (DSI, JBS&G 2025²) to characterise potential contamination in surficial soils to 0.5 m depth at the site to assess the potential risks to workers during the proposed works and to users from asbestos in surface soils. Investigation of potential contamination below 0.5 m to assess the overall suitability of the site was beyond the scope of the investigation. The investigation was completed consistent with applicable guidelines made or endorsed by NSW Environment Protection Authority (EPA).

Asbestos fines / fibrous asbestos was reported at trace levels with ACM in subsurface soil at one location near the playground (where asbestos was previously identified) with bonded asbestos reported in surficial soils at three locations in the south of the site, presenting a potentially unacceptable health-based risk for workers and future site users. It was noted that while current grass and soft-fall surfaces are maintained there are no complete exposure risks to asbestos fibres for current use and maintenance of these areas, and JBS&G concluded the site within the study boundaries is suitable for the proposed works and recreational use subject to management of asbestos by preparation and implementation of an Asbestos Management Plan (AMP) and a RAP to address asbestos contamination where identified within 0.5 m of the site surface.

This document presents a RAP that outlines the principles of remediation and validation works required for the site, that when completed, will make and demonstrate that the site has been made suitable for the intended land use.

This RAP has been prepared with reference to relevant guidelines made or endorsed by the NSW EPA inclusive of NEPC (2013³) and EPA (2020⁴) and *State Environmental Planning Policy (SEPP Resilience and Hazards) 2021*.

The objective of this RAP is to document the procedures and standards to be followed in order to remove the potential contamination risks for the proposed development such that the site can be made suitable for the intended public park use, consistent with the requirements of 'Chapter 4 Remediation of Land' in the Resilience and Hazards SEPP.

¹ *Finucane Reserve, Matraville, Site Brief*. Randwick City Council, 5 November 2024 (RCC 2024).

² *Detailed Site Investigation, Finucane Reserve, 1 Finucane Crescent, Matraville NSW*. JBS&G Australia Pty Ltd, reference: 68409/164,716, 31 January 2025 (JBS&G 2025)

³ *National Environment Protection (Assessment of Site Contamination) Measure, Amendment No 1 (2013)*. National Environment Protection Council (NEPC 2013)

⁴ *Consultants Reporting on Contaminated Land – Contaminated Land Guidelines*. NSW EPA 2020 (EPA 2020)

Remediation is required to address the following contamination risks to ensure the suitability of the site for public open space land use:

- The presence of bonded ACM within subsurface soils above the NEPC (2013) Health Screening Level for recreational land use (HSL-C) and AF/FA below the HSL-C at one location (TP03_0.2-0.5) in the northeast of the site within the proposed works area. The presence of bonded ACM above criteria and AF/FA below the criteria will require management to ensure that ACM is not present on the site surface following redevelopment; and
- The presence of bonded ACM within surficial soils at three locations (TP23, TP25 and TP31) outside the works area in the south of the site represents a potentially unacceptable risk to future site users and maintenance workers and as such impacted fill/soil requires to be managed.

Potential remedial options have been assessed, giving consideration to the proposed public open space land use with the preferred remedial strategy for the site identified as a combination of onsite containment with long-term management, and offsite disposal.

Subject to the successful implementation and validation of the measures detailed in this RAP and subject to the limitations in **Section 13**, it is considered the site can be made suitable for the proposed development works and ongoing recreational land use.

1. Introduction

1.1 Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by Randwick City Council (RCC, the client) to prepare a Remedial Action Plan (RAP) for Finucane Reserve located at 1 Finucane Crescent, Matraville, NSW (the site). The site is legally identified as Lot 8 in Deposited Plan (DP) 113489, in addition to a small portion of land to the north comprising an undeveloped section of the Finucane Crescent road reserve. The site location and site layout are shown in **Figures 1** and **2** respectively. The combined area of the site is approximately 5,000m². The site as referred herein is defined as the lateral study boundaries as shown on **Figure 2**, with the vertical extent limited to a maximum depth of 0.5 metres below ground surface (m bgs).

The reserve was historically utilised as a dumping ground between 1942 to 1955, with the park established in the early 1980s. JBS&G understands that during previous works involving the removal of an area of the play facilities, asbestos containing material (ACM) was identified and works were halted and the area capped and covered with approximately 0.2 m of clean material (RCC, 2024⁵).

An upgrade to the playground and surrounding facilities is proposed. All works are proposed to occur in the northern extent of the site, in proximity to the existing play equipment. Based on the scope of proposed upgrades it is anticipated that works will only require shallow disturbance of soils for minor levelling and some trenching.

Given the ACM previously identified near the playground, RCC engaged JBS&G to complete a Detailed Site Investigation (DSI, JBS&G 2025⁶) to characterise potential contamination in surficial soils to 0.5 m depth at the site to assess the potential risks to workers during the proposed works and to users from asbestos in surface soils. Investigation of potential contamination below 0.5 m to assess the overall suitability of the site was beyond the scope of the investigation. The investigation was completed consistent with applicable guidelines made or endorsed by NSW Environment Protection Authority (EPA).

Asbestos fines / fibrous asbestos was reported at trace levels with ACM in subsurface soil at one location near the playground (where asbestos was previously identified) with bonded asbestos reported in surficial soils at three locations in the south of the site, presenting a potentially unacceptable health-based risk for workers and future site users. It was noted that while current grass and soft-fall surfaces are maintained there are no complete exposure risks to asbestos fibres for current use and maintenance of these areas, and JBS&G concluded the site within the study boundaries is suitable for the proposed works and recreational use subject to management of asbestos by preparation and implementation of an Asbestos Management Plan (AMP) and a RAP to address asbestos contamination where identified within 0.5 m of the site surface.

This document presents a RAP that outlines the principles of remediation and validation works required for the site, that when completed, will make and demonstrate that the site has been made suitable for the intended land use.

This RAP has been prepared with reference to relevant guidelines made or endorsed by the NSW Environment Protection Authority (EPA) inclusive of NEPC (2013⁷) and EPA (2020⁸) and *State Environmental Planning Policy (SEPP Resilience and Hazards) 2021*.

⁵ *Finucane Reserve, Matraville, Site Brief*. Randwick City Council, 5 November 2024 (RCC 2024).

⁶ *Detailed Site Investigation, Finucane Reserve, 1 Finucane Crescent, Matraville NSW*. JBS&G Australia Pty Ltd, reference: 68409/164,716, 31 January 2025 (JBS&G 2025)

⁷ *National Environment Protection (Assessment of Site Contamination) Measure 1999*, as amended 2013. National Environment Protection Council (NEPC 2013 ASC NEPM)

⁸ *Consultants Reporting on Contaminated Land – Contaminated Land Guidelines*. NSW EPA 2020 (EPA 2020)

1.2 Objectives

The objective of this RAP is to document the procedures and standards to be followed in order to remove the potential contamination risks for the proposed development such that the site can be made suitable for the proposed development and ongoing recreational use, consistent with the requirements of 'Chapter 4 Remediation of land' in Resilience and Hazards SEPP.

1.3 Redevelopment Site Details

Redevelopment works by RCC involve an upgrade to the playground and surrounding facilities located in the northern portion of the site and only involve shallow ground disturbances. The scope of works for the proposed project comprise the following:

- Installation of a concrete footpath to connect the west and east entrance of the park.
- Install picnic setting and shelter.
- Install one new play equipment in the existing playground.
- Install new shade sails to the playground.
- Replace all existing rubber soft-fall surface.
- Install seats, bike racks, and wheelchair accessible drinking fountain.
- Planting of trees with supporting hardwood stakes.

2. Site Condition, History and Surrounding Environment

2.1 Site Identification

The location of the site is shown in **Figure 1**. The site details are summarised in **Table 2.1** and described in detail in the following sections.

Table 2.1 Site Identification

Lot / DP Number	Lot 8 DP 113489
Street Address	1 Finucane Crescent, Matraville NSW
Local Government Authority	Randwick City Council
Site Area	Approximately 5,000m ² to a depth of 0.5 m below ground surface.
Current Zoning	The site is zoned RE1 (Public Recreation) under the Randwick <i>Local Environmental Plan (LEP) 2012</i>
Geographic Coordinates (approximate centre of site) (GDA94 MGA56)	E: 337365 N: 6241000
Previous Land Use	Vegetated and vacant land
Current Land Use	Recreational public open space
Proposed Use	Ongoing recreational open space, following proposed upgrade works in the north of the site.

2.2 Site Description

A site inspection was undertaken on the 4 December 2024 by an appropriately trained and qualified JBS&G environmental consultant (consistent with NEPC (2013) ASC NEPM guidelines).

Access to the property was through Finucane Crescent where bollards were observed at the reserve entry to block off vehicle access. The site was generally flat and sloped slightly to the southwest.

The site is predominantly landscaped comprising grass and trees with a small portion comprising wet pour rubber in the northeastern section used as a playground area. All vegetation on site appeared to be healthy and in good condition with some observed patches of sand around the trees and in the southern portion of the site along the boundary. No asbestos or staining was observed along the ground surface.

2.3 Summary Site History

JBS&G (2025) reported the site to have been historically vacant until filling activities took place between 1942 to 1955 as notified by RCC and observed in historical aerial imageries. The site was later transformed into a park in the 1970s and has been used as a public park to this day.

2.4 Surrounding Land Uses

The land uses surrounding the site have been identified as follows:

- North – The site is bound to the north by Matraville Soldiers' Settlement Public School followed by a Childcare Centre and residential properties;
- East – The site is bound to the east by Finucane Crescent and residential properties, followed by Lawson Street;
- South – The site is bound to the south by residential properties followed by Flinders Street; and
- West – The site is bound to the west by residential properties followed by Menin Road.

2.5 Environmental Setting

The environmental setting of the site as outlined in JBS&G (2025) is presented in **Table 2.2**.

Table 2.2 Site Environmental Setting Summary

Environmental Aspect	Characteristics
Topography	The sites elevation is approximately 28 to 32 m Australian Height Datum (AHD) with the overall topography gently sloping southwest.
Geology	The geology maps indicates that the site is present within the coastal deposits – bedrock-mantling dune facies comprising marine deposited and aeolian reworked fine to coarse grained quartz-lithic sand with abundant carbonate, sporadic humic debris in stabilised dunes.
Hydrology	The site is identified to be generally flat and slightly sloping to the southwest. Rainfall is expected to infiltrate the surface soils or be collected by the stormwater drainage system located in the northeastern portion of the site which are expected to drain to Botany Bay located south of the site or Tasman Sea located to the east. The nearest permanent surface water receptors are the Tasman Sea and Botany Bay located approximately 2.2 and 2.3 km southwest and east of the site, respectively
Hydrogeology	Over 50 groundwater bores are identified within a 2km radius from the site, generally functional and for the purpose of monitoring, water supply or commercial/industrial use, with the ones closest to the site used for water supply. Given the topographical slope of the site and broader area, groundwater is anticipated to traverse southwest and east. No groundwater was encountered during the recent intrusive investigation.
Salinity	There is no Dryland Salinity National Assessment data onsite, nor within the dataset buffer, nor where there any salinity assessments provided.
Acid Sulfate Soils (ASS)	Review of Acid Sulfate Soil (ASS) Risk Map indicates that the site is located in an area with no known occurrence of acid sulfate soil materials. Based on the scope of works extending to only 0.5 m bgs and the location of the site, no further consideration of requirements for the assessment or management of ASS is warranted.
Soil Landscape	The site is within the Tuggerah Landscape group. This group of landscape is characterised by gently undulating to rolling coastal dunefields comprising quaternary (Holocene and Pleistocene) wind-blown, fine to medium grained, well sorted marine quartz sand. Limitations include extreme wind erosion hazard, non-cohesive, highly permeable soil, very low soil fertility, localised flooding and permanently high water tables.

3. Previous Investigations

3.1 Finucane Reserve, Matraville, Site Brief (RCC 2024)

JBS&G was provided with a report (RCC 2024) which aimed to provide information on the site and the proposed upgrade works to assist with the undertaking of a DSI and development of a RAP. An investigation was conducted by RCC on the existing play facilities on site and determined that a portion of the play facilities and soft-fall was considered dangerous and required to be removed. Upon removal of these facilities, ACM was discovered which was capped and covered with approximately 0.2 m of clean material as identified by JBS&G (2025).

3.2 Detailed Site Investigation (JBS&G 2025)

JBS&G conducted a DSI across the site to characterise fill material to a depth of 0.5 m bgs. The scope of work comprised a desktop review, intrusive soil investigation, laboratory analysis of soil samples for contaminants of potential concern, comparison of soil data against EPA endorsed assessment criteria presented in the NEPC (2013) ASC NEPM, and preparation of a DSI report presenting the outcomes of the investigation.

The scope of the DSI included a desktop assessment of the site's environmental setting and historical land use, implementation of a sampling, analysis and quality plan (SAQP) involving collection and analysis of soil samples from 26 locations to a depth of 0.5 m, visual observations from an additional six investigation locations, soil sample analysis for a range of contaminants of potential concern (COPC), monitoring of surface emissions of any potential hazardous ground gases (HGG) to inform risk to site workers and users, data assessment including comparison of results against EPA endorsed land use criteria for developed open space scenarios.

Soil analytical results from the DSI are provided in **Table A** and **Table B (Appendix A)**. Soil sampling locations are presented on **Figure 3** and sampling locations where results exceeded adopted site assessment criteria applicable to the proposed land use scenario are presented on **Figure 4**.

Based on the results of the investigation it was concluded that:

- The site is generally absent of gross and/or widespread contamination. Notwithstanding, potentially unacceptable risks to future site users were identified at the site, as summarised following:
 - The presence of bonded ACM within subsurface soils above the Health Screening Criteria (HSL-C) and asbestos fines / fibrous asbestos (AF/FA) below the HSL criteria at one location (TP03_0.2-0.5) in the northeast of the site within the proposed works area (assumed to also be present in soil beneath the soft-fall playground surface). The presence of bonded ACM above criteria and AF/FA below the criteria will require management to ensure that ACM is not present on the site surface following redevelopment; and
 - The presence of bonded ACM within surficial soils at three locations (TP23, TP25 and TP31) outside the works area in the south of the site represents a potentially unacceptable risk to future site users and maintenance workers and as such impacted fill/soil requires to be managed.
- While current grass and soft-fall surfaces are maintained there are no complete exposure risks to asbestos fibres for current use and maintenance of these areas given the ACM and AF/FA is covered by existing grass or soft-fall rubber mitigating potential for fibres to be released and become airborne.
- The presence of asbestos in soil at the site should be identified via implementation of an Asbestos Register incorporated into an Asbestos Management Plan (AMP) in accordance with the *Work Health and Safety Regulation 2017* such that potential occupational exposure scenarios may be appropriately addressed during maintenance of the site in its current state until such time as the risks are removed;
- No other potentially unacceptable contamination risks to future site users were identified at the site;

- Asbestos air monitoring was conducted during the intrusive works with all reported results considered satisfactory and conforming with the minimum action level of 0.01 fibres/mL for control monitoring as outlined in the WHS Regulation and SafeWork NSW (2022) *Code of Practice – How to Safely Remove Asbestos*;
- Following the intrusive works, JBS&G conducted an asbestos clearance inspection for the site's ground surface. No asbestos was identified on the ground surface during the clearance. A clearance letter was prepared and issued to RCC on 8 January 2025 and a copy was included in the DSI report;
- No evidence of background contamination of site soils was identified;
- No unacceptable risk to site users were identified from surface HGG emissions based on the reported concentrations of methane gas and carbon dioxide;
- With consideration of the proposed land use, and observations made during the investigation, aesthetic issues other than the presence of visible ACM within surface soil were not identified;
- In absence of gross and/or widespread surficial soil contamination at the site, no potential issues relating to off-site migration of contaminants were identified under the current site conditions given the non-friable ACM in surficial soils and noting the friable asbestos at one location was not present in surface soil and covered by grass. Should existing vegetative cover be significantly disturbed, management actions would be necessary to appropriately manage the potential risk of airborne asbestos fibre generation and subsequent contaminant migration; and
- The site within the study boundaries is suitable for the proposed works and recreational use subject to the implementation of the below management recommendations.

Based on the conclusions and limitations of the investigation it was recommended that:

- Management of the identified asbestos contamination is undertaken via preparation and implementation of a RAP for the site within the study boundaries to be considered suitable for the proposed works; and
- In the meantime, appropriate asbestos management procedures should be implemented via preparation and implementation of an AMP and asbestos register to ensure occupational exposure risks are appropriately managed during any/all activities that result in ground surface disturbance.

4. Conceptual Site Model

4.1 General

The following sections present a conceptual site model (CSM) for the site prior to the commencement of remediation. The purpose of the CSM is to identify potentially complete source-pathway-receptor linkages at the site such that an informed assessment of potential remedial options can be made. **Figure 5** presents refined areas of environmental concern (AECs) following the intrusive investigation works presented in JBS&G (2025). Environmental data as abstracted from JBS&G (2025) are provided as **Appendix A**. Concentrations of COPCs have been screened against a range of criteria as appropriate to the assessment of potential contamination against residential land use and public open space land use. It is noted the CSM herein relates to the lateral extent of the site and the vertical site boundary being 0.5 m below ground surfaces of the site, as defined herein.

4.2 Conceptual Site Model

4.2.1 Sources of Contamination

Sources of contamination exist at the site as defined herein and reported in JBS&G (2025). Identified sources include uncontrolled fill material reported to variously contain ACM/AF/FA and anthropogenic inclusions of glass, scrap metal, brick and concrete fragments, terracotta and slag. Asbestos as ACM and AF/FA was the only contaminant identified to require management, with all other potential contaminants of concern reported below the adopted land use criteria.

4.2.2 Affected Media

The available environmental data indicates that surface soils and fill material to a depth of 0.5 m bgs in a number of areas at the site are contaminated. Soil media has been identified to variously contain bonded and friable asbestos at concentrations exceeding adopted recreational land use criteria at the locations shown on **Figure 4**. Each of the areas of affected soils are discussed following:

- Bonded ACM in subsurface fill material at one sampling location in the north (TP03, JBS&G 2025) exceeded the human health criteria between 0.2 and 0.5 m bgs. It is further noted that this location has been identified to be impacted with AF/FA in soil and as such, will require management specific to the health risk;
- Bonded ACM in fill material at three sampling locations in the south (TP23, TP25 and TP31, JBS&G 2025) exceeded the human health criteria in surface and subsurface soil to 0.5 m bgs; and
- Potential bonded ACM in fill material is assumed to be present within soils underneath the soft-fall surface of the play facilities based on information presented by RCC (2025) and the abovementioned result at TP03 adjacent this area. The level of impact/contamination is unknown. As reported by JBS&G (2025) the soft-fall surface and grass mitigates potential risk while these surfaces remain undisturbed.

4.3 Receptors and Exposure Pathways

As noted above, the contaminant of concern for this RAP is asbestos. Potential exposure risk to asbestos occurs where respirable fibres become airborne and are inhaled. For the proposed works and ongoing recreational use of the site, the greater risk from asbestos contamination is considered to be the ground surface and surficial soils that might be disturbed by shallow ground disturbance works or recreational activities.

Potential pathways and receptors of environmental impact within the site which will need to be addressed with respect to potential risks to current and/or future site users include:

- Current and future site users who may potentially be exposed to contamination through inhalation of fibres associated with asbestos contaminated/impacted soils if disturbed;
- Excavation/construction/maintenance workers conducting activities at the site, who may potentially be exposed to contamination through inhalation of fibres associated with asbestos contaminated/impacted soils if disturbed; and
- Existing and/or future users/occupants of and/or workers at adjoining properties should fibres from surficial contamination become airborne and migrate from the site and be inhaled.

4.4 Preferential Pathways

For the purpose of this assessment, preferential pathways have been defined as natural and/or man-made pathways that result in the preferential migration of COPC, such as service trenches in which fill materials and disturbed natural soil are anticipated to have a higher permeability than the surrounding undisturbed natural soils and/or bedrock. However, given the contaminant of concern at the site is asbestos, which is a solid, there is no potential for asbestos to migrate through subsurface environments.

5. Remedial Options

5.1 Remediation Objectives

The remediation objectives are outlined as follows:

- Remove or manage contamination sources and potentially unacceptable human health issues for the public open space as proposed for the site;
- Ensure unexpected contamination finds are assessed, managed and validated appropriately for the proposed land use;
- Validate the remedial works in accordance with relevant NSW EPA guidelines and with reference to the site-specific validation assessment criteria; and
- Document the validation process.

The RAP has been prepared with reference to the following guidelines:

- *State Environmental Planning Policy (Resilience and Hazards) 2021*;
- *Contaminated Land Guidelines, Sampling Design part 1 – Application*, NSW EPA, 2022 (EPA, 2022a);
- *Contaminated Land Guidelines, Sampling Design part 2 – Interpretation*, NSW EPA, 2022 (EPA, 2022b);
- *Contaminated Land Management: Consultants Reporting on Contaminated Land*, NSW EPA, May 2020 (EPA 2020);
- *Contaminated Land Management: Guidelines for NSW Site Auditor Scheme (3rd Edition)*, October 2017 NSW EPA (EPA 2017);
- *National Environment Protection (Assessment of Site Contamination Measure) Measure 1999, as amended 2013*, National Environment Protection council (NEPC 2013);
- *Work Health and Safety Act 2011*. NSW Government Legislation. (WHS Act 2011);
- *Safe Work NSW (2022) Code of Practice: How to Manage and Control Asbestos in the Workplace* (SWNSW 2022a);
- *Safe Work NSW (2022) Code of Practice: How to Safely Remove Asbestos* (SWNSW 2022b);
- *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*. WA Department of Health, 2009 (WA DoH 2009); and
- *Waste Classification Guidelines. Part 1: Classifying Waste*, NSW EPA, November 2014 (EPA 2014).

5.2 Extent of Remediation

Based on the findings of the previous investigations (**Section 3**) and the contamination status (**Section 4.2**), the extent of remediation to be undertaken within the development site has been estimated as follows and is shown on **Figure 4**:

- AF/FA impacted soil was observed in TP03 between 0.2 and 0.5 m bgs. The sample location is also noted to be contaminated with bonded ACM.
 - The lateral extent is estimated at approximately 60 m² as the sample location is located in a patched area noted to be the area where ACM was previously identified by the council and capped. The preliminary estimated volume of AF/FA/ACM contaminated soil, based on observations at the sampling location is approximately 20 m³;

- The impacted area mentioned above used to be a play area and hence an assumption has been made that the current playground area to the south which comprise an approximate area of 90 m² is also contaminated. No information is provided on any capping arrangements for this area so fill material from 0 to 0.5 m bgs are assumed to be contaminated. The preliminary estimated volume of AF/FA/ACM contaminated soil, based on these assumptions is approximately 45 m³. It is understood the existing soft-fall is to be replaced with minimal disturbances proposed for underlying soils. JBS&G proposes to inspect the area and conduct additional intrusive investigation into the fill material to the depth of 0.5 m bgs following removal of the existing soft-fall to confirm whether or not the area is impacted with asbestos. Otherwise, as a conservative approach the material would be considered to be impacted with asbestos.
- The total contaminated area relates to the TP03 area only and is approximately 60 m², with estimated volume of approximately 20 m³, with no remediation proposed in the existing soft-fall area until additional intrusive investigations are conducted to confirm the presence or absence of asbestos impacts.
- ACM contaminated soils were also observed in the southwestern portion of the site (TP23) from the surface to the extent of investigation (0.5 m bgs). The areal extent is estimated at approximately 45 m² and the preliminary estimated volume of ACM impacted soil is approximately 25 m³; and
- ACM contaminated soils were also observed in the southeastern portion of the site (TP25 and TP31) from the surface to the extent of investigation (0.5 m bgs). The areal extent is estimated at approximately 180 m² and the preliminary estimated volume of ACM impacted soil is approximately 90 m³. The impacted area was estimated based on observations of anthropogenic inclusions in adjacent test pits and patched sand with no vegetation.

5.3 Remedial Options Assessment

EPA (2017) adopts the NEPC (2013) ASC NEPM preferred remediation hierarchy as follows:

- 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.

The remedial options are evaluated in **Table 5.1** below. It should be noted that ACM contamination at TP03 is also impacted with AF/FA, and hence the preferred remediation option for one applies to the other.

Table 5.1: Remediation Options Assessment Matrix

Remedial Option	Applicability	Assessment
Option 1: On-site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level.	<u>AF/FA Impacts</u> AF / FA are typically heterogeneously distributed throughout impacted soils and are not readily visible to the naked eye. On this basis, there is no option considered appropriate to remove asbestos fibres from impacted soils on site. Furthermore, attempted removal of AF / FA from impacted soil would result in increased disturbance of AF / FA impacted soils and therefore associated potential health exposure and contaminant migration risks.	Not a suitable option for AF/FA/ACM impacted/contaminated material.
	<u>ACM only contaminated soils</u> Bonded ACM can be removed from impacted soils by hand-picking (emu-picking). Hand picking of ACM within fill material is labour intensive and can be costly and time, dependent upon specific factors, albeit typically less costly than landfill disposal of bulk soil material. Sufficient space is also required to temporarily stockpile and spread the material. The success of the remediation method is dependent upon the soil type and the amount of other building rubble present within the fill, and also on the adopted validation criterion. High proportions of clay or the building rubble may reduce the effectiveness of this option.	Suitable option
Option 2: Off-site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site.	<u>AF/FA Impacts</u> As above (Option 1).	Not a suitable option.
	<u>ACM only contaminated soils</u> As above (Option 1), however, there are reductions in noise and dust emissions on site in comparison to onsite treatment (Option 1), but these are offset by the requirement to transport material away from the site and so increased truck movements. Typically, the costs associated with transport and off-site treatment followed by returning the treated materials to site may be equivalent to the costs associated with disposal to landfill. This option also requires a suitable location for reuse of the treated material once returned to site and as such it would be necessary to confirm capacity and suitability for material to be used below proposed development levels.	Not a suitable option.
Option 3: Consolidation and isolation of the soil on-site by containment within a properly designed barrier.	<u>AF/FA/ACM Impacts</u> Asbestos contaminated/impacted soils are readily able to be consolidated and contained within the extent of the site under a suitable permanent physical barrier (cap) which would	The retention of the materials will reduce the waste generation and resource requirements of the remediation of the site. This is the preferred option with respect to the

Remedial Option	Applicability	Assessment
	remove the future exposure pathways between the contaminated soil and site users/workers. However, this would encumber the site with ongoing management requirements as the suitability of the site will be dependent upon maintaining the barrier. Containment of contaminated soil would require the potential exposure to contamination to be managed by the implementation of a passive AMP/ Environment Management Plan (EMP). There must be acceptance by the ultimate custodian of the land (in this case, RCC) that future controls will be implemented. Further, the AMP/EMP will require to be noted on future Section 10.7 Planning Certificates and within the Council property management system (for land to be managed by council).	remediation principles as a result of the low waste volumes and energy use. However, this option will require further consideration as application of an AMP/EMP to areas of the site where material is capped insitu will be required. This is the preferred remediation approach for the ACM contamination observed in the southern portion of the site. It is noted that the existing and proposed replacement soft-fall surface of the playground effectively acts as a cap to contain potential asbestos impacts below this area (if identified).
Option 4: Removal of contaminated soil to an approved site or facility, followed where necessary by replacement with clean fill	<u>AF/FA/ACM Impacts</u> There are currently suitably licensed waste facilities in the Sydney Metropolitan region capable of accepting asbestos contaminated soils. Offsite disposal of AF / FA impacted/contaminated soils is likely the fastest method of remediation and removes the requirement for ongoing management of the site under the contaminated land management framework. However, there are significant costs associated with disposal as a result of the NSW Waste Levy. Suitable material may possibly also be required to be imported to establish development levels, adding costs and vehicle movements during site works.	This is a suitable option where impacted soil removal is required to facilitate site redevelopment. This option would negate the need for an AMP/EMP on the site and as such presents the lowest risk to the client and future site users. However, given the potential quantities of soil excavation and off-site disposal is unlikely to be the most economical option. As soil in the works area requires disturbance, this is the preferred remediation approach for the AF/FA impacts observed within TP03 and vicinity.

5.4 Proposed Remedial Approach

Potential remedial options have been outlined in **Table 5.1**. Based on assessment of those options, giving consideration to the works proposed and the continued public open space land use, the preferred remedial strategy for the site is a combination of offsite disposal and onsite containment. Onsite containment requires a specific thickness of capping material discussed in **Section 6.2.2** and JBS&G considers this could be achieved by offsite disposal of some contaminated soils to allow for importation of capping material. On this basis, the below remedial approach is proposed:

- AF/FA impacts and bonded ACM contamination between 0.2 and 0.5 m bgs at and around TP03 are preferred to be excavated and disposed offsite.
- It is understood the existing soft-fall surface of the playground area south of TP03, where it is assumed underlying soil is also impacted by asbestos, is proposed to be replaced as part of the works. If asbestos is identified within this area following removal of the existing surface and additional intrusive investigations as discussed in **Section 5.2**, the preferred approach would be to ensure the material is

covered with a marker layer and the new soft-fall surface to act as an appropriate cap providing physical separation between site users and asbestos impacted soil beneath; and

- Bonded ACM contamination within the two areas highlighted in the southern portion of the site as presented on **Figure 4** are preferred to be excavated to a depth of 0.3 m bgs and disposed offsite for the remaining material to be contained and capped on site subject to ongoing management. This depth is considered suitable as it would prevent disturbance of capped soils and release of airborne fibres under typical recreational use and grounds maintenance scenarios.

As a contingency, if unexpected asbestos or other impacts are identified, or the preferred remedial options or validation fails, alternate approaches may be adopted. Contingency including unexpected finds is dealt with in **Section 8.1**.

6. Remedial Plan

The remedial scope of works is provided in the following sections.

6.1 Preliminary Works

6.1.1 Approval, Licenses and Notices

State Environment Planning Policy (Resilience and Hazards) 2021

From review of the site location and proposed activities, the remediation works are classified as Category 2 Remediation Works (**Section 11.1**) as per the meaning provided in *State Environment Planning Policy (Resilience and Hazards) 2021* (SEPP-RH) under which Section 4.11 does not require development consent from the local council for remediation of contaminated land.

A notice of commencement of remediation works must be given to council at least 30 days prior to commencement of remediation works. Notification of completion of remediation must be given to the council within 30 days of completion to meet SEPP-RH requirements.

Asbestos Works

Asbestos impacted/contaminated fill-based soils have been reported in JBS&G (2025). The asbestos has been identified in friable and bonded forms. To this extent, all asbestos management works will require the implementation of asbestos controls such as donning personal protective equipment (PPE), air monitoring for friable asbestos and dust suppression in accordance with relevant Codes of Practice (SWNSW 2022a⁹ and 2022b¹⁰) and further detailed in **Section 10**.

As friable asbestos has been identified within a portion of the fill materials at the site, a Class A friable asbestos removal contractor must be engaged to supervise or perform the works in these areas and the contractor will be required to obtain a site-specific permit from SafeWork NSW.

Remediation works shall not commence until all required approvals, licences and notifications have been granted and/or received.

6.1.2 Site Establishment

All safety and environmental controls are to be implemented as the first stage of remediation works. These controls will include, but not be limited to:

- Locate and isolate all required utilities in the proximity of the works;
- Assess need for traffic and pedestrian controls;
- Work area security fencing;
- Site signage and contact numbers;
- Stabilised site entry gate;
- Appropriate decontamination areas for personnel and plant
- Sediment fencing (attached to security fencing); and
- Stormwater runoff sediment controls.

Environmental controls are outlined in **Section 9**.

⁹ *How to safely remove asbestos - Code of Practice*, Safe Work NSW, 2022 (SWNSW 2022a)

¹⁰ *How to manage and control asbestos in the workplace - Code of Practice*, Safe Work NSW, 2022 (SWNSW 2022b)

6.2 Remedial Works

Areas requiring remediation are discussed in **Section 5.2**. The remedial works are required to be undertaken by a remedial contractor with appropriate qualifications, licences and experience, under the supervision of an Environmental Consultant. The scope of works will comprise the excavation and containment (or off-site disposal) of soils impacted and/or contaminated by asbestos. The remedial work stages are described in more details in the following sections.

6.2.1 Excavation of Impacted Soils

Soils impacted and/or contaminated by asbestos shall be excavated under the direction and supervision of the remediation consultant. The procedure for undertaking this excavation activity will be as follows:

- The areas will be designated by the Environmental Consultant, and the contractor will commence excavation of the soils;
- Excavation of the impacted soils will occur to a lateral and vertical extent as designated by the Environmental Consultant, at which point the Environmental Consultant will complete validation activities as per **Table 7.3**. The excavation will be inspected by an Environmental Consultant prior to sampling of the walls and base of each of the excavations for the relevant COPCs where applicable;
- Should validation be conducted by collecting samples and the initial validation assessment fail, the excavation will be extended laterally and/or vertically and additional validation samples are collected for analysis to demonstrate the validation has been successful, otherwise the excavation will be lined with marker layer and inspected by the Environmental Consultant;
- Upon successful completion of asbestos remedial excavations, the updated status of the remedial areas will be documented by the competent person/LAA via issue of a clearance certificate issued to the Remediation Contractor;
- Impacted soils are transferred to a temporary holding area on-site (as required) and stockpiled in accordance with **Section 9.3.2** (i.e. appropriately covered);
- Where impacted material is temporarily stockpiled outside of identified impacted areas and is placed on plastic or geofabric, a visual inspection only of the stockpile footprint will be required following loading into trucks for placement in the containment cell or offsite disposal. Where impacted material is temporarily placed on unsealed ground, the area is to be validated by The Environmental Consultant as per **Section 7**. Should validation fail, the failed portion will be excavated a further 0.2 m in the direction of the failure and the validation process repeated until validation is successfully achieved; and
- Once validation is achieved, the consultant will advise the contractor that the excavation area can be reinstated with validated site won or imported soil (**Section 7.4**), or if reinstatement is not required for development levels, the area can be made safe, with asbestos controls no longer required.

6.2.2 Capping and Containment

As identified in **Section 5**, onsite management of identified asbestos impacts in the southern areas of the site is preferred via containment and the implementation of permanent physical separation by containing the contamination below a suitable capping scenario, which eliminates future exposures subject to ongoing management controls.

With consideration to ANZECC (1999¹¹) guidance, the minimum requirements for the physical separation to be adopted in remediation of the site should include:

- Permanent concrete slabs or asphaltic concrete hardstand or similar that underlain where feasible by a visual “marker layer”, and where existing surfaces are to remain, preventing marker layer placement, the existing surface material (e.g. soft-fall rubber) acts as both the marker layer and the cap; or
- A minimum soil cover thickness in recreational areas which is underlain by a visual “marker layer”.

The marker layer shall consist of a bright coloured (orange or similar) non-woven polyester continuous filament or PET (such as nonwoven geotextiles) or similar with a minimum density of approximately 140 grams per square metre (or equivalent). The marker layer must:

- Be easily recognisable within soils (i.e., bright orange in colour);
- Be durable as a long term marker layer (i.e., > 140 grams per square metre); and
- Maintain integrity during remedial/civil works such as capping layer insulation and road/building construction.

Additionally, the marker layer must meet geotechnical and civil specifications where required.

In some recreational/landscape cases, such as where the capping thickness is reduced, a material that is harder to penetrate, such as a geo-grid type material, can be added across the marker layer to mitigate potential for accidental/inadvertent disturbance of the marker layer.

The specific details of the marker layer are required to be included in the site validation report and LTEMP documents in addition to surveyed plans showing the extent of capped area within the site.

6.2.2.1 Specific Capping Arrangements

The following capping arrangements are considered appropriate for the limited contaminated areas and the proposed upgrade works:

- New/replacement soft-fall areas – installation of marker layer immediately below any new or replacement soft-fall material (with any sub-grade if required) and above impacted or potentially impacted soil.
- Permanent hardstand areas (e.g., concrete paths/slabs, or asphaltic concrete or similar, but not bricks or pavers) – installation of a marker layer overlying potentially contaminated material followed by sub-grade material validated as environmentally suitable materials for human exposure and then the permanent structure (e.g., exterior concrete footpaths, asphaltic roads, etc.).
- Within underground services trenches / services – service infrastructure will require remediation to 150 mm below the depth of services, with a marker layer installed on the vertical and horizontal trench faces, followed by service installation and backfill consisting of environmentally suitable materials for potential human and/or ecological exposure.
- Turfed areas – installation of the marker layer at a minimum depth of 300 mm below final finished site levels, with a capping layer consisting of environmentally suitable materials for potential human and/or ecological exposure. A geo-grid layer can be placed over the marker layer to provide greater protection if required.

¹¹ *Guidelines for the Assessment of On-site Containment of Contaminated Soil*, Australian and New Zealand Environment and Conservation Council, September 1999. (ANZECC 1999).

- Mass planting / shallow landscaping areas – installation of the marker layer at a minimum depth of 500 mm below the final finished site levels, with a capping layer consisting of environmentally suitable materials for potential human and/or ecological exposure.
- New tree pit zones – installation of the marker layer at a minimum depth of 1500 mm below the final finished site levels, with a capping layer consisting of environmentally suitable materials for potential human and/or ecological exposure, noting that the marker layer should extend the depth required for installation of the new tree's existing root ball.

For the existing soft-fall area that will be replaced, if asbestos is identified and requires management, the new soft-fall material itself will act as capping above the marker layer which will be installed prior to replacement of the soft-fall material.

Material above the marker layer extending to the final finished ground level will be required to be environmentally suitable material for human and/or ecological exposure (as appropriate). This may include: virgin excavated natural material (VENM) sourced from on-site, imported VENM, excavated natural material (ENM) or similar material certified in accordance with an exemption issued by the NSW EPA that also meets site suitability criteria.

At the interface of remediated and non-remediated areas, the extent of the marker and capping layer should be extended a minimum of 300 mm laterally outside the extent of remediated area or to the extent of the site boundary, where practicable. This may include battering of the marker/capping layer to tie-in with existing site levels within the 300mm outside of the remediated area, where practicable.

Where a containment cell approach is to be adopted, prior to the commencement of works a capping specification document presenting the proposed location details, extent and specific capping requirements in relation to the proposed final ground surface treatment(s) will be prepared. This document will provide sufficient information, including indicative construction drawings (plan and cross section) to ensure correct interpretation by the remediation contractor.

Validation of capping arrangements will be required as outlined in **Section 7.3.1**, including inspections by the Environmental Consultant, a survey plan prepared by a registered surveyor showing the level and lateral extent of the marker layer and permanent capping in relation to the site boundaries.

6.2.3 Offsite Disposal of Material

Any contaminated soils or other waste generated during remediation to be disposed off-site shall be classified in accordance with EPA (2014) *Waste Classification Guidelines*.

Should natural soils/bedrock require off-site disposal then these shall also be classified in accordance with EPA (2014) *Waste Classification Guidelines* or an appropriate exemption as created under the *Protection of the Environment Operations (Waste) Regulation 2014*.

Waste certificates will be prepared for each stockpile and/or material type that is to be disposed. Disposal of waste to licensed waste facilities in accordance with relevant waste regulations will be undertaken by the Remediation Contractor and the waste facility must be lawfully licensed to receive the material sent to it for disposal.

All waste tracking documentation including disposal dockets must be maintained by the remedial contractor and must be provided to the client's representative and environmental consultant for inclusion in the validation report.

Any asbestos waste in one load disposed off-site must also be tracked using the NSW EPA online system Integrated Waste Tracking Solution (IWTS).

6.2.4 Asbestos Management

Based on the available characterisation information as discussed in **Section 4**, fill materials in portions of the site are impacted and/or contaminated with asbestos. Asbestos contaminated soil necessitating management for potential asbestos exposure is defined in SWNSW (2022b) as:

- Soil that contains visible asbestos as determined by a competent person; or
- Soil that contains asbestos fibres at quantities exceeding trace levels (considered to be the analytical detection limit in lieu of alternate guidance) as reported by analysis undertaken in accordance with AS4964:2004 *Method for the qualitative identification of asbestos in bulk samples*.

Environmental, health and safety management requirements for the handling of these materials will be documented in an Asbestos Management Plan (AMP) to be prepared based on the requirements provided for asbestos-related works in SWNSW (2022b), inclusive of preparation of an asbestos register and associated asbestos removal control/management plan.

Where sampling and analysis of specific fill materials is completed in conjunction with inspection by a competent person, and the results indicate the material does not fall within the “asbestos contaminated soil” definition, the requirements for management of “asbestos contaminated soils” will not be required to be implemented.

For the purposes of remediation works within site, a competent person shall be considered to be a person who holds a tertiary degree in a science of engineering discipline, has experience in contaminated site assessment, has completed a WorkSafe approved Asbestos Removal Supervisor course.

6.3 Material Importation

Based on the scope of remedial works described herein, it is anticipated that if materials are required to be imported to site, it will generally be as a result of construction requirements or otherwise to ensure appropriate growing media are established on the site.

Prior to importation of all material, appropriate assessment of such materials must be completed to demonstrate the material is both fit for purpose and suitable from a contamination view point. In accordance with EPA requirements, the extent of assessment will be determined by the type of material proposed to be imported.

Where material proposed to be imported is Virgin Excavated Natural Material (VENM), an assessment must demonstrate that the material is compliant with the definition of VENM as presented in the POEO Act 1997, adopting in the minimum requirements for characterisation of fill material as presented in EPA (2022a).

Where material proposed to be imported has been characterised under the Resource Recovery Framework (Order/Exemption), the material must firstly be demonstrated by the supplier as suitable for use in accordance with the requirements of the Order via provision of a statement of compliance. Suitable materials are anticipated to comprise but will not necessarily be limited to: excavated natural material – ENM, recycled aggregate, basalt fines, compost, mixed organic waste, pasteurised garden organics and recovered fines, with reference to the list of current orders and exemptions on the NSW EPA website.

In addition to the testing completed by the supplier, given the low frequency of compliance testing required under these Exemptions, the specific material proposed to be imported will require an additional compliance assessment prior to approval to import. The additional assessment is required to ensure that the incoming material does not pose an unacceptable risk to human health and/or environment at the placement site and is therefore suitable for use. It is anticipated that such assessment activities will include visual inspections, representative sampling and laboratory analysis (including asbestos as per NEPM/DOH) of material to demonstrate the material meets the requirements of this RAP. As for VENM assessments, it is considered suitable to define such requirements on a specific site basis given the potential variability of project site requirements.

Material tracking records in addition to the import assessment report are required to be included in the final validation report for the site.

6.4 Surveying

A qualified surveyor will be required to conduct surveying of excavations, stockpiles and remedial extent as required by the Client's representative such that the remedial/validation objectives can be achieved.

6.5 Validation

Validation of the remedial works will be conducted by the Environmental Consultant to demonstrate the remediation/management objectives have been achieved and to document the final condition of the site at the completion of works such that conclusions may be drawn on the end use suitability of the site for the proposed development. Details of the validation program are provided in **Section 7**.

6.6 Site Dis-establishment.

On completion of the remediation works all plant/equipment and safety/environmental controls should be removed from the site. Equipment used during asbestos remediation works will need to be appropriately decontaminated or disposed of as asbestos waste by the Remediation Contractor, in accordance with SWNSW (2022a), EPA (2014) and relevant waste regulations.

Details are provided in **Section 9**.

6.7 Contingency Plan

Given the available site history information, consideration has been given to the potential for additional small scale issues that may arise during works (from a contamination viewpoint). Should further impacted material (i.e. not previously identified) be identified as part of an Unexpected Find during remediation and/or earthworks/construction works, the remedial options screening matrix in **Table 5.2** will be required to be reviewed. Notwithstanding, it is anticipated that any impacts could be appropriately managed through either on site treatment/management or controlled excavation and off-site disposal.

7. Validation Plan

7.1 General

Data will be required to be collected during remediation/management and upgrade works to assess the effectiveness of the implemented management actions and document the final condition of the site at the completion of all works. Such information will allow conclusions to be drawn on the end suitability of the site for the proposed use. The general principles to be implemented with regard to the validation assessment are discussed in accordance with EPA (2017) requirements in the following sections.

It is anticipated that the validation assessment will be required to address the following broad issues:

- Validation that soil remediation works has managed / removed asbestos contaminated soils at the site;
- Validation that the final site surface does not contain visually identifiable bonded asbestos impacts or other unacceptable aesthetic issues; and
- Confirmation that marker layer is in place to retain underlying asbestos contaminated soils.

7.2 Data Quality Objectives

Data quality objectives (DQOs) have been developed for the validation assessment, as discussed in the following sections.

7.2.1 State the Problem

JBS&G (2025) has identified the presence of contaminated soil in three locations at the site. The contaminated soil requires to be remediated to make the site suitable for the proposed upgrade works and ongoing recreational land use.

To appropriately demonstrate that the remedial/management works have been completed in accordance with this RAP, sufficient data in the form of observations, sample analytical data, material tracking records, survey data, disposal docket, etc. are required to be collected and assessed in a defensible manner

7.2.2 Identify the Decision

The decisions which are required to be made for validation of the site are as follow:

- Are there any unacceptable risks to onsite or offsite receptors following the remediation of contaminated/impacted soil?
- Have all materials imported to the site been demonstrated as environmentally suitable for their proposed use?
- Have waste materials been classified and disposed from the site in accordance with the RAP and relevant regulatory guidelines?
- Have marker and capping layers (where required) been installed appropriately and in accordance with RAP requirements?
- Is there any potential migration of contaminants from the site?
- Have the works been completed in accordance with the RAP, or where variations to the works were required, have these met the objectives of the RAP?
- Is the site suitable for the proposed land uses without any requirement for ongoing management of contamination, or alternatively where material has been contained onsite is the site suitable subject to ongoing management?

7.2.3 Identify Inputs to the Decision

The inputs to the decision are:

- Previous investigation results as discussed in **Section 3**;
- The proposed upgrade works and final site features;
- Field observations in relation to inspection of all excavation bases, walls, stockpiles and final site surfaces for signs of asbestos impacts, aesthetic impact, or other indicators of potential contamination;
- Environmental data as collected from the validation of remedial excavations;
- Material characterisation data obtained during assessment of contaminated material for off-site disposal and/or surplus material prior to off-site disposal or beneficial re-use;
- Disposal dockets and relevant documents in relation to appropriate disposal of material (if required) to be removed from site as part of the remediation works (landfill dockets, EPA IWTS, beneficial reuse / recycling dockets, trade waste disposal, etc.);
- Material characterisation data (including field observations, sampling and analytical data) obtained during assessment of material proposed to be imported to the site;
- Relevant guideline criteria for validation and waste classification;
- Management measures documented within an Asbestos Register/Management Plan (if required) to ensure compliance with WHS legislation; and
- Data quality indicators (DQIs) as assessed by quality assurance / quality control (QA/QC).

7.2.4 Define the Study Boundaries

The lateral study boundaries are limited to the boundaries of the site, as shown on **Figure 2**.

The vertical extent of the investigation was to a maximum depth of 0.5 m bgs, considered sufficient for the proposed upgrade works and typical recreational use of the reserve.

7.2.5 Develop the Decision Rule

The decision rules adopted to answer the decisions identified in **Section 7.2.2** are discussed below in **Table 7.1** following.

Table 7.1 Summary of Decision Rules

Decisions Required to be Made	Decision Rule
1. Are there any unacceptable risks to onsite or offsite receptors following the remediation of contaminated/impacted soil?	Soil validation data shall be collected of the walls and base of excavations and treated material/soil proposed for reuse onsite with comparison of the subsequent laboratory data with adopted site validation criteria relevant for the proposed land use. If the soil validation results for each data set meet the adopted validation criteria, then the answer to the question will be No. If the soil validation results fail the adopted validation criteria for one or more datasets, then the answer to the question will be Yes. Further remedial works may be undertaken in this instance, with a subsequent repeat of the validation process.
2. Have all materials imported to the site been demonstrated as environmentally suitable for their proposed use?	Soil analytical results for imported material shall be compared against the assessment criteria. Where no statistically significant exceedances of the site assessment criteria are identified, the answer to the decision will be Yes. Otherwise the decision will be No.

Decisions Required to be Made	Decision Rule
3. Have waste materials been classified and disposed from the site in accordance with the RAP and relevant regulatory guidelines?	All material disposed from the site will require to be accompanied by adequate characterisation data (as appropriate) and waste classification (for soils). Documentation from the operation receiving the material including the dates, tonnage/volume and classification of the accepted material will be required to facilitate the decision. If the criteria stated above are satisfied, the decision will be Yes, and if receipts are provided recording the disposal of material to an off-site licensed facility, the decision will be Yes. If the material exceeds the criteria, and no disposal receipts are provided, the answer will be No.
4. Have marker and capping layers (where required) been installed appropriately and in accordance with RAP requirements?	Where survey and photographic documentation are available which confirm the extent of impacted material retained, and thickness of soil/mulch capping is appropriate, the decision will be Yes. Otherwise the decision will be No.
5. Is there any potential migration of contaminants from the site?	Should concentrations of contaminants remain at the site following validation, which could pose an unacceptable risk from migration (or should off-site sources pose a potentially unacceptable risk to the site), the answer will be Yes, and further investigation or management may be required. Otherwise, the answer will be No.
6. Have the works been completed in accordance with the RAP, or where variations to the works were required, have these met the objectives of the RAP?	Evaluation of the RAP requirements and completed scope of works will be completed on a qualitative basis. If the completed works are inconsistent with the RAP objectives, the answer will be No. In this instance, evaluation of the works will be undertaken with consideration to the RAP objectives. If the works are inconsistent with the stated objectives, the answer will be No. Otherwise, the answer to the decision will be Yes.
7. Is the site suitable for the proposed land uses without any requirement for ongoing management of contamination, or alternatively where material has been contained onsite is the site suitable subject to ongoing management?	If the answer to question 1 and question 5 of the above is No, and the answer to questions 2, 3 and 4 and 6 of the above is Yes, then the answer to the decision will be Yes. Otherwise, the answer to the decision will be No. In this instance further remediation/ management actions will require to be implemented and appropriately documented such that a future review of the above decisions may result in a different decision outcome.

7.2.6 Specific Limits on Decision Errors

This step is to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data. Data generated during this project must be appropriate to allow decisions to be made with confidence.

Specific limits for this project have been adopted in accordance with the appropriate guidance from the NSW EPA, NEPC (2013) ASC NEPM, appropriate DQIs used to assess QA/QC, and standard JBS&G procedures for field sampling and handling.

To assess the usability of the data prior to making decisions, the data will be assessed against pre-determined DQIs for to precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS parameters). The acceptable limit on decision error is 95% compliance with DQIs.

The pre-determined DQIs established for the project are discussed below in relation to the PARCCS parameters and are shown in **Table 7.2**.

- **Precision** – measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples.
- **Accuracy** – measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- **Representativeness** – expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** – expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; and ensuring analysing laboratories use consistent analysis techniques; and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.
- **Sensitivity** – expresses the appropriateness of the chosen field and laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted site assessment criteria.

Table 7.2 Data Quality Indicators

Data Quality Indicators	Frequency	Data Quality Criteria
Precision		
Field duplicate (intra laboratory)	1 / 20 samples/media	<50% RPD ¹
Field Triplicate (Inter laboratory)	1 / 20 samples/media	<50% RPD ¹
Laboratory Duplicates	1 / 20 samples/media	<50% RPD ¹
Accuracy		
Surrogate spikes	All organic samples	70-130% recovery
Laboratory control samples	1 per lab batch	70-130% recovery
Matrix spikes	1 per lab batch	70-130% recovery
Representativeness		
Sampling appropriate for media and analytes	All samples	.. ²
Samples extracted and analysed within holding times.	-	Organics (14 days), inorganics (6 months)
Laboratory blanks	1 per lab batch	<LOR
Trip spike	1 per lab batch (soil only)	70-130% recovery
Trip blank	1 per lab batch (soil only)	<LOR
Equipment/rinsate blank	1 per sampling event/media	<LOR
Comparability		
Standard operating procedures for sample collection & handling	All Samples	All Samples
Standard analytical methods used for all analyses	All Samples	NATA accreditation
Consistent field conditions, sampling staff and laboratory analysis	All Samples	All samples ²
Limits of reporting appropriate and consistent	All Samples	All samples ²
Completeness		
Sample description and COCs completed and appropriate	All Samples	All samples ²
Appropriate documentation	All Samples	All samples ²
Satisfactory frequency and result for QC samples		95% compliance
Data from critical samples is considered valid	-	Critical samples valid
Sensitivity		
Analytical methods and limits of recovery appropriate for media and adopted site assessment criteria	All samples	LOR ≤ site assessment criteria

¹If the RPD between duplicates is greater than the pre-determined data quality indicator, a judgment will be made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.

²A qualitative assessment of compliance with standard procedures and appropriate sample collection methods will be completed during the DQI compliance assessment.

If any of the DQIs are not met, further assessment will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data. Corrective actions may include requesting further information from samplers and/ or analytical laboratories, downgrading of the quality of the data or alternatively, re-collection of the data.

7.2.7 Optimise the Design of Obtaining Data

The purpose of this step is to identify a resource-effective field validation sampling design that generates data that are expected to satisfy the decision performance criteria, as specified in the preceding steps of the DQO process. The output of this step is the sampling design that will guide development of the field sampling and analysis plan. This step provides a general description of the activities necessary to generate and select data collection designs that satisfy decision performance criteria.

The remediation validation and subsequent laboratory analysis program as outlined in the following sections will need to be implemented during site remediation activities to demonstrate the successful completion of works in compliance with the RAP goals. The validation/characterisation sampling and analytical program for the site is outlined in **Table 7.3** below.

Table 7.3 Characterisation/Remediation Validation Program

Item	Sampling Frequency			Analytical Suite
	Excavation Floors	Excavation Walls	Materials/ Other	
Validation / Characterisation				
Validation of Bonded Asbestos and AF/FA impacted excavations	1/25 m ²	1 per 5 linear m	N/A	Asbestos (500 mL NEPM)
Validation of Bonded Asbestos impacted excavations	1/25 m ²	1 per 5 linear m	N/A	Asbestos (500 mL NEPM)
Excavations formed by removal of unexpected finds	To be determined by the environmental consultant.		N/A	To be determined by the environmental consultant
Waste classification of unexpected finds	N/A	N/A	1/25 m ³ to 200 m ³ , then as per Table 4 <i>Sampling design part 1 - application</i> (EPA, 2022a). (Minimum of 3 samples).	Heavy Metals, toral recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylenes (BTEX), organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs) and asbestos (500 mL)
Imported VENM, if required for remedial excavation reinstatement	N/A	N/A	If adequate documentati on is not available, generally up to 10 samples per source site should be analysed as appropriate based on proposed	Heavy metals TRH/BTEX PAHs OCPs/PCBs Asbestos (500 mL)

Item	Sampling Frequency			Analytical Suite
			import volumes	
Imported ENM, if required for remedial excavation reinstatement	N/A	N/A	As per EPA ENM Order	Heavy metals TRH/BTEX PAHs pH EC RTA 276 (foreign materials) Asbestos
Recycled/Recovered Products	N/A	N/A	Minimum of 3 samples per source site.	Heavy metals TPH/BTEX PAHs OCPs/PCBs Asbestos (500mL)

7.3 Validation Methodology

7.3.1 Validation of Excavations

Samples will need to be collected by an appropriately trained and experienced environmental scientist/engineer from the TP03 area using a hand trowel or from the bucket of mechanical excavation equipment, at the required densities to meet the project DQOs. The remaining areas are proposed to be covered by a marker layer and capped with approved imported material, and hence no validation sampling of the excavation is required.

Prior to collection of each sample, hand tools will need to be thoroughly decontaminated using phosphate free detergent and distilled water as per **Section 7.3.5**.

During the collection of soil samples, features such as seepage, discolouration, staining, odours and other indicators of contamination will need to be noted on the field documentation.

7.3.2 Capping Arrangement Validation

Marker Layer Inspection

Visual inspection will be undertaken by the Environmental Consultant to verify the installation of the marker layer across the excavations. Photographic records and a survey of the marker layer installation, including vertical and lateral extents by the Remedial Contractor will be retained for inclusion in the validation report.

Capping Layer Validation

Material to be used as a capping layer must be validated by the Environmental Consultant to be environmentally suitable, consisting of VENM, suitable on-site materials or material considered suitable for beneficial reuse via a resource recovery exemption issued by NSW EPA. Additionally, all assessment results for proposed capping layer material must demonstrate contaminant concentrations do not exceed the adopted site validation criteria for soils.

The capping layer must be placed at the thicknesses specified for each capping scenario as detailed in **Section 6.2.2**. Photographic records and a survey of the capping layer installation, which details the final thicknesses

of the capping layer, including the vertical and lateral extents by the Remedial Contractor will be prepared for inclusion in the validation report and long-term AMP/EMP.

7.3.3 Sample Handling

Collected samples will be immediately transferred to sample containers of appropriate composition (glass jars for chemical analysis, plastic bags for asbestos). Sample labels recorded: job number; sample identification number; and date of sampling.

Sample containers will be transferred to a chilled ice box for sample preservation prior to and during shipment to the testing laboratory. A chain-of-custody form will be completed and forwarded with the samples to the testing laboratory.

7.3.4 Duplicate and Triplicate Sample Preparation and QA/QC Requirements

Field duplicate and triplicate samples for the characterisation/validation assessment will be obtained during sampling using the procedures outlined at a frequency outlined in **Table 7.3**. The primary sample will be divided laterally into three samples with minimal disturbance to reduce the potential for loss of volatiles and placed in three clean glass jars and / or plastic bags. All jars will be filled completely with no headspace to reduce the potential for loss of volatiles and separately labelled as the primary, duplicate and triplicate samples before being placed in the same chilled esky for laboratory transport.

Trip spike, storage blank and rinsate samples will be collected where analysis for volatile compounds is required.

7.3.5 Sampling Equipment Decontamination

The following procedure will be used to clean non-disposable equipment, including the trowel, pick etc., prior to the collection of each sample:

- Scrubbing with a wire brush to remove gross contamination;
- Pressure spray with Decon 90 detergent and potable water mix;
- Pressure spray rinse with potable water; and
- Air drying.

Rinsate samples will be obtained during the field decontamination procedures at regular intervals during characterisation/validation sampling activities (which include reusable equipment and validation of non-asbestos impacts). Each rinsate sample will be obtained by rinsing the trowel with laboratory grade demineralised water following the decontamination procedure. The water sample will be appropriately preserved and stored with the site samples prior to transport to the laboratory for chemical analysis.

7.3.6 Laboratory Analyses

Eurofins MGT Pty Ltd (Eurofins) will function as the primary laboratory for the required analyses. The secondary laboratory to be contracted for the works will be Envirolab Services Pty Ltd (Envirolab). All laboratories are National Association of Testing Authorities (NATA) registered for the relevant analyses. In addition, the laboratories are required to meet JBS&G's internal QA/QC requirements.

7.3.7 Validation of Unexpected Finds

The procedure described below shall be required if unexpected, impacted soils requiring remediation and validation are identified during the works, consistent with the unexpected find protocol presented in **Section 8.1** and **Figure 8.1**.

Samples will be collected and analysed in accordance with the analytical schedule (**Table 7.3**) by NATA accredited laboratories.

A suitably qualified Environmental Consultant will be required to assess unexpected finds and undertake the validation inspections and sampling to verify such finds have been addressed and the areas meet the validation criteria in this RAP.

7.4 Validation Criteria

As discussed, the site will undergo upgrade works and will continue to be used as a public open space and in accordance with the decision process for assessment of recreational open space / parks sites (EPA 2017), validation criteria sourced from the publications have been adopted:

- HSLs for asbestos levels in soil for residential A with garden/accessible soil (HSL A), residential B with minimal opportunities for soil access (HSL B) and recreational (HSL C) land use scenarios;
- Health Investigation Levels (HILs) for recreational / public open space (HIL C) land use scenario;
- Soil Health Screening Levels (HSLs) for Vapour Intrusion for recreational (HSL C) land use scenario with sand soils;
- Generic ecological investigation levels (EILs) for urban residential and public open space land use scenarios;
- Ecological Screening Levels (ESLs) for urban residential and public open space land use scenarios in coarse soil;
- Management limits for petroleum hydrocarbons for residential, parkland and public open space land use. Following the NEPM guidance, Management limits are considered only after HIL/HSLs and EIL/ESLs; and
- Aesthetic considerations, applicable for all land uses.

The results of asbestos analysis are assessed in general accordance with NEPC (2013) including DOH (2009) guidance with regard to asbestos in soil.

Where there were no NSW EPA endorsed thresholds the laboratory limit of reporting (LOR) was adopted as an initial screening value for the purposes of this assessment.

In addition to the numerical criteria for chemical and asbestos contaminants, consideration shall be given to the aesthetic characteristics of material the subject of validation, including the presence of soils that are odorous or discoloured because of contamination, or otherwise contain significant quantities of non-soil inclusions (ie. construction and demolition waste and similar).

7.4.1 Offsite Disposal Criteria

Where contaminated fill/soil is not suitable for onsite management or is surplus to construction requirements, materials are proposed to be remediated by off-site disposal. Materials shall be classified in accordance with EPA (2014) *Waste Classification Guidelines* or an appropriate exemption as created under the *Protection of the Environment Operations (Waste) Regulation 2014*.

7.4.2 Imported Soil Criteria

In accordance with current EPA policy, only material that does not represent an environmental or health risk at the receiving site may be considered for resource recovery. Imported materials will only be accepted to the site if they meet the restrictions placed on these materials and meet the definition of:

- VENM as defined in the *Protection of the Environment Operations Act* (1997) Schedule 1;
- ENM as defined in EPA (2014); or
- Resource recovery materials as per an EPA exemption.

All material imported onto the site are required to be accompanied by appropriate documentation that has been verified by the appointed site contamination (environmental) consultant. All materials will be required to be inspected upon import to the site by the appointed site contamination (environmental) consultant to confirm consistency with provided documents and/or consistency with observations made at the source site.

Sampling of materials as per an EPA exemption (recycled products) is required to be undertaken by the facility in accordance with the relevant exemption. In addition, where materials are proposed for beneficial reuse under a NSW EPA exemption (i.e. imported to the site), fill material will need to be further assessed by an Environmental Consultant for land use suitability.

7.5 Validation Reporting

At the completion of the remedial works a Validation Report will be prepared in general accordance with the *NSW EPA Guidelines for Consultants Reporting on Contaminated Land* (EPA 2020), documenting the works as completed. This report will contain information including:

- Results of previous investigations conducted at the site;
- Details of the remediation works conducted;
- Information demonstrating that the objectives of the RAP have been achieved, in particular the validation sample results and assessment of the data against both the pre-defined DQO and the remediation acceptance (validation) criteria;
- All material tracking data;
- Any variations to the strategy undertaken during the implementation of the remedial works;
- Results of all environmental monitoring undertaken during the course of the remedial works;
- Details of any environmental incidents occurring during the remedial works and the actions undertaken in response to these incidents;
- Verification of regulatory compliance;
- Details on waste classification, tracking and off-site disposal including landfill dockets;
- The extent of impacted materials as retained on the site and subject to the long-term management provisions (as required); and
- Clear statement of the suitability of the site with respect to permissible land uses.

The report will serve to document the remediation, and validation works for future reference.

7.5.1 Long-term Environmental Management Plan

In addition to the requirements of the validation plan, should the remediation strategy implementation result in onsite containment of material above land use criteria such that a long term environmental management plan (EMP) is required, this document will be required to address the following in accordance with EPA (2022c¹²).

An AMP will be required where contamination includes asbestos in soil at a workplace, either in addition to the EMP where asbestos concentrations exceed land use criteria and ongoing contamination management is required, or in place of an EMP where asbestos impacts are below land use criteria and do not pose a health risk to use of the land but requires management from a WHS perspective only.

¹² Practice Note. *Preparing Environmental Management Plans for Contaminated Land*. NSW EPA January 2022 (EPA 2022c)

The precise nature and extent of the management requirements will not be known until remediation/management works are conducted and the validation data obtained. The long term EMP will be prepared for the relevant portions of the Site following the completion of the validation report.

The long term EMP is required to document the following elements:

- A statement of the objectives of the long term EMP – i.e., to ensure continued suitability of the Site portion following remediation.
- Identification of residual environmental contamination issues at the Site that require ongoing management/monitoring to meet the long term EMP objectives, including the type of contamination and location within the Site (including a survey plan prepared by a registered surveyor).
- Documentation of environmental management measures which have been implemented to address the identified environmental issues at the Site.
- Description of management controls to limit the exposure of Site users to known areas of contamination to acceptable levels.
- Description of responsibilities for implementing various elements of the provisions contained in the long-term EMP.
- Timeframes for implementing the various control/monitoring, etc. elements outlined in the long-term EMP.
- Environmental monitoring and reporting requirements (if required) for the future management of environmental impact underlying the Site including:
 - Appropriate monitoring locations and depth within and down-gradient of any residual contamination;
 - Relevant assessment criteria to be used in evaluating monitoring results;
 - Frequency of monitoring and reporting;
 - Process for reviewing monitoring data and how decisions will be made regarding the ongoing management strategy;
 - The length of time for which monitoring is expected to continue;
 - The regulatory authorities involved, and the management inputs required from each;
 - The integration of environmental management and monitoring measures for soil;
 - Health and safety requirements for particular activities;
 - A program of review and audits;
 - The provisions in the long term EMP are feasible (i.e., able to be implemented) and able to be legally enforceable (i.e., a mechanism exists, such as development consent conditions, to give the plan a basis in law); and
 - The relevant consent authority is satisfied that the inclusion of a development consent condition relating to the implementation of the long term EMP is acceptable.
- Corrective action procedures to be implemented where long term EMP assessment criteria are breached.

8. Contingency Plan

A review of remediation works has been undertaken to identify potential risks to meeting the specified site validation criteria. A number of potential risks have been identified. These are listed following with contingencies that will be implemented to ensure that validation criteria are met.

Additionally, the associated remedial works health and environmental risks/hazards and their minimisation/mitigation are further discussed in **Sections 9** and **10**.

8.1 Unexpected Finds Protocol

It is acknowledged that previous works have been undertaken to identify contaminants of potential concern. However, ground conditions between sampling points may vary, and further hazards may arise from unexpected sources and/or in unexpected locations during remediation. The nature of any residual hazards which may be present at the site are generally detectable through visual or olfactory means, for example:

- Friable asbestos and other contamination encountered outside the extent of known impacts, such as from hazardous building materials including asbestos and lead-based paints in building footprints following demolition;
- Construction / demolition waste (visible) outside the known extent;
- Other previously unidentified contaminated soils / fill materials (visible);
- Bottles / containers of chemicals (visible); and
- Odorous or discoloured soils.

As a precautionary measure to ensure the protection of the workforce and surrounding community, should any of the abovementioned materials be identified (or any other unexpected potentially hazardous substance), the procedure summarised in **Figure 8.1** and detailed in the following sections is to be followed.

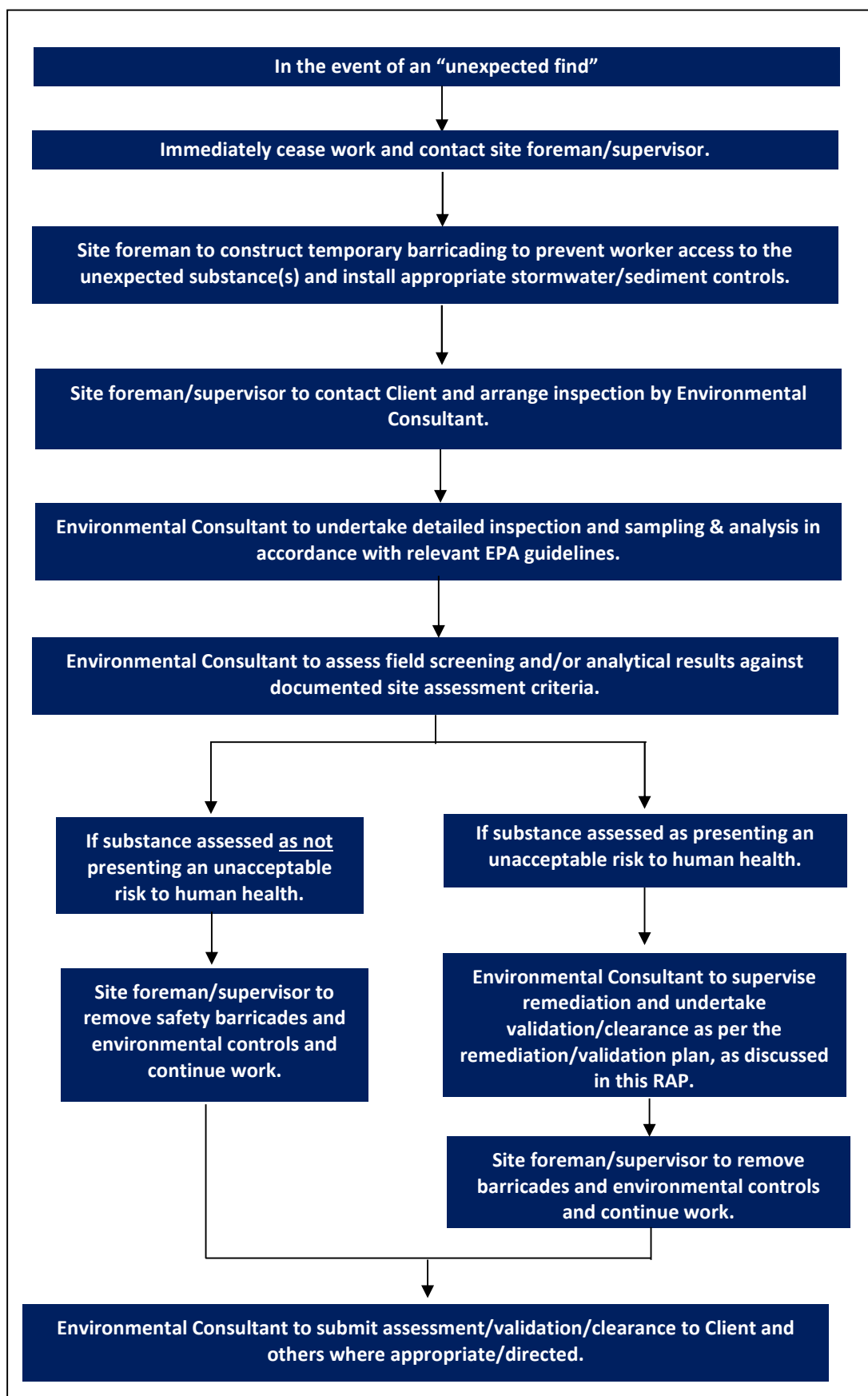
An enlarged version of the unexpected finds protocol, suitable for use on site, should be posted on site by the Client or Contractor.

The sampling strategy for each “unexpected find” shall be designed by a suitably qualified Environmental Consultant and should aim to determine the nature of the substance and whether it is at concentrations which pose an unacceptable risk to human health or the environment.

The sampling frequency of the identified substance/materials shall meet the minimum requirements outlined in EPA (2022a).

Where the preferred or contingent remedial strategies presented in this RAP may not be feasible based on assessment of an unexpected find, an alternate remedial strategy will require documentation, including any additional/alternate site management controls and validation requirements.

Figure 8.1 – Unexpected Finds Protocol



8.2 Remedial Strategy Failure

In the event that the proposed remediation works do not meet the validation criteria, or if the selected remedial strategy is not able to proceed, the following actions will be considered to ensure firstly the safety and health of people and the environment and secondly that the overall project objectives are achieved.

1. Reassessment of remedial and validation options for the proposed development area.
2. Continued controlled excavation for on-site remediation or off-site disposal until validation is achieved.

9. Site Management Plan

9.1 Contact Persons

Contact details for key personnel involved in remediation and validation works are summarised in **Table 9.1**.

Table 9.1 Contact Details

Client's Supervisor/Manager	Details
Name	To be advised
Company	To be advised
Address	To be advised
Contact Phone	To be advised
Remediation Contractor	Details
Name	To be advised
Company	To be advised
Contact Phone	To be advised
Name	To be advised
Company	To be advised
Address	To be advised
Contact Phone	To be advised

9.2 Hours of Operation

Remediation works shall only be permitted during the following hours, or as approved by the Randwick City Council within the consent:

- Monday to Friday: 7:00 am to 5:00 pm
- Saturdays: 8:00 am to 5:00 pm
- Sundays and Public Holidays: No work permitted.

Emergency work is permitted to be completed outside of these hours.

9.3 Soil and Water Management

All works shall be conducted in general accordance with Landcom (2004)¹³ guidance (the Blue Book), which outlines the general requirements for the preparation of a soil and water management plan.

All remedial works shall be conducted in accordance with a soil and water management plan, which is to be kept onsite and made available to council officers on request. All erosion and sediment measures must be maintained in a functional condition through the remediation works by the remedial contractor.

To prevent the migration of impacted soil off site, silt fences shall be constructed at the down-gradient site boundaries by the remedial contractor. Any material which is collected behind the sediment control structures shall be removed off site to a licensed waste facility after waste classification.

¹³*Managing Urban Stormwater: Soils and Construction*, Landcom 4th Edition, March 2004.

In storm or extended rainfall event, the structures located on site for sediment control shall be monitored and replaced or altered if necessary by the contractor. Collected material shall be managed in accordance with remediation works by the contractor.

9.3.1 Site Access

During remediation works, perimeter fencing will be maintained to restrict access to the works area. Only authorised persons will be able to enter the works area.

Vehicle access to the works area shall be stabilised to prevent the tracking of soil around the site and the adjoining driveway/access point to the road will be swept or cleaned on an as-needed basis. Any collected materials shall be treated as potentially contaminated and will be suitably managed.

9.3.2 Stockpiles

The following procedures will be implemented:

- No stockpiles or other materials shall be placed on footpaths or roadways and will be away from all stormwater infrastructure (including drainage lines, stormwater pits, gutters, etc) where possible. Where this is not possible, sediment controls will be placed over stormwater grates to prevent ingress of sediment to stormwater drainage lines.
- Stockpiles shall be formed with sediment control structures placed immediately down slope to protect other lands and waters from sediment pollution.
- All asbestos impacted soils will be covered with plastic or geotechnical fabric.

9.3.3 Excavation Pump out

Excavation pump out water (if any) shall be pumped from the excavation by a licensed contractor and disposed of off-site as “liquid waste” in accordance with EPA (2014).

9.4 Noise

The remediation works shall comply with the NSW EPA’s Environmental Noise Control Manual for the control of noise from construction sites.

All machinery and equipment used on site will be in good working order and with the fitted with appropriate silencers when necessary.

9.5 Air Quality

9.5.1 Air Monitoring

Airborne asbestos fibre monitoring is recommended to be conducted during the works in accordance with requirements of the National Occupational Health and Safety Commission (NOHSC) *Asbestos Code of Practice and Guidance Notes*, in particular the guidance note for the estimated of airborne dust [NOHSC 3002:2005].

The consultant shall undertake airborne asbestos fibres monitoring at a minimum of five static locations daily during remediation works that will disturb asbestos impacted or contaminated materials. Monitoring locations will include works perimeter locations and downwind locations. Wind Rose information available from the Bureau of Meteorology (BOM) for the nearest weather stations will be used to determine common prevailing winds in the area.

Air filters shall be analysed by a NATA accredited laboratory and results shall be required to be below 0.01 fibres/mL. All detections of fibres shall be further analysed by scanning electron microscope (SEM) to confirm the fibres are asbestos.

If respirable asbestos fibres are confirmed and present between 0.01 and 0.02 fibres/mL, the following controls must be implemented by the licensed asbestos removalist, in accordance with SWNSW (2022a):

- Review control measures;
- Investigate the cause; and
- Implement controls to eliminate or minimise exposure and prevent further release.

If respirable asbestos fibres are confirmed and present above 0.02 fibres/mL, the following controls must be implemented by the licensed asbestos removalist, in accordance with SWNSW (2022a):

- Stop removal work;
- Notify SafeWork NSW by phone, then by fax or written statement that work has ceased;
- Investigate the cause;
- Implement controls to eliminate or minimise exposure and prevent further release; and
- Do not recommence removal work until further air monitoring is conducted and fibre levels are detected below 0.01 fibres/mL.

A daily report air monitoring report will be prepared documenting the previous/same days airborne asbestos fibre air monitoring results. This report will be made available to all relevant stakeholders and site workers.

9.5.2 Dust Control

During the remediation, dust levels will be monitored and minimised as necessary by using mist sprays or water spray application on the ground surface via watercart. Dust shall also be controlled by ensuring vehicles leave via the designated (stabilised) site access point.

9.5.3 Odour

No odours should be detectable at the site boundary. Appropriate actions will be taken to reduce the odours, which may include increasing the amount of covering of excavations / stockpiles, mist sprays, odour suppressants or maintenance of equipment.

Records of volatile emissions and odours shall be kept by the remediation manager. Equipment and machinery will be adequately maintained to minimise exhaust emissions. No materials shall be burnt on the site.

9.6 Groundwater

Based on the CSM, it is not anticipated that groundwater remediation and/or dewatering activities will be required as part of the remediation works.

9.7 Material Transportation

The transporting contractor shall ensure there is no material tracked out onto the street and that the load is securely covered. In addition, all site vehicles must leave the site in a forward direction.

All appropriate road rules shall be observed, and state roads will be selected as far as practicable over local roads when deciding on the transport route to the off-site material disposal location.

Where material is to be imported, controls are to be implemented to maintain separation between contaminated and non-contaminated materials.

9.8 Hazardous Materials

All hazardous and/or intractable wastes (if any) shall be removed and disposed of in accordance with the relevant regulatory requirements. In particular, any hazardous wastes will be transported by a licensed transporter.

9.9 On-site Containment of Contamination

Leaving contaminated soil in-situ is an element of the remediation strategy for the site. Any materials to be contained on site will have regard to the requirements outlined in the *Guidelines for the Assessment of On-site Containment of Contaminated Soil* (ANZECC 1999) and any ongoing management provisions shall meet the requirements outlined in *Contaminated Land Management Guidelines for the NSW Site Auditor Scheme, 3rd Edition* (EPA 2017).

Implementation of the ongoing EMP will manage risks associated with disturbance of the contained contaminated material.

As noted in **Section 7.5.1**, an AMP is required where asbestos is present at a workplace. Where the asbestos contained at the site does not exceed land use criteria and as such does not pose a health risk to use of the land, an EMP would not be required for ongoing contamination management, however an AMP would be required to manage WHS risks.

9.10 Disposal of Contaminated Soil

All soil will be classified, managed and disposed in accordance with the *Waste Classification Guidelines Part 1: Classifying Waste* (EPA 2014), and *Protection of the Environment Operation (Waste) Regulation* (Waste Regulation).

9.11 Site Signage and Contact Numbers

Throughout the duration of the works appropriate signage shall be erected around the remediation area and stockpiles with the contact details of the remediation contractor and project manager.

9.12 Complaint Reporting and Resolution

Complaints from adjoining site occupants or workers on site will be directed initially to the civil/remediation contractor on site. Following that, discussion with the Environmental Consultant and the Client, and the complaint will be investigated, and the issue remedied as required or applicable.

10. Health and Safety Plan

This health and safety plan contains procedures and requirements that are to be implemented as a minimum during the remediation works.

The objectives of the health and safety plan are:

- To apply standard procedures that reduce risks resulting from the above works;
- To ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- To have procedures to protect other site workers and the general public.
- These objectives will be achieved by:
 - Assignment of responsibilities;
 - An evaluation of hazards;
 - Establishment of personal protection standards and mandatory safety practices and procedures; and
 - Provision for contingencies that may arise while operations are being conducted at the site.

This health and safety plan does not provide safety information specific to construction or excavation activities carried out by contractors, such as the safe operation, maintenance and inspection of plant, etc. Contractors will be required to prepare their own Safe Work Method Statements for their work activities. All parties working on the site shall comply with all applicable Health and Safety legislation, regulations, codes and guidelines.

10.1 Responsibilities

Remediation Supervisor

The remediation supervisor is responsible for ensuring that the work is carried out in accordance with the health and safety plan. This will include:

- Ensuring a copy of the health and safety plan is available at the site during the remediation/validation activities;
- Confirming individuals are competent in performing allotted tasks;
- Liaison with the contractor representatives, as appropriate, regarding safety matters; and
- Investigation and reporting of incidents and accidents.

Other Members of the Site Workforce

Every individual worker is responsible for conducting their allocated tasks in a safe manner and in accordance with their training and experience. They must give due consideration to the safety of all others in their proximity and cooperate in matters of health and safety. All workers must leave their work areas in such a condition that the location will not be hazardous to others at any time.

10.2 Hazards

Job Risk Assessments (JRAs) and Safe Work Method Statements (SWMS) will need to be supplied by the Remediation Contractor and incorporated into the Health and Safety plan detailing all the known or potential hazards associated with the work activities some are listed below.

10.2.1 Inhalation Hazards

The main inhalation hazards from the remediation/validation works are consequent of the presence of asbestos. Measures are required to be put in place to prevent/ minimise the generation of airborne fibres. These have been described in the environmental controls for the works. Where there is a potential for airborne emissions to be generated, PPE shall be required to be worn to prevent potential exposure, as described in **Section 10.3**.

10.2.2 Chemical and Microbiological Hazards

In addition to the previously identified asbestos hazards, should chemical and microbiological impacts be identified at the site, care must be taken to ensure that the contamination is not introduced to the worker via ingestion, inhalation or absorption. PPE and decontamination requirements related to asbestos remedial works and summarised in **Sections 10.3** and **10.5** are sufficient for managing any potential exposure to chemicals and microbiological hazards in soils.

10.2.3 Physical Hazards

Operating Machinery

Heavy plant and equipment operating in the vicinity of field personnel presents a risk of physical injury. Personnel should be cognisant of their position in relation to operating machinery at all times.

Never walk behind or to the side of any operating equipment without the operator's knowledge. Do not assume that the operator knows your position. Personnel should stay at least 1 m from the operational area of heavy equipment and should not stand directly below any load or piece of equipment (e.g. backhoe/excavator).

Work In or Near Excavations

All excavations shall be shored, sloped or otherwise constructed so as to minimise the potential for collapse. Appropriate physical barriers should be erected during and on completion of excavations to prevent any personal entering the excavation area.

Cuts and Abrasions

The manual work associated with the remediation works may give rise to the risk of cuts and abrasions to personnel working in the area. As well as the direct consequences of any cut or abrasion, such injuries can lead to the possibility of exposure to contaminants through the wound as well as diseases such as tetanus. To minimise the risk of direct or indirect injury, personnel will wear the personal protective equipment described in **Section 10.3**.

Heat Stress and UV Exposure

Site personnel may experience heat stress due to a combination of elevated ambient temperatures and the concurrent use of personal protection equipment; this depends in part on the type of work and the time of year.

In addition to heat stress, overexposure to UV radiation in sunlight can result in sunburn to exposed skin. The use of a high protection sunscreen (SPF15 or greater) on all exposed skin is recommended. Hats (including hard hats in specified areas) will also provide additional sun protection during the peak (i.e. 10:00 am to 3:00 PM) sun period. Sunglasses should be worn (where appropriate) to protect eyes from effects of UV exposure.

Underground Services

There is the potential for underground services (electricity, natural gas lines, water, telephone, sewer, and stormwater) to be present beneath the work area. The remediation contractor shall ensure that appropriate procedures will be taken to minimise the risk associated with excavation near services.

Aboveground Electrical Hazards

All electrical plant and equipment must comply with the requirements of Australian Standard AS 3000. Hand held portable tools shall comply with AS/NZS 3160 "hand-held portable electric tools" and shall be double insulated. Cord connected portable hand lamps shall comply with AS/NZS 3118. A Residual Current Device (RCD) shall protect plug-in portable equipment, which is connected to a supply above Extra Low Voltage - 12-24volts (including equipment supplied from a generator or welding set). RCD protection shall be provided during maintenance of portable electrical equipment at all times while the equipment is connected to a power supply above Extra Low Voltage, irrespective of whether power is switched ON or OFF. RCD's shall comply with AS 3190 and shall be type II units, rated to trip at or below 30 milliamps within 40 milliseconds.

No excavator, drill rig or crane may work within 6 m of overhead distribution power lines, subject to necessary precautions undertaken.

Manual Handling

When lifting or handling heavy objects, use correct lifting techniques, bending the knees not the back. If the item to be lifted is too heavy or awkward for one person to lift, seek assistance from other company employees or use mechanical help.

Noise

Long-term exposure to high levels of noise is unlikely during this project. However, operating machinery may cause significant noise exposures for short periods. Earplugs or earmuffs should be worn in any situation where noise levels make normal conversation difficult.

10.3 Personal Protective Equipment

All workers who may come into direct contact with contaminated soil will wear the following minimum personal protective equipment (PPE):

- Overalls or long sleeved collared shirt;
- Heavy duty outer gloves (e.g. leather) where there is a risk of cuts or abrasions, otherwise PVC outer gloves if in direct contact with contaminated soil;
- Steel capped boots;
- Safety glasses;
- High visibility vest or jacket; and
- Hard hat.

10.4 Asbestos Air Monitoring Procedures

Friable and non-friable ACM has been identified at the site. As discussed in **Section 9.5.1**, monitoring is required for movement and removal of friable asbestos. Air monitoring for asbestos removal work can be beneficial as the results can be used:

- To identify failures in containment;
- To identify poor work practices; and
- To provide proof of containment for occupiers and regulatory authorities and to provide evidence of good work practices for both present and future needs.

Where undertaken, monitoring will be conducted in accordance with the National Occupational Health & Safety Commission (NOHSC) membrane filter method as approved by the National Association of Testing Authorities (NATA).

The appropriate TWA (NOHSC) levels are:

- Amosite - 0.1 fibre/mL;
- Chrysotile – 0.1 fibre/mL;
- Crocidolite - 0.1 fibre/mL;
- Other forms of asbestos - 0.1 fibre/mL; and
- Any mixture of these, or where the composition is unknown - 0.1 fibre/mL.

With consideration to these levels the following trigger levels have been developed:

- If airborne fibre levels reach 0.01 fibres/mL the source of fibre release is to be found and rectified. Work in the affected area does not have to stop; and
- If airborne fibre levels reach 0.02 fibres/mL work in the work area should stop and additional controls measures employed. This will involve additional water spraying during excavations.

Air monitoring results will be obtained within 24 hours of sample collection. While this precludes “real time” monitoring, inspections will be made during excavation works and, if there are any visible dusts, light water sprays will be used to wet the excavation and prevent the release of any airborne asbestos fibres.

10.5 Decontamination Procedures

The decontamination procedures specified below will be followed whenever personnel, plant or equipment leave the site.

Personnel

The following steps should be taken to ensure personnel do not leave the site with potentially contaminated clothing:

1. Disposal of coveralls and respirator;
2. Wash boots in clean water;
3. Remove outer gloves and store for reuse;
4. Remove overalls (if used) and store for reuse;
5. Remove respirator and goggles (if used) and store clean for reuse or decontamination, as appropriate; and
6. Thoroughly wash hands and face.

If any part of a worker’s body comes into direct contact with any potentially contaminated material, the affected part(s) should be immediately washed with clean water.

Vehicle, Plant and Equipment

All equipment, including personal protective equipment, will be washed or otherwise cleaned to ensure that contaminated soil, water or dust is removed before it leaves the Site. All plant and equipment will have their outer bodies thoroughly cleaned of soil and sediment before moving off the site.

10.6 Asbestos Management

Notwithstanding any part of the proposed requirements for occupational health and safety as outlined here – all works on the remedial site must be undertaken in accordance with a Construction Asbestos Management Plan.

10.7 Emergency Response

The remediation contractor will be responsible for preparing an emergency response plan, which will provide details on appropriate action and evacuation procedures in the event of an emergency.

In the event of an emergency arising on the site, appropriate action should be taken. Site evacuation procedures should be followed, as necessary.

In the event of an accident: evaluate the seriousness of the injury, and contact emergency services, if necessary; provide first aid, as appropriate, and if safe to do so evacuate the injured person via the Decontamination Zone; make the area as safe as possible without jeopardising safety.

If a serious accident occurs, do not disturb the scene, except to make safe and prevent further injury or damage, and keep all unauthorised people out, and report all accidents to the Project Manager.

11. Regulatory Approvals/Licensing

11.1 Remediation of Land - State Environment Planning Policy (Resilience and Hazards) 2021

Development consent requirements for remediation works is addressed by reference to SEPP-RH and associated SEPP 55 Planning Guidelines.

To identify whether the works fall within Category 1, works requiring consent, or Category 2 works not requiring consent, consideration is required to be given to a list of potential triggers for classification as Category 1 Remediation Works as discussed following. Should none of the triggers be activated, the works would fall into Category 2. Triggers for Category 1 works comprise:

- The work is considered to be Designated Development under Schedule 3 of the EPA&A Regulation or under a planning instrument.
- The work proposed is on land identified as critical habitat under the Threatened Species Conservation Act 1995.
- The remediation works will have a significant effect on threatened species, populations, ecological communities or their habitats (via consideration of s.5A of the EP&A Act).
- The work is proposed in an area or zone to which any classifications to the following effect apply under an environmental planning instrument:
 - coastal protection;
 - conservation or heritage conservation;
 - habitat area, habitat protection area, habitat or wildlife corridor;
 - environmental protection;
 - escarpment, escarpment protection or escarpment preservation;
 - floodway;
 - littoral rainforest;
 - nature reserve;
 - scenic area or scenic protection;
 - wetland, or
 - carried out or to be carried out on any land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council for any local government area in which the land is situated (or if the land is within the unincorporated area, the Western Lands Commissioner).
- The work requires consent under another SEPP or regional environmental plan.

Triggers for Category 1 mentioned above have not been met, and hence the remediation works fall under Category 2 works not requiring consent. A notice of commencement and notification of completion must be given to council at least 30 days prior to commencement and within 30 days of completion of remediation works.

11.2 Protection of the Environment Operations Act 1997 (POEO 1997)

The proposed remediation/validation activities are not required to be licensed under the *Protection of the Environment Operation Act 1997*, which is based on the following:

- The proposed remediation works will not treat more than 1000 m³ per year of contaminated soil received from off-site.
- The proposed remediation works will not involve the treatment of contaminated soil originating on-site with the capacity: (i) to incinerate more than 1000 m³ per year of contaminated soil, or (ii) to treat (otherwise than by incineration) and store more than 30 000 m³ of contaminated soil, or (iii) disturb an aggregate area of 3 hectares of contaminated soil.

11.3 Protection of the Environment Operations (Waste) Regulation 2014

The regulations make requirements relating to non-licensed waste activities and waste transporting. The Waste Regulation stipulates special transportation, reporting, re-use and recycling requirements relating to soil and asbestos waste and must be complied with regardless whether the activity is licensed.

The requirements for the transportation of asbestos waste include:

- Bonded asbestos material must be securely packaged at all times;
- Friable asbestos material must be kept in a sealed container;
- Asbestos-contaminated soils must be wetted down; and
- All asbestos waste must be transported in a covered, leak-proof vehicle.

The transporter of asbestos waste must cause the following information to be given to the EPA prior to the transportation of asbestos waste loads:

- Source site details including address, name and contact details;
- Date of proposed transportation commencement;
- Name, address and contact details of disposal site; and
- Approximate weight of each class of asbestos in each load.

The transporter of asbestos waste must ensure the following information is given to the disposal site before or at delivery:

- Unique consignment code issued by EPA in relation to that load; and
- Any other information specified in the Asbestos and Waste Tyres Guidelines (EPA 2015).

The requirements relating to the off-site disposal of asbestos waste are as follows:

- Asbestos waste in any form must be disposed of only at a landfill site that may lawfully receive the waste;
- When asbestos waste is delivered to a landfill site, the occupier of the landfill site must be informed by the person delivering the waste that the waste contains asbestos;
- When unloading and disposing of asbestos waste at a landfill site, the waste must be unloaded and disposed of in such a manner as to prevent the generation of dust or the stirring up of dust; and
- Asbestos waste disposed of at a landfill site must be covered with virgin excavated natural material or other material as approved in the facility's environment protection licence.

The Waste Regulation requires that wastes are stored in an environmentally safe manner. It also stipulates that vehicles used to transport waste must be covered when loaded.

Provision is provided in the Regulation and EPA (2014) guidelines for the NSW EPA to approve the immobilisation of contaminants in waste (if required).

11.4 Waste Classification Guidelines (EPA 2014)

All wastes generated shall be assessed, classified and managed in accordance with EPA (2014) guideline. Where wastes require immobilisation prior to off-site disposal (to reduce waste classifications) an immobilisation approval shall be sought in accordance with Part 2 of this guideline, or otherwise General Approvals for the immobilisation of wastes in soils as historically issued by the NSW EPA. Immobilisations are only anticipated to be potentially required with unexpected finds.

11.5 Asbestos Removal Regulations and Code of Practice

The removal and disposal of asbestos will be managed in accordance with the Work Health and Safety Act (2011) and Work Health and Safety Regulation (2017), *Code of Practice How to Safely Remove Asbestos* (SWNSW 2022a), *Code of Practice How to Manage and Control Asbestos in the Workplace* (SWNSW 2022b), NSW SafeWork Guidelines, the NSW EPA (2014) *Waste Classification Guidelines*, and requirements under the *Protection of the Environment Operations (Waste) Regulation* (2014) for asbestos waste monitoring.

Excavation, on-site remediation and removal of asbestos impacted soils are required to be conducted by a Class A (Friable) or B (Bonded) Asbestos Removal licensed contractor.

12. Conclusions

Subject to the successful implementation of the measures detailed in this RAP and subject to the limitations in **Section 13**, it is considered the site can be made suitable for the proposed works and ongoing recreational land use.

13. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties. The report has been prepared specifically for the client for the purposes of the commission, and no warranties, express or implied, are offered to any third parties and no liability will be accepted for use or interpretation of this report by any third party.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose. This report should not be amended in any way without prior approval by JBS&G, or reproduced other than in full including all attachments as originally provided to the client by JBS&G.

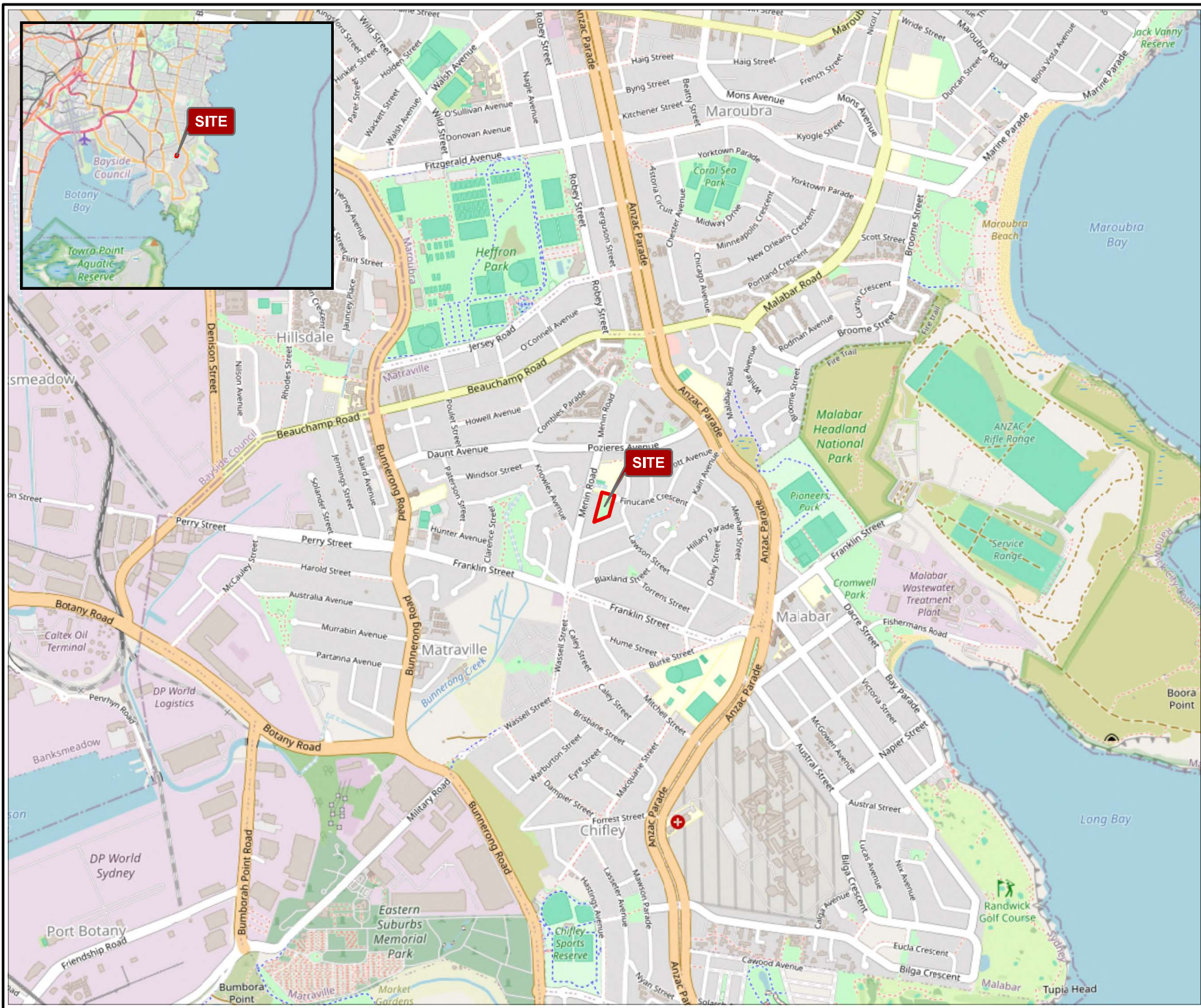
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements or agreed scope of work.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

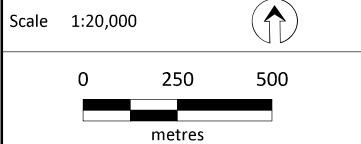
Figures



Legend
Approximate Site Boundary



Job No: 68409
Client: Randwick City Council
Version: R02 Rev A Date 20/02/2025
Drawn By: HW Checked By: FB



Coord. Sys. GDA2020 MGA Zone 56

**1 Finucane Cres,
Matraville, NSW**
SITE LOCATION

FIGURE 1



Legend

Approximate Site Boundary

NSW Cadastre



Job No: 68409

Client: Randwick City Council

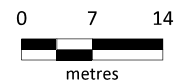
Version: R02 Rev A

Date 20/02/2025

Drawn By: MW

Checked By: FB

Scale 1:750



Coord. Sys. GDA2020 MGA Zone 56

**1 Finucane Cres,
Matraville, NSW**

SITE LAYOUT

FIGURE 2



- Legend
- Approximate Site Boundary
 - NSW Cadastre
- Sample Locations
- Test Pit Location
 - Visual Test Pit Location



Job No: 68409

Client: Randwick City Council

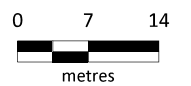
Version: R02 Rev A

Date 20/02/2025

Drawn By: HW

Checked By: FB

Scale 1:750



Coord. Sys. GDA2020 MGA Zone 56

**1 Finucane Cres,
Matraville, NSW**

SAMPLE LOCATIONS

FIGURE 3



- Legend
- Approximate Site Boundary
 - NSW Cadastre
- Sample Locations
- Test Pit Location
 - Visual Test Pit Location
 - Asbestos Detected at Sample Location



Job No: 68409

Client: Randwick City Council

Version: R02 Rev A	Date 20/02/2025
Drawn By: HW	Checked By: FB

Scale 1:700

0 7.5 15 metres

Coord. Sys. GDA2020 MGA Zone 56

**1 Finucane Cres,
Matraville, NSW**

ASBESTOS DETECTIONS

FIGURE 4



- Legend
- ▬ Approximate Site Boundary
 - ▬ NSW Cadastre
 - ▨ Extent of Remediation
- Sample Locations
- Test Pit Location
 - Visual Test Pit Location



Job No: 68409

Client: Randwick City Council

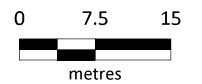
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Date 20/02/2025

Drawn By: MW

Checked By: FB

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Coord. Sys. GDA2020 MGA Zone 56

**1 Finucane Cres,
Matraville, NSW**

EXTENT OF REMEDIATION

FIGURE 5

Appendix A Tables

TABLE A: Soil Analytical Results
Project Number: 68409
Project Name: Finucane Reserve DSI & RAP

	Metals & Metalloids								TPHs (NEPC 1999)					TPHs (NEPC 1999) - After Silica Gel				TRHs (NEPC 2013)							TRHs (NEPC 2013) - After Silica Gel			
	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum of Total)	C10-C14 Fraction (after silica gel clean-up)	C15-C28 Fraction (after silica gel clean-up)	C29-C36 Fraction (after silica gel clean-up)	C10-C36 Fraction (Sum of Total) (after silica gel clean-up)	C6-C10	C10-C16	C16-C34	C34-C40	C10-C40 (Sum of total)	F1 (C6-C10 minus BTEX)	F2 (C10-C16 less Napthalene)	C10-C16 (after silica gel clean-up)	C16-C34 (after silica gel clean-up)	C34-C40 (after silica gel clean-up)	C10-C40 (Sum of total) (after silica gel clean-up)
EQL	2	0.4	1	1	1	0.1	1	1	20	20	50	50	50	50	100	100	50	20	50	100	100	50	20	50	50	100	100	100
NEPM 2013 Table 1A(1) HILS Rec C Soil	300	90	300	17,000	600	80	1,200	30,000																				
NEPM 2013 Table 1A(3) Rec C Soil HSL for Vapour Intrusion, Sand																												
NEPM 2013 Table 1B(1-5) Generic EIL - Urban Residential and Public Open Space	100		190	60	1,100		30	70																				
NEPM 2013 Table 1B(6) ESLs for Urban Res, Coarse Soil																				300	2,800		180	120				
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil																		700	1,000	2,500	10,000							

Field ID	Location Code	Matrix Type	Date	Lab Report Number																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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Health Screening Level Asbestos Concentration in Soil (% w/w)	
Category	HSL C
Bonded ACM in soils	0.02
FA and AF in soils	0.001
Asbestos Presence	Bold

Sample Information				Field Asbestos Quantification					Laboratory Analysis				
Sample ID	Sample Location	Date	>7 mm ACM observed during screening?	Approx. Volume of Soil (L)	Soil Mass (g)*	Mass ACM (g)	Mass Asbestos in ACM (g)**	Asbestos from ACM in soil (%w/w)	Sample Mass (g)	Asbestos from ACM in soil (%w/w)	Asbestos from FA in soil (%w/w)	Asbestos from AF in soil (%w/w)	Asbestos from FA & AF in soil (%w/w)
Data Gap Investigation													
TP01_0-0.5	TP01	18/12/2024	No	10	16250	0	0	0	956	0	0	0	0
TP02_0-0.5	TP02	18/12/2024	No	10	16250	0	0	0	958	0	0	0	0
TP03_0-0.2	TP03	18/12/2024	No	10	16250	0	0	0	653	0	0	0	0
TP03_0.2-0.5	TP03	18/12/2024	Yes	10	16250	64	9.6	0.591	517	0	0	0	0
QC02	TP03	18/12/2024	No	-	-	-	-	-	696	0	0.00062	0	0.00062
QA02	TP03	18/12/2024	No	-	-	-	-	-	884	0	0	0	0
TP04_0-0.5	TP04	18/12/2024	No	10	16250	0	0	0	1000	0	0	0	0
QC01	TP04	18/12/2024	No	-	-	-	-	-	1028	-	-	-	-
QA01	TP04	18/12/2024	No	-	-	-	-	-	849	0	0	0	0
TP05_0-0.1	TP05	18/12/2024	No	10	16250	0	0	0	-	-	-	-	-
TP05_0.1-0.5	TP05	18/12/2024	No	10	16250	0	0	0	-	-	-	-	-
TP06_0-0.5	TP06	18/12/2024	No	10	16250	0	0	0	1001	0	0	0	0
TP07_0-0.5	TP07	18/12/2024	No	10	16250	0	0	0	905	0	0	0	0
TP08_0-0.2	TP08	18/12/2024	No	10	16250	0	0	0	-	-	-	-	-
TP08_0.2-0.5	TP08	18/12/2024	No	10	16250	0	0	0	833	0	0	0	0
TP09_0-0.2	TP09	18/12/2024	No	10	16250	0	0	0	829	0	0	0	0
TP09_0.2-0.5	TP09	18/12/2024	No	10	16250	0	0	0	-	-	-	-	-
TP10_0-0.5	TP10	18/12/2024	No	10	16250	0	0	0	769	0	0	0	0
TP11_0-0.2	TP11	18/12/2024	No	10	16250	0	0	0	-	-	-	-	-
TP11_0.2-0.5	TP11	18/12/2024	No	10	16250	0	0	0	896	0	0	0	0
TP12_0-0.5	TP12	18/12/2024	No	10	16250	0	0	0	743	0	0	0	0
TP13_0-0.5	TP13	18/12/2024	No	10	16250	0	0	0	862	0	0	0	0
TP14_0-0.5	TP14	18/12/2024	No	10	16250	0	0	0	751	0	0	0	0
TP15_0-0.5	TP15	18/12/2024	No	10	16250	0	0	0	873	0	0	0	0
TP16_0-0.5	TP16	18/12/2024	No	10	16250	0	0	0	902	0	0	0	0
TP17_0-0.2	TP17	18/12/2024	No	10	16250	0	0	0	702	0	0	0	0
TP17_0.2-0.5	TP17	18/12/2024	No	10	16250	0	0	0	-	-	-	-	-
TP18_0-0.5	TP18	18/12/2024	No	10	16250	0	0	0	961	0	0	0	0
TP19_0-0.5	TP19	18/12/2024	No	10	16250	0	0	0	795	0	0	0	0
TP20_0-0.5	TP20	18/12/2024	No	10	16250	0	0	0	784	0	0	0	0
TP21_0-0.5	TP21	18/12/2024	No	10	16250	0	0	0	965	0	0	0	0
TP21_0.4-0.5	TP21	18/12/2024	No	10	16250	0	0	0	725	0	0	0	0
TP22_0-0.5	TP22	18/12/2024	No	10	16250	0	0	0	972	0	0	0	0
TP23_0-0.5	TP23	18/12/2024	Yes	10	16250	8	1.2	0.074	839	0	0	0	0
TP24_0-0.5	TP24	18/12/2024	No	10	16250	0	0	0	929	0	0	0	0
TP25_0-0.5	TP25	18/12/2024	Yes	10	16250	20	3.0	0.185	744	0	0	0	0
TP26_0-0.5	TP26	18/12/2024	No	10	16250	0	0	0	848	0	0	0	0
TP27_0-0.5	TP27	18/12/2024	No	No asbestos quantification or sampling conducted. Only Visual Observations					-	-	-	-	-
TP28_0-0.5	TP28	18/12/2024	No	No asbestos quantification or sampling conducted. Only Visual Observations					-	-	-	-	-
TP29_0-0.5	TP29	18/12/2024	No	No asbestos quantification or sampling conducted. Only Visual Observations					-	-	-	-	-
TP30_0-0.5	TP30	18/12/2024	No	No asbestos quantification or sampling conducted. Only Visual Observations					-	-	-	-	-
TP31_0-0.5	TP31	18/12/2024	Yes	No asbestos quantification or sampling conducted. Only Visual Observations					-	-	-	-	-
TP32_0-0.5	TP32	18/12/2024	No	No asbestos quantification or sampling conducted. Only Visual Observations					-	-	-	-	-

* Soil mass based on soil densities provided within CRC Care 2011: Technical Report 10
Soil Mass (g) = Soil Density (1.625 kg/L) * 10 L = 16.25 kg

** Mass Asbestos in ACM = 0.15 * Mass ACM (g) - per ASC NEPM
*** Asbestos from ACM in Soil = Mass Asbestos in ACM / Soil Mass - per ASC NEPM
**** Asbestos weight adjusted to include ACM detected in laboratory analytical sample

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