Remediation Action Plan for the Proposed Nepean Gardens Cemetery, Wallacia, NSW

Prepared for Catholic Cemeteries Board

Report No: P1706171JR08V01

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Project Details

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1 Introduction

1.1 Overview

This report documents a Remediation Action Plan (**RAP**) on behalf of the Catholic Cemeteries Board. The report supports a development application (**DA**) for a proposed cemetery in the eastern portion of Wallacia Golf Course, 13 Park Road and 512 Mulgoa Road, Wallacia, NSW (the **site**).

A Detailed Site Investigation (**DSI**) was previously prepared for the site (MA, 2020), which identified bonded fragments of asbestos containing material (**ACM**) within fill mounds identified between the 3rd and 7th holes, and within stockpiled fill material to the west of the existing maintenance shed.

This report has been prepared in general accordance with ASC NEPC (1999, amended 2013), NSW EPA (2017) and NSW EPA (2020).

1.2 Proposed development

The proposed development will involve converting the golf course (or part thereof) into a cemetery development known as 'Nepean Gardens' (the **Development**).

1.3 Objectives and Scope of the RAP

The RAP objectives are:

- Set remediation goals and criteria.
- Define the extent of areas requiring remediation.
- Review possible remedial options.
- Provide rationale for the preferred remedial option.
- Provide a remediation plan to implement and validate the preferred remediation option.
- Provide a site management plan for the remediation.
- Outline contingency plans.
- Outline regulatory compliance requirements.

1.4 Reference Guidelines and Planning Instruments

This assessment was prepared in general accordance with the following guidelines:

1. State Environmental Planning Policy No. 55 – Remediation of Land (**SEPP 55**).
2. ASC NEPC (1999, amended 2013) *National Environmental Protection (Assessment of Site Contamination) Measure* (referred to as ASC NEPM (2013)).
3. NSW EPA (2017) 3rd Ed. *Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme*.
4. NSW EPA (1995) *Sampling Design Guidelines*.
5. NSW EPA (2020) *Consultants Reporting on Contaminated Land, Contaminated Land Guidelines*.
6. SafeWork NSW (2019) *How to Safely Remove Asbestos Code of Practice*.

1.5 Abbreviations

AASS	**Actual acid sulfate soil**	**MBT**	**Monobutyltin**
ABC	Ambient background concentrations	**MNA**	Monitored natural attenuation
ACM	Asbestos containing material	**MPE**	Multi phase extraction
AEC	Area of environmental concern	**NAPL**	Non aqueous phase liquid
AF	Asbestos fines	**NATA**	National Association of Testing Authorities
AMP	Asbestos Management Plan	**ND**	No data
ANZECC	Australia and New Zealand Environment Conservation Council	**NEPC**	National Environment Protection Council
ANZG	Australian and New Zealand Governments	**NEPM**	National Environment Protection Measure
ASC NEPM	National Environmental Protection (Assessment of Site Contamination) Measure (2013)	**OCP**	Organochloride pesticides
ASS	Acid sulfate soil	**OEH**	NSW Office of Environment and Heritage
ASSMAC	Acid Sulfate Soils Management Advisory Committee	**OPP**	Organophosphorus pesticides
AST	Above ground storage tank	**PACM**	Potential asbestos containing material
BGL	Below ground level	**PAH**	Polycyclic aromatic hydrocarbons
BH	Borehole	**PASS**	Potential acid sulfate soil
BTEXN	Benzene, toluene, ethylbenzene, xylene, naphthalene	**PCB**	Polychlorinated biphenyl
CEMP	Construction Environmental Management Plan	**PCEMP**	Post Construction Environmental Management Plan
COC	Chain of custody	**PESA**	Preliminary Environmental Site Assessment
COPC	Contaminants of potential concern	**PFAS**	Per- and polyfluoroalkyl substances
DA	Development application	**PID**	Photoionisation detector
DBT	Dibutyltin	**ppb**	Parts per billion
DEC	Department of Environment and Conservation	**ppm**	Parts per million
DECC	Department of Environment and Climate Change	**PQL**	Practical quantitative limit (interchangeable with EQL and LOR)
DNAPL	Dense non aqueous phase liquid	**PSI**	Preliminary Site Investigation
DP	Deposited Plan	**QA/QC**	Quality assurance / quality control
DPI	NSW Department of Primary Industry	**RAC**	Remediation acceptance criteria
DPIW	NSW Department of Primary Industry – Water	**RAP**	Remediation Action Plan
DQI	Data quality indicators	**HHRA**	Human Health Risk Assessment
DQO	Data quality objectives	**RPD**	Relative percentage difference
DSI	Detailed Site Investigation	**SAC**	Site assessment criteria
EAC	Ecological assessment criteria	**SAQP**	Sampling and Analysis Quality Plan
EIL	Ecological investigation level	**SEPP**	State Environmental Planning Policy
EMP	Environmental Management Plan	**SIL**	Soil investigation level
EPA	NSW Environmental Protection Authority	**SOP**	Standard operating procedure
EQL	Estimated quantitation limit (interchangeable with PQL and LOR)	**SWL**	Standing water level
ESA	Environmental Site Assessment	**SWMS**	Safe Work Method Statement
ESL	Ecological screening level	**TB**	Trip blank
FA	Fibrous asbestos	**TBT**	Tributyl tin
GIL	Groundwater investigation level	**TCLP**	Toxicity characteristics leaching procedure
HIL	Health investigation level	**TEQ**	Toxic equivalency factor
HM	Heavy metals	**TP**	Test pit
HSL	Health screening level	**TPH**	Total petroleum hydrocarbons
IA	Investigation area	**TRH**	Total recoverable hydrocarbons
ISQG	Interim Sediment Quality Guideline	**TS**	Trip spike
ITP	Inspection Testing Plan	**UCL**	Upper confidence limit
LGA	Local government area	**UPSS**	Underground petroleum storage system
LNAPL	Light non aqueous phase liquid	**UST**	Underground storage tank
LOR	Limit of reporting (interchangeable with EQL and PQL)	**VHC**	Volatile halogenated compounds
MA	Martens & Associates Pty Ltd	**VOC**	Volatile organic compounds
mAHD	Metres, Australian Height Datum	**WHS**	Work health and safety
mbgl	Metres below ground level	**WHSP**	Work Health and Safety Plan

2 Site Background Information

2.1 Site Details

Site information is summarised in Table 1. Site area and general surrounds plans are provided in Map 1.

Table 1: Site Information.

Item	Description / Detail
Property address	13 Park Road and 512 Mulgoa Road, Wallacia, NSW
Lot / DP	Lot 2 in DP 1108408 Lot 512 in DP 1079728
Site area	Approximately 44.4 ha (Six Maps, 2020)
LGA	Penrith City Council (PCC)
Current zoning	The majority of the site is zoned E3 – Environmental Management. A small portion of the site in the south is zoned RU5 – Rural Village.
Current land use and site infrastructure	Currently the site is an operating golf course. Observed infrastructure relevant to this investigation included: 1. A carparking area, members clubhouse and administration building in the southwest corner of the site. 2. Multiple maintenance sheds, primarily used by the greens keeping staff in the central southern portion of the site with above-ground storage tanks in the maintenance shed area. 3. Two dilapidated sheds in the central northern portion of the site. 4. A telecommunications tower in the north eastern portion of the site.
Surrounding land uses	The site is bordered by rural allotments to the north and east, Park Road to the south and residential properties to the south and west. A BP service station is located to the west of the site and an operating market garden is located adjacent to the northern boundary. Jerrys Creek is located in the western portion of the golf course.
Topography	The site is located within undulating terrain, with general grades of 5-10% and slightly steeper grade of up to 20 % near to drainage depressions. The site has a generally northerly aspect and varies from approximately 65 mAHD near the eastern site boundary, falling to 45 mAHD within the drainage depression near the central northern portion of the site.
Geology	The Penrith 1:100,000 Geological Sheet 9030 (1991) indicates the site is underlain by Wianamatta Group Bringelly Shale comprising shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff.
Soil landscape	The NSW Environment and Heritage eSPADE website identifies that the site is associated with Luddenham soil landscapes consisting of shallow dark podzolic soils or massive earthy clays on crests, moderately deep red podzolic soils on upper slopes, and moderately deep yellow podzolic soils and prairie soils on lower slopes and drainage lines.
Drainage	The site generally drains via overland flow into drainage depressions within the site, ultimately leading north to a series of creeks north of the site.

3 Previous Site Investigations

Site contamination risk has been previously assessed in the following documents:

1. Douglas Partners (2017) Preliminary Site Investigation – Contamination: Proposed Cemetery, Wallacia Golf Course, Wallacia, NSW. Ref. 76652.02.

2. Martens and Associates (2020) *Detailed Site Investigation for the Proposed Nepean Gardens, Wallacia, NSW*. Ref. P1706171JR07V02 (November 2020).

A summary of the above investigations is provided in the following sections.

3.1 Preliminary Site Investigation

A PSI (DP, 2017) was previously completed for the site which identified potential sources of contamination. Key findings are summarised in Table 2.

Table 2: PSI (DP, 2017) summary.

Investigation Details	Investigation Task and Finding
Scope of works	○ Desktop review of previous reports, aerial photographs, online databases and land title information. ○ Review of local geology, hydrogeology and topography maps. ○ Site walkover to review existing site conditions. ○ Identification of AECs.
Key findings of historic site review and walkover	Aerial photographs from 1947, 1961, 1975, 1986, 1998, 2002, 2005 and 2014 were reviewed. The following observations were made: ○ A structure in the place of the existing clubhouse / administration building was observed in the 1947 aerial photograph. ○ The golf course was first observed in the 1961 aerial photograph. ○ Three former structures which are no longer present were observed in the 1947, 1961 and 1986 aerial respectively. ○ Evidence of soil disturbance and likely filling was observed in a number of aerial photographs. DP also undertook a site walkover inspection, which identified that: ○ The site was, at the time of inspection, being used as a golf course. ○ A brick and timber clubhouse were present in the southwest corner of the site. ○ A galvanised steel maintenance shed was present in the central southern portion of the site. Two above ground storage tanks (AST) were observed at the maintenance shed.
Identified AEC and COPC	DP identified 15 AECs, including existing and former sheds and structures, areas of identified fill across the golf course, potential use of fuels or oils around the existing maintenance shed, and the entire golf course for potential pesticide use since its establishment over 50 years ago. AECs identified by DP have been included in the conceptual site model (CSM) for the DSI (Section. 4)
Recommendations	The PSI recommended a DSI be undertaken to assess AEC and associated COPC.

3.2 Detailed Site Investigation

A DSI was completed for the site by MA, initially reported in Report No. 1706171JR07V01 (14 August 2020). The DSI was updated on 12 November 2020 (Report No. 1706171JR07V02) following supplementary fieldworks to close some previously identified data gaps. Key findings are outlined in Table 3.

Table 3 :DSI summary (MA, 2020).

Investigation Details	Investigation Task and Finding
Scope of works	○ Review of PSI (MA, 2020). ○ Intrusive subsurface investigation and sampling of AECs as identified in the PSI (DP, 2017). ○ Laboratory analyses of selected samples for identified COPC and assessment against site acceptance criteria (SAC). ○ Preparation of a report in general accordance with the relevant sections of ASC NEPM (1999, amended 2013), NSW EPA (2017) and NSW EPA (2020).
Site Walkover	Prior to DSI intrusive investigations, MA undertook a detailed site walkover on 9 June 2020. In addition to previous findings from DP (2017) investigations, MA observed the following: ○ Additional areas of fill, not identified by DP (2017) were observed across the site, particularly around golf course tees and greens, as well as fill mounds in the central northern portion of the site. ○ A number of soil stockpiles and mounds were observed in the central southern portion of the site between the 3rd and 7th hole and to the west of the maintenance shed. ○ Two dilapidated galvanised iron and timber sheds were observed in the northern portion of the site. ○ An exposed fibrous cement pipe was observed at the ground surface in the central northern portion of the site. Given the age of the site and golf course usage, this was considered likely to be a potential asbestos pipe. ○ A fragment of fibrous cement material (potential asbestos containing material, PACM) was observed at the soil surface in the central northern portion of the site. ○ Based on the findings of the site walkover, additional AECs were included as part of the subsurface investigation program.

Investigation Details	Investigation Task and Finding
DSI Field Work	Initial surface and subsurface soil investigations were completed between 16 and 24 June 2020 and involved: o Excavation of 70 boreholes (BH301 – BH370) using a hand operated hydraulic pushtube to a maximum investigation depth of 1.0 mbgl. o Excavation of 32 test pits (TP401 – TP432) using a hand spade to a maximum investigation depth of 0.4 mbgl. o Collection of an asphalt sample for coal tar analysis. o Collection of representative soil samples from boreholes and test pits to be sent for laboratory analysis and for future reference. o Laboratory analysis of representative soil samples. o Collection of QA / QC samples for laboratory analysis. Supplementary subsurface soil investigations were completed between 4 and 9 November 2020, in AECs 10,12, 13, 16 and 17, and involved: o Excavation of 32 test pits (TP501 – TP532) using a 1.8 tonne excavator to a maximum investigation depth of 1.8 mbgl. o Collection of PACM material samples to be sent for laboratory analysis. o Collection of representative soil samples to be sent for laboratory analysis. o Laboratory analysis of PACM and soil samples. Soil sampling locations are shown in Map 3 and borehole and test pit logs are provided in Attachment B.
Key findings	<u>Chemical contamination:</u> Site testing within all accessible AEC indicated found chemical contaminant concentrations in collected soil samples to be below the adopted SAC. <u>Asbestos in soil:</u> Fill mounds between the 3rd and 7th holes (AEC 16) were observed to contain a large amount of builders rubble which included fibre cement sheeting fragments. Stockpiled fill material to the west of the existing maintenance shed (AEC 17) was observed to contain similar material to that encountered at AEC 16 including cement fibre sheeting fragments. Laboratory testing of collected soil and material samples confirmed the presence of asbestos within material samples. All analysed soil samples were found to free of asbestos fibres at the reporting limit of 0.1 mg/kg in accordance with AS4964.
Recommendations	The DSI recommended that a RAP be prepared outlining remediation and management requirements to address identified ACM contamination associated with AEC 16 and AEC 17.

4 Data Gap Closure

4.1 Data Gap Extents

The following data gaps identified in the DSI (MA, 2020) as requiring additional assessment that still remain as data gaps are:

1. AEC 1: Footprint of existing clubhouse.
2. AEC 9: Footprint of existing maintenance shed.

The footprints beneath these structures could not be accessed during the DSI field investigations and will require assessment post demolition, if such structures are to be removed. If the structures are to remain, then no further assessment is necessary.

4.2 Data Gap Closure Methodology

If demolition of site structures is proposed, the following works are recommended following demolition to address the data gaps noted above:

1. Walkover and inspection of data gap areas and adjacent curtilage.
2. Document any areas or locations of building waste. Undertake shallow raking of topsoil via excavator with toothed bucket attachment to assess for presence of any suspected ACM below surface.
3. Collection of soil samples in footprint of former structures at one per 25 m^2.
4. Soil samples to be laboratory analysed for heavy metals, TRH, BTEXN, PAH, OC and OP pesticides and phenols.
5. Laboratory results are to be compared to site assessment criteria (SAC) adopted from the DSI, and NSW EPA (2014) waste classification guidelines to confirm contamination status and classification of the material.

Data gap locations are shown in the site plan in Attachment A.

4.3 Data Gap SAC

The SAC for data gap investigation (Table 4) are adopted from the DSI (MA, 2020).

Table 4: Conceptual site model.

Media	Adopted Guidelines	Applicability
Soil	ASC NEPM (2013)	Health investigation levels (HIL) HIL C – Open space was adopted based on the proposed land use. Health screening levels (HSL) HSL C – Open space land use for sand was adopted based on granular natural and fill material. Ecological Investigation Levels (EIL) EILs were derived from methodology from ASC NEPM (2013) for the protection of terrestrial ecosystems for urban residential areas and public spaces. A pH of 5.87 has been adopted from results of a salinity assessment prepared by MA (2020). A conservative CEC of 5 cmol/kg has been adopted. Individual EIL values are provided in Attachment C. Ecological Screening Levels (ESL) Residential / public open space use, coarse soil. Management Limits Residential / public open space use, coarse soil. Asbestos Assessed on a detect / non-detect basis.

5 Remediation Areas

5.1 Extent of Remediation Required

Based on the DSI (MA, 2020) findings, site contamination is limited to fill material containing bonded asbestos fragments within AEC 16 and AEC 17 as follows:

- Remediation Area A (AEC 16) – Fill material was observed in several test pit locations in AEC 16, with depths ranging between 0.0 mbgl and > 1.8 mbgl. The area of AEC has been estimated as approximately 3,200 m^2. The MA (2020) DSI indicated that fill material within AEC 16 contains bonded ACM fragments. Based on an approximate average depth of fill (1.0 m), the volume of ACM impacted fill requiring remediation is approximately 3,200 m^3.

- Remediation Area B (AEC 17) – A stockpile of approximately 100 m^3 of soil fill material was located in AEC 17. The MA (2020) DSI indicated that fill material within this stockpile contains bonded ACM fragments.

The location of remediation areas (AEC 16 and AEC 17) is provided in Attachment A.

6 Remediation Goals and Options

6.1 Remediation Goal

The remediation goal is to remediate areas where futures site receptors may come in contact with soils currently contaminated by asbestos. The remediation plan will provide context for further site investigation work to assess identified data gaps and to waste classify material being removed from site as part of remediation and construction works.

6.2 Assessment of Remediation Options

Soil remediation options were considered, with reference to NSW EPA (2017) and ASC NEPM (2013), for the preferred hierarchy of options for site clean-up and / or management, as follows:

- On-site treatment of the contamination so that is it destroyed and the associated risk is reduced to an acceptable level.
- Off-site treatment of excavated soil, so that the contamination is destroyed or the associated risk is reduced to an acceptable level, after which the soil is returned to the site.
- Removal of contaminated material to an approved facility, followed, where necessary, by replacement with appropriate material, if required.
- Cap and contain material onsite with an appropriately designed barrier.

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 would be required.

Review of available soil remediation strategies and technologies is considered on the basis of:

- Effectiveness at achieving remediation objectives.
- Suitability in light of the proposed development.
- Anticipated costs.
- Ongoing environmental and public health adequacy.

A review of remediation options considered possible for the site is presented in Table 5.

Table 5: Review of soil remediation options.

Remediation Options	Advantages	Disadvantages	Comments
Capping and containment	○ Excavation and removal of contaminated soils not required, reducing tipping costs.	○ Human health risk is mitigated by burying, but contamination remains onsite. ○ A long term Environmental Management Plan (EMP) required to manage remaining contamination. ○ Note on title indicating presence of contamination. ○ Likely to require additional earthworks and over excavation to facilitate capping layer beneath design levels.	In consideration of the proposed development, construction of a containment cell and capping layer is generally not considered a feasible option given that proposed future use as a cemetery involves ongoing excavation across the site. There would be an ongoing risk that buried contamination would be disturbed during operational use of the site. In light of the proposed use, onsite containment of asbestos contamination is not considered an appropriate remediation method.
Offsite disposal	○ Provides the shortest timeframe for remediation. ○ Removes human and ecological risks and long term management requirements. ○ Meets redevelopment objectives. ○ Suitable to remove heavy metal and PAH contamination.	○ Cost for material transport and disposal charges. ○ Cost associated with classifying wastes prior to offsite disposal.	This proven and reliable technique for managing contamination is suitable as it removes identified contamination and associated risk to humans and environment. This remediation option is considered the most appropriate remediation technique to remove risk and prevent long term management requirements.

6.3 Preferred Soil Remediation Options

In consideration of soil remediation technologies presented in Table 6 and the proposed development, the excavation and offsite disposal of impacted soil are considered the most suitable remediation option.

Details of remediation and validation methodology are provided in Section 7.

7 Remediation Plan

7.1 Introduction

The following sections outline works required to remediate identified contamination such that the site is fit for the proposed development.

All remediation works within the Penrith local government area are considered to be Category 1 works under State Environmental Planning Policy No.55 – Remediation of Land and accordingly require consent.

Unless otherwise identified, activities discussed below will be the responsibility of the contractor or its representative.

7.2 Stage 1 –Regulatory Approvals / Notifications

The following notifications are required (unless approved by consent conditions):

- Notification to Penrith City Council is required in accordance with SEPP – 55 where other development consents do not cover the work. At the conclusion of remediation works, Council shall again be notified of the remediation outcome.
- Notification of asbestos removal work must be lodged with SafeWork NSW prior to the commencement of remediation works.

7.3 Stage 2 – Appointment of Contractor / Consultant

For remediation works to be successfully completed the appointment of a suitability qualified environmental consultant and an earthworks contractor is required. The environmental consultant should be engaged to:

- Supervise all remediation and validation works.
- Monitor the excavation and stockpiling of impacted material.
- Provide waste classification of material to be disposed of offsite.
- Document all stages of the excavation and stockpiling of contaminated soil.
- Monitor and document the offsite disposal of material to an appropriately licenced landfill.
- Perform validation inspections and testing of remediation areas.
- Prepare a validation report documenting remediation and validation reports, and confirming final site status.

7.4 Stage 3 – Site Establishment

Prior to any remediation / construction works, the site shall be prepared for the works. This will include:

- Establishment of site offices, work sheds and amenities for site workers.
- Appropriate physical barriers and site signage is to be erected surrounding site areas requiring remediation and site signage.
- Installation of appropriate dust control measures (i.e. dust screens and / or water sprays).
- Establishment of site holding areas for contaminated material. Site areas nominated to store material are to have appropriate environmental controls in place including storm water diversion, erosion and sedimentation controls and dust suppression.

7.5 Stage 4 – Remediation Work

The adopted remediation is outlined in the following sections.

7.5.1 Remediation Area A (AEC16)

The proposed works sequence in Remediation Area A shall be:

- Excavate fill in the remediation area until underlying natural residual silty clays are exposed. Residual silty clays are expected at depths ranging from 0.0 mbgl to > 1.8 mbgl. It is anticipated that the fill material in this area will need to be excavated to an average depth of 1.0 mbgl and over an area of approximately 3,200 m^2.
- The estimated lateral extent of the remediation area is shown on the site plan in Attachment A.

Excavated material is to be placed either:

- Directly into trucks for offsite disposal if *in-situ* waste classified; or
- In the designated contaminated material holding prior to offsite disposal.

The soil removed from AEC16 will be waste classified as a minimum classification of "special waste – asbestos waste" and will require formal waste classification in accordance with NSW EPA (2014) waste classification guidelines.

The appointed environmental consultant shall validate remediation excavations, as outlined in Section 7.7.

7.5.2 Remediation Area B (AEC 17)

Excavate fill in the remediation area stockpile until underlying natural residual clays are exposed. The lateral extent of the remediation area stockpile is shown on the site plan in Attachment A.

Excavated material is to be placed either:

- Directly into trucks for offsite disposal if *in-situ* waste classified; or
- In the designated contaminated material holding prior to offsite disposal.

The soil removed from AEC17 will be waste classified as a minimum classification of "special waste – asbestos waste" and will require formal waste classification in accordance with NSW EPA (2014) waste classification guidelines.

The appointed environmental consultant shall visually validate the base of the excavated stockpile, as outlined in Section 7.7.

7.6 Stage 5 – Waste Classification

7.6.1 Waste Classification

Prior to any soil being removed from site, a formal waste classification is to be prepared for the material in accordance with the NSW EPA (2014) Waste Classification Guidelines.

7.6.2 Waste Disposal, Materials Tracking and Management

Any relocation or movement of contaminated spoil onsite shall be recorded on daily site logs by the remediation contractor. These documents shall be updated daily and kept in the site office.

Offsite disposal will require materials tracking for site validation. This shall entail recording of vehicle registration numbers, number of truck movements and approximate volumes of material transported. Materials tracking documentation is to be supplied to the environmental consultant upon disposal, along with tipping documents supplied by the receiving landfill.

Transportation of waste shall be, where applicable, undertaken by appropriately qualified and licensed contractor.

7.7 Site Validation

Prior to the AEC 16 and AEC 17 being declared fit for the proposed land use, a validation report documenting the completed remediation works and results of validation testing must be prepared by the appointed site environmental consultant. The following sections outline the site validation requirements.

7.7.1 Data Quality Objectives

The data quality objective (DQO) process is required to define the type, quantity and quality of data needed to support decisions relating to the environmental condition of the site. Table 6 outlines the process used to develop the DQO for the site post remediation and were developed with reference to NSW EPA (2017) and ASC NEPM (2013).

Table 6: Data quality objectives for the assessment of soil.

Step 1 Stating the Problem	Previous site investigations have identified the presence of asbestos contamination in fill material at the site, which requires appropriate remediation before the site can be deemed suitable for the intended use as a cemetery.
Step 2 Identifying the Decision(s)	To assess the suitability of the site for future land use, decisions are to be made based on the remediation removing the identified risk to future site users. o Has the completed remediation works removed the identified risk to future site users? o Is the soil quality suitable for the intended land use? o Are future management of site soils required?
Step 3 Identification of Inputs to the Decision	The inputs to the validation of the site will include: o Existing assessment data. o Observations during remedial activities.
Step 4 Study Boundary Definitions	Study boundaries are as follows: o Lateral – Lateral boundary of the assessment is defined by the remediation area extents, site boundaries and proposed redevelopment areas. o Vertical – Vertical boundary will be governed by the maximum depth of impacted fill. o Temporal – The dates of site inspections, remediation and validation works.
Step 5 Development of Decision Rules	The decision rules for this remediation area are as follows: o If no bonded asbestos is visible at the completion of excavating the fill material or the base of the soil stockpile, then the area can be confirmed as validated. o If bonded asbestos is visible following excavation of the fill material, then additional remediation or management strategies will be required for that remediation area. o If bonded asbestos is visible following excavation of the fill material, and the site boundary has been reached, further management is required in the area. o All material nominated for offsite disposal shall be classified in accordance with NSW EPA (2014) Waste Classification Guidelines. o Material tracking is to be appropriately documented and waste disposal dockets validated.
Step 6 Specification of Limits on Decision Errors	Specific limits for the acceptability of data obtained during the remediation and validation works would be in general accordance with NSW EPA endorsed guidelines.
Step 7 Optimisation of Sampling Design	Validation based on the remediation option, to ensure that all the necessary data is collected to confirm site suitability the proposed land use.

7.7.2 Asbestos Validation Process

Validation of bonded asbestos (ACM) impacted AEC will be undertaken by visually assessing the bases and walls of excavations (AEC 16) and footprint of former stockpiles (AEC 17).

Following removal of ACM impacted soils, a walkover of the entire AEC area shall be undertaken and raking of the surface competed to assess the upper 100 mm of soils. Raking of both the base and walls of any excavation is to be completed. Raking can be completed via machine (excavator tooth bucket or soil tyne) or by hand with a suitable rack.

If any additional ACM (or suspected ACM) is identified during the visual assessment process, addition excavation is to occur under the supervision of the appointed environmental consultant. Any additional material excavated is to be disposed offsite with other remediation spoil and waste classified as per Section 7.6. The process is to be repeated until validation is successful.

At the completion of visual validation, an asbestos clearance certificate is to be obtained confirm that no asbestos is present within the AEC areas.

It is recommended that land surrounding the delineated AEC 16 and 17 is assessed for ACM contamination via a serious of shallow test pits to confirm the extent of ACM impact have been fully remediated.

7.7.3 Imported Fill Protocol

Where any fill is imported to the site during remediation or for further earthworks, the fill is to be documented and verified as ENM or VENM. Waste classification documentation is to be provided and reviewed by the appointed environmental consultant prior to material importation.

All imported material is to be tracked and inspected by the environmental consultant at initial importation.

7.7.4 Validation Reporting

A site validation report is to be prepared by the environmental consultant at the completion of remediation works. This report shall document remediation and validation sequence, detail all results of the assessment, provide material tracking data for material taken from the site and document any imported material (and testing or supporting documentation for it).

The document shall include details regarding any remaining site contamination, and identify residual risks posed by remaining contaminants, and provide comment on whether remediation has been successful and suitability of areas AEC 16 and AEC 17 for the proposed land use.

8 Site Management Plan for Remediation

8.1 Overview

A site-specific Construction Environmental Management Plan (**CEMP**) and worker health and safety plan (WHSP) are to be prepared by the appointed Contractor prior to the commencement of site works. CEMP and WHSP must meet the requirements of relevant occupational and environmental legislation. The following sections are intended as a guide to the information that should be included in these plans.

8.2 Construction Environmental Management Plan

A site specific CEMP shall be prepared to ensure the works do not negatively impact on potential receptors (humans and environment) and comply with applicable environmental legislation. Based on the site condition and proposed remediation method, primary environmental hazards requiring management during remedial works may include:

- Asbestos management.
- Soil management.
- Air quality / dust control.
- Erosion and sediment control measures.
- Noise and odour controls.

Additional on-site management issues that may be included in the CEMP include:

- Site access and security.
- Signage and contact Information.
- Traffic control.
- Hours of operation.
- Imported material.

Suggested requirements for these management points are discussed in the following subsections.

8.2.1 Asbestos Management

An asbestos removal control plan (**ARCP**) must be prepared and included in the CEMP. The ARCP will set out the responsibilities, procedures and safeguards that will be followed by contractor during the handling of asbestos impacted soil.

The ARCP is to be submitted to SafeWork NSW as part of the asbestos removal notification.

8.2.2 Air Quality / Dust Control

Due to the proposed remediation involving soil excavation and offsite disposal, the potential for dust generation is elevated. Management of dust will be required through out remediation works. Dust suppression measure are to include:

- Use of water sprays across the remediation areas. Water spraying the area before the commencement of remediation work (i.e. the day before) should be undertaken to dampen the soil prior to excavation.
- If during excavation works measurable volumes of dust are being produced, dust control measure will need to increase and continued use of water to spray material will be required.
- All soil loads are to be covered once placed in trucks for the duration of transport to the licensed waste facility.
- Vehicle access will be limited to those vehicles required within the area of remediation.

8.2.3 Noise Control

To mitigate noise impacts which may arise as a result of remedial works, the contractor will undertake works in accordance with state and local noise regulations. The contractor's machinery, including machinery hired by the contractor, should be in good working order so that abnormal machine noise is avoided.

All works are to be undertaken with the designated working hours in Section 8.2.9.

8.2.4 Odour Control

Based on the identified site contaminants and site location relative to surrounding receptors, odour is not considered to be major environmental concern. Should odours be encountered, contingency measures including the covering of temporary stockpiles should be implemented.

8.2.5 Site Access and Security

Prior to works commencing, barricades shall be erected to control access to the designated work area, along the proposed remediation area boundary. Site security and access controls must remain in place during all onsite remediation works.

8.2.6 Signage and Contact Information

Security fencing and asbestos removal signage around all defined remediation areas must be installed and maintained by the contractor.

A sign displaying the contact details of the contractor (including the onsite foreman or manager) shall be displayed for the duration of remediation works.

8.2.7 Traffic Control

Prior to exiting the site, vehicles shall have wheels washed at a designated exit point to remove potentially contaminated soil that may have accumulated while onsite. Prior to leaving the site, during the decontamination phase, earthworks machinery is required to decontaminate upon plastic sheeting laid beneath vehicles, with all accumulated potentially contaminated soil removed. Plastic sheeting and contaminated soils collected should be disposed of with classified waste for subsequent offsite disposal.

8.2.8 Hours of Operation

Onsite works are only permitted during the following hours as outlined in NSW EPA Interim Construction Noise Guideline:

- Monday – Friday: 7:30 am – 5:30 pm.
- Saturday: 7:30 am – 3:30 pm.
- Sunday and public holidays: No work permitted.

In certain instances, these hours may be modified when the contractor has the approval of Council.

8.3 Worker Health and Safety Plan (WHSP)

Worker health and safety of all onsite workers or visitors is the responsibility of the contractor. The purpose of a WHSP is to provide relevant health and safety information for all personnel working on or visiting the site.

The WHSP should include (but not necessarily be limited to):

- WHS legislative requirements.
- Hazardous materials identification (including fuel and chemical management).
- Induction requirements. All onsite personnel and visitors must be suitably inducted prior to entering the site.
- Location of worker facilities.
- Designation, delineation and control of access to various work zones.
- Community notification.

- Roles and responsibilities.
- Training and competency.
- Hazard identification and risk assessment.
- Control measures including personal protective equipment (PPE).
- Incident and emergency response.
- Safe work method statement(s).
- Toolbox meetings.
- Audits and inspections.

8.3.1 WHS Legislation and Standards

All onsite works should comply with the WHS act, regulations, codes of practice, and with relevant Australian Standards. As a minimum all work must comply with:

- Workplace Health and Safety Act (2011).
- Workplace Health and Safety Regulation (2017).
- AS 1940 (2017) – The Storage and Handling of Flammable and Combustible Liquids.
- AS 2436 (2010 R2016) – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites.
- Managing the Work Environment and Facilities Code of Practice (December 2018).
- Managing Noise and Preventing Hearing Loss at Work Code of Practice (October 2018).
- Hazardous Manual Tasks Code of Practice (October 2018).
- Work Health and Safety Consultation, Co-operation and Co-ordination Code of Practice (May 2018).
- SafeWork NSW (2019) How to Safely Remove Asbestos Code of Practice.

8.3.2 Hazard Assessment

A WHS hazards assessment is to be completed by the contractor and incorporated into the WHSP. Key hazards may include:

- Onsite chemical hazards (storage of fuels, contaminated soils).
- Heat exposure for workers.
- Buried services.
- Noise.
- Dust.
- Operation of heavy equipment.
- Operation of electrical equipment.

8.3.3 Site Inductions

Prior to starting works, site workers and subcontractors involved in the project shall attend a site specific safety induction.

Documented evidence of the safety induction must be available onsite. The contractor must supply site workers and subcontractors with appropriate PPE as outlined in Section 8.3.4.

8.3.4 Personal Protective Equipment

Table 7 below lists the personal protective equipment (**PPE**) required to prevent exposure to contaminants, in designated remediation areas.

Table 7: Personal protective equipment.

Type	Description	When Required
Head protection	Hard hat	All site activities
Eye protection	Safety glasses	All site activities
Hand protection	Disposable nitrile gloves	Soil sampling activities
	Cut resistant gloves	Manual handling activities
Body protection	High visibly clothing	All site activities
	Sunhat, sunscreen	All site activities
	Disposable coveralls	During asbestos remediation works
Foot protection	Steel toed boots	All site activities
Hearing protection	Ear plugs or ear muffs	Site activities likely to generate potentially harmful noise levels
Respiration protection	Minimum P2 dust mask	Dust generating activities

Site personnel should be aware that personal protective equipment required to be worn may limit manual dexterity, hearing, visibility and may increase the difficulty of performing tasks. PPE places an additional strain on the user when performing work that requires physical activity.

Eating, drinking, chewing gum or tobacco, smoking or any practice that involves hand to mouth transfer increases the probability of ingestion of foreign matter into the body. Hands must be thoroughly washed before eating, drinking or smoking. Clothing which becomes dirty from onsite work should be washed separately from other clothing.

9 Environmental Regulatory Requirements

9.1 State Environmental Planning Policies

All remediation works within the Penrith local government area are considered to be Category 1 works under State Environmental Planning Policy No.55 – Remediation of Land and accordingly require consent.

9.2 Waste Disposal Requirements

All waste soil must be classified in accordance with EPA (2014) waste classification guidelines prior to offsite disposal to a suitably licenced waste receiving facility.

Waste classification documentation and waste dockets from the receiving waste facility must be kept for validation of the remediation works.

9.3 Asbestos Licences

All asbestos removal shall be undertaken in accordance with relevant work health and safety regulation including but not limited to:

- Safework NSW – Applicant Guide for Asbestos Licences and Notifications (2019).
- Safe Work Australia – How to Safely Remove Asbestos: Code of Practice (2019).

10 Remediation Contacts

Names and phone numbers of appropriate personnel for contact during the remediation will be provided prior to commencement of remediation work.

11 Contingency Plan for Remediation and Redevelopment

11.1 Overview

It is considered possible that unexpected situations may occur during remediation and site redevelopment works including the possibility to uncover unidentified contamination. A site contingency plan for managing unexpected situations should be prepared by the Contractor. Unexpected situations that may arise include:

1. Uncovering types of contamination that are not presently identified.
2. Generation of unacceptable levels of dust.
3. Generation of unacceptable asbestos fibres.
4. Generation of an unacceptable level of noise.
5. Excessive rainfall, and collection of excessive water in excavations.

The following sections outline contingency procedures for the events listed above.

11.2 Unexpected Finds

All site personnel are to be aware of their responsibilities under the unexpected finds protocol and are to report any potential signs of contamination (e.g. observed PACM, petroleum and / or oil spills, chemical odours or staining) to the site manager immediately. In the event of uncovering unexpected finds during remedial works, the following steps are to be undertaken by the contractor:

1. Cease all work in the area and notify site foreman / manager and environmental consultant.
2. Notify any relevant authorities (e.g. fire brigade) if an emergency response is required.
3. Construct temporary barricading to prevent worker / public access to any unexpected and / or unknown substances.
4. Install appropriate stormwater diversion and sediment controls as required.
5. Notify relevant authorities that the contractor is legally required to notify (e.g. NSW EPA and / or Council).
6. Site foreman / manager is to arrange site inspection by the environmental consultant to assess the unexpected find and determine if any further investigation, management or remedial action is required in the area.

The environmental consultant is to prepare an assessment and, if required, validation of each unexpected find to the contractor prior to the recommencing of works ceased as a result of the unexpected find.

All unexpected finds are to be documented in the site Validation Report prepared by the environmental consultant at the end of remediation works.

11.3 Unacceptable Level of Dust

Contingency measures must be prepared to control unacceptable dust levels. Excessive dust may be identified by workers, dust monitoring equipment or community complaints. Actions to control excessive dust can include:

- Increased use of water sprays.
- Covering soil stockpiles.
- Changing work protocols (e.g. avoiding work on windy days).

11.4 Unacceptable Level of Noise

Contingency measures must be prepared to control unacceptable noise levels. Excessive noise may be identified by workers, noise monitoring equipment or community complaints. Actions to control excessive noise can include:

- Identification and isolation of the source of noise.
- Modification of the action of the source to reduce the noise.
- Erection of temporary noise barriers.

11.5 Excessive Rainfall

Contingency measures must be prepared to control the effects of excessive rainfall. Actions to control the effects of excessive rainfall can include:

- Construction of sediment and surface water controls.
- Diversion of surface water away from excavations, soil stockpiles and active work areas.
- Appropriate stockpile covers.

12 Conclusion

This RAP has found that:

1. Based on previous site investigations, only areas AEC 16 and AEC 17 require remediation in order that these areas can be made suitable for burial plots as part of proposed cemetery development.

2. Identified residual data gaps are minor and include only areas below existing structures. Data gaps can be closed following demolition, should such structures be demolished.

3. A suitable and practical remediation strategy for areas AEC 16 and AEC 17, including remediation goals and options, a remediation plan, remediation works, site validation measures has been developed and can be implemented as part of the site development works. The recommended remediation methodology is to excavate and dispose waste material off-site to an appropriately licensed facility.

4. Suitable site management and contingency measures to be employed during the remediation of areas AEC 16 and AEC 17 have been documented.

13 Limitations

This RAP was undertaken in accordance with current industry standards.

It is important to note that no land contamination study can be considered to be a complete and exhaustive characterisation of a site nor can it be guaranteed that any assessment shall identify and characterise all areas of potential contamination or all past potentially contaminating land uses. This is particularly the case where onsite filling has occurred and site access was limited. Therefore, this report should not be read as a guarantee that only contamination identified shall be found on the site. Should material be exposed in future which appears to be contaminated, additional testing may be required to determine the implications for the site.

Martens & Associates Pty Ltd has undertaken this assessment for the purposes of assessing potential site contamination. No reliance on this report should be made for any other investigation or proposal. Martens & Associates Pty Ltd accepts no responsibility, and provides no guarantee regarding the characteristics of areas of the site not specifically studied in this investigation.

14 References

Douglas Partners (2017) *Preliminary Site Investigation – Contamination: Proposed Cemetery, Wallacia Golf Course, Wallacia, NSW*. Ref. 76652.02.

Martens and Associates Pty Ltd (2017) *Preliminary Geotechnical, Groundwater and Salinity Assessment: Proposed Wallacia Cemetery, Wallacia, NSW*. Ref. P1706171JR01V01.

Martens and Associates Pty Ltd (2020) *Salinity Assessment: Proposed Wallacia Memorial Park, Wallacia, NSW*. Ref. P1706171JR03V01.

Martens and Associates (2020) *Detailed Site Investigation for the Proposed Nepean Gardens, Wallacia, NSW*. Ref. P1706171JR07V02 (November 2020)

NEPC (1999, amended 2013) *National Environmental Protection (Assessment of Site Contamination) Measure*. Referred to as ASC NEPM (2013).

NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination.*

NSW EPA (2017) *3rd Ed. Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme.*

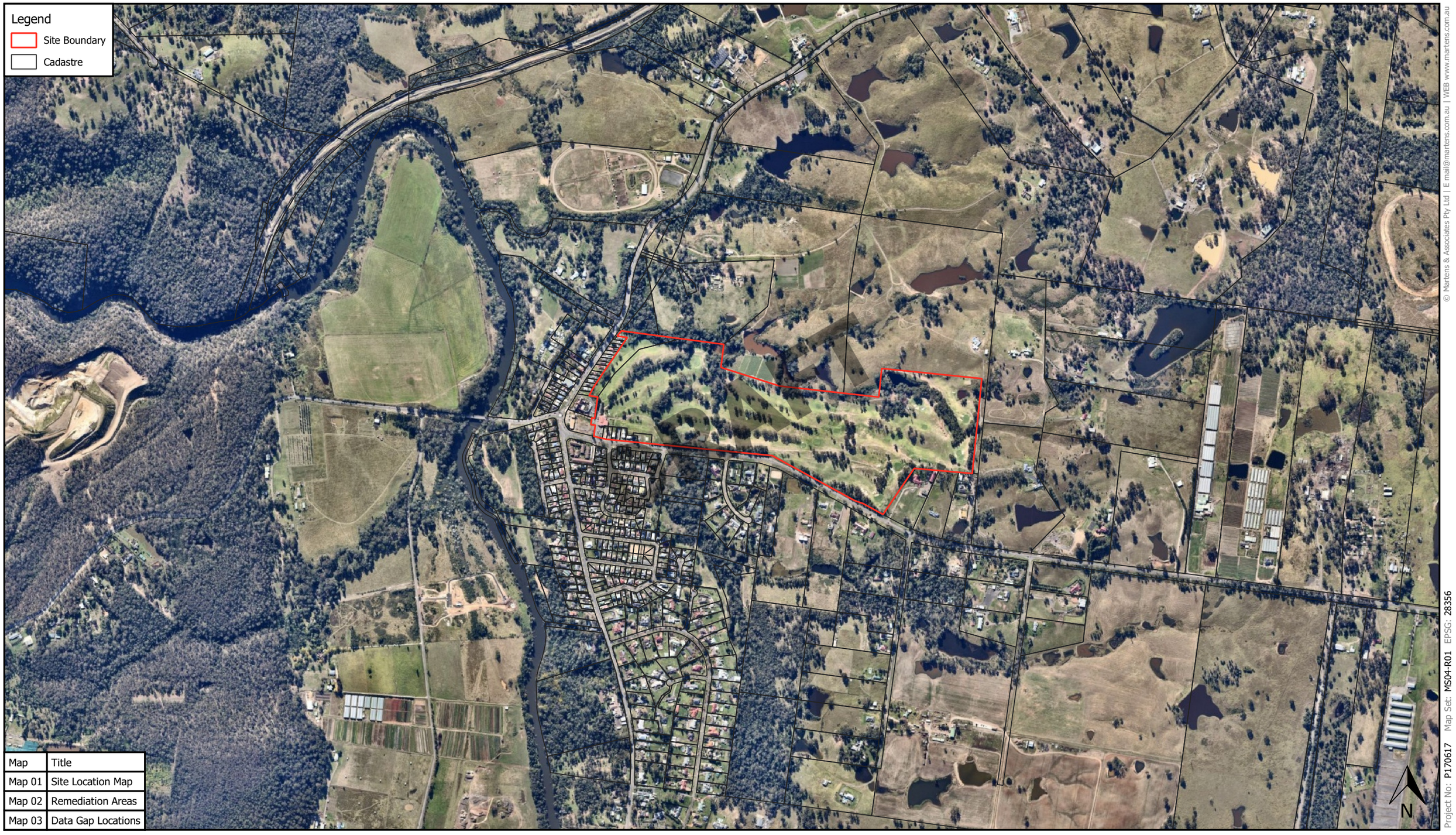
NSW EPA (1995) *Contaminated Sites: Sampling Design Guidelines.*

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

SafeWork NSW (2019) *How to Safely Remove Asbestos Code of Practice*

State Environmental Planning Policy No 55 – Remediation of Land 1998 (NSW).

15 Attachment A: Maps



Map	Title
Map 01	Site Location Map
Map 02	Remediation Areas
Map 03	Data Gap Locations

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1:12500 @ A3

Map Title / Figure:

Site Location Map

Map 01	Map
Wallacia Golf Course	Site
Proposed Cemetery	Project
Remedial Action Plan	Sub-Project
CMCT	Client
12/11/2020	Date

Project No: P170617 Map Set: MS04-R01 EPSG: 28356

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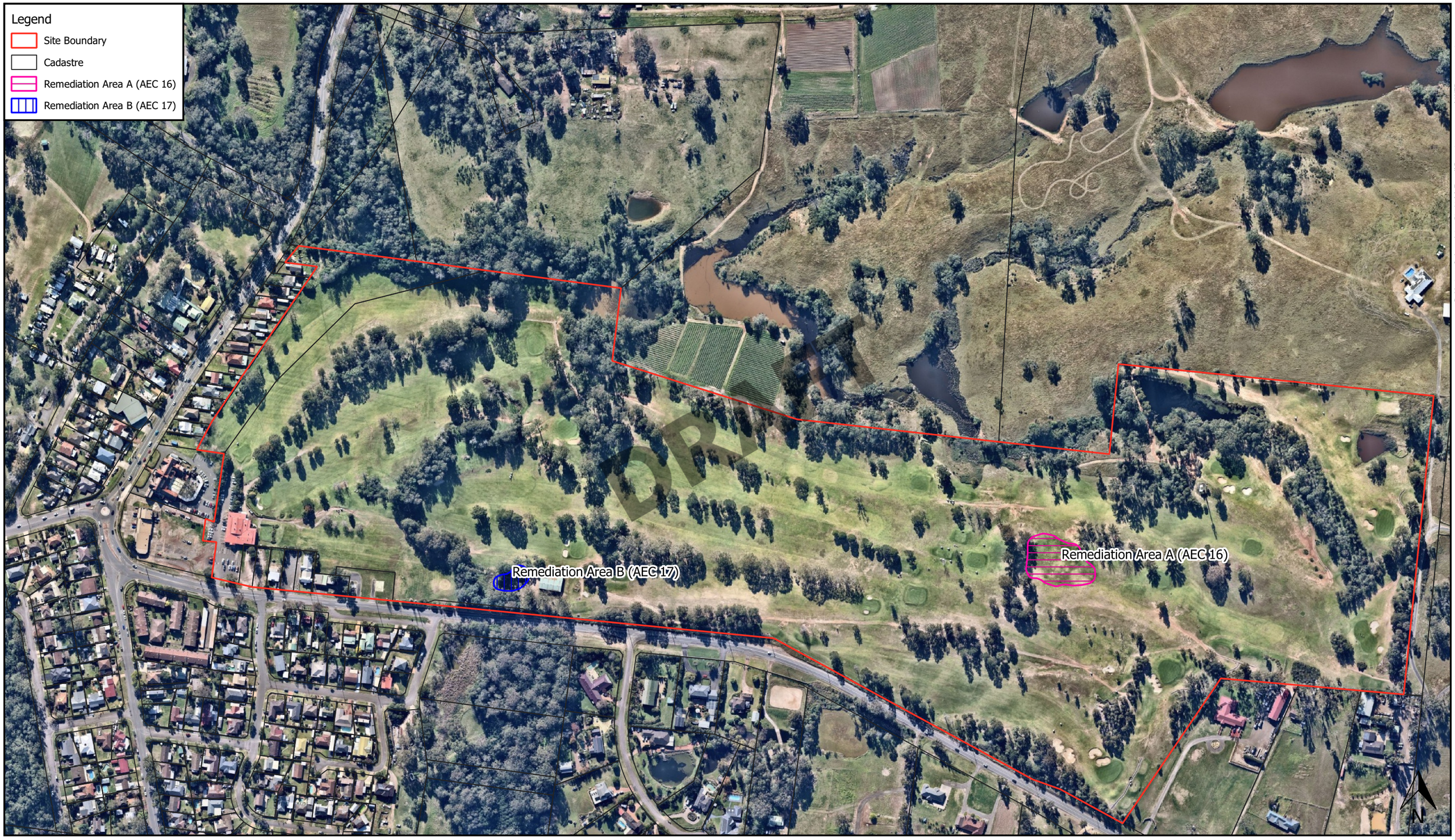

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Map Title / Figure:

Remediation Areas

Map 02	Map
Wallacia Golf Course	Site
Proposed Cemetery	Project
Remedial Action Plan	Sub-Project
CMCT	Client
12/11/2020	Date

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Legend

- Site Boundary
- Cadastre
- Existing Clubhouse (AEC1)
- Existing Maintenance Shed (AEC 9)

Existing Clubhouse

Existing Maintenance Shed

Project No: P170617 Map Set: MS04-R01 EPSG: 28356

N

0 40 80 120 160 200 m

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Map Title / Figure:

Data Gap Locations

Map 03	Map
Wallacia Golf Course	Site
Proposed Cemetery	Project
Remedial Action Plan	Sub-Project
CMCT	Client
12/11/2020	Date

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