ENVIRONMENTAL INVESTIGATION SERVICES

# REPORT

TO

# CATHOLIC METROPOLITAN CEMETERIES TRUST

ON

# CONTAMINATION MANAGEMENT AND REMEDIATION ACTION PLAN

FOR

# PROPOSED MEMORIAL PARK

AT

# 167-177 ST ANDREWS ROAD, VARROVILLE, NSW

**29 JUNE 2018** **REF: E30510KPrpt-RAP**

Postal Address: PO Box 976, North Ryde BC NSW 1670
Tel: 02 9888 5000 • Fax: 9888 5004
EIS is a division of Jeffery and Katauskas Pty Ltd • ABN 17 003 550 801

| Document Distribution Record | | |
|---|---|---|
| **Report Reference** | **Distribution** | **Report Date** |
| E30510KPrpt-RAP DRAFT | Client via email | 29 June 2018 |
| E30510KPrpt-RAP | Client via email | 2 July 2018 |

Report prepared by:

Brendan Page
Associate | Environmental Scientist

Report reviewed by:

Vittal Boggaram
Associate | Environmental Scientist

# EXECUTIVE SUMMARY

Mr. David De Angelis of NettCorp, acting on behalf of Catholic Metropolitan Cemeteries Trust ('the client') commissioned Environmental Investigation Services (EIS)[1] to prepare a Contamination Management and Remediation Action Plan (RAP) for the proposed memorial park at 167-177 St Andrews Road, Varroville, NSW. The site location is shown on Figure 1 and the RAP applies to the proposed development area as shown on Figure 2. The proposed development area is referred to as 'the site' in this report.

EIS understand that the client previously lodged a Development Application (DA) for the proposed memorial park to Campbelltown City Council (Ref: 3293/2017/DA-C). Council issued a Request for Additional Information (dated 29 May 2018) that specified (Item 8.0) that a RAP must be prepared and submitted prior to determination of the DA.

Based on the details provided, EIS understand that the proposed development includes the redevelopment of the site for use as a memorial park (Macarthur Memorial Park). The DA described this as the construction and operation of a new cemetery and parklands. The memorial park will include the construction of roads/driveways, a multi-purpose chapel, gatehouse, function room, café and flower shop, administration building, ground staff facilities, car parks, riparian works/restoration and various burial zones. Restoration of parts of the former homestead buildings is also proposed. Plans showing the general layout of the development are attached in the appendices.

The site has previously been investigated by Douglas Partners. The results of the Douglas Partners investigation are summarised in Section 2 and have been considered in the development of this plan.

The goal of this plan (referred to herein as the RAP) is to minimise potential risks associated with site contamination and provide a methodology to render the site suitable (and confirm site suitability) for the proposed development from a contamination viewpoint. The primary aim of the RAP is to provide a methodology to manage and/or remediate actual or potential contamination so that risks to human health and/or the environment (i.e. ecology) during remediation and future site use under the proposed development scenario are low and acceptable.

The objectives of the RAP are to:

- Provide a framework and methodology for undertaking further investigations prior to commencement of remediation, in order to better define the remedial extent;
- Provide a methodology to manage contamination, remediate and validate the site;
- Provide a contingency plan for the remediation works;
- Outline site management procedures to be implemented during remediation work; and
- Provide an unexpected finds protocol to be implemented during the development works.

The site was historically used for agricultural/horticultural activities. The investigation by Douglas Partners identified localised soil contamination impacts from heavy metals (lead and zinc), hydrocarbons and asbestos in the form of bonded Asbestos Containing Material (ACM)/fibre cement. The EIS site walkover inspection also identified a number of other Areas of Environmental Concern (AEC) associated with dumped and buried waste. A summary of the AEC is provided in the following table:

| AEC | Contaminants / Contaminants of Potential Concern |
|---|---|
| AEC1 (PP1 to PP8 inclusive)<br><br>Power poles along the western boundary. Elevated PAHs and TRHs were identified during the Douglas Partners investigation. | Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (total recoverable hydrocarbons - TRHs), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs) and organophosphate pesticides (OPPs). |

[1] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

| AEC | Contaminants / Contaminants of Potential Concern |
|---|---|
| | |
| AEC2<br><br>Oil/fuel spills associated with machinery and storage in the vicinity of the cattle yard. Elevated PAHs were identified during the Douglas Partners investigation. | TRHs and PAHs. |
| AEC3<br><br>Buried demolition waste in drainage line. | Heavy metals (as above), TRH, benzene, toluene, ethylbenzene xylenes (BTEX), PAHs, OCP/OPPs, polychlorinated biphenyls (PCBs) and asbestos. |
| AEC4<br><br>Dumped and partially buried demolition waste in drainage line. | As for AEC3. |
| AEC5<br><br>Fibre cement buried on eastern embankment of drainage line. Possibly includes imported fill. | As for AEC3. |
| AEC6<br><br>Former homestead. Fibre cement fragments (buried), OCPs Aldrin and dieldrin, lead and zinc were identified during the Douglas Partners investigation. Area includes an above-ground storage tank (AST) and various waste storage. | As for AEC3. |
| AEC7<br><br>Dumped waste in drainage line. This includes fibre cement sheeting, other demolition waste and household waste such as tin cans, bottles and furniture. | As for AEC3. |
| AEC8<br><br>Driveway comprising imported fill with building/demolition waste. | As for AEC3. |
| AEC9<br><br>Stockpile of unknown origin. Elevated contaminants were not detected during the Douglas Partners investigation (TP20). However, further consideration of asbestos in the form of bonded fibre cement is required. | Asbestos (bonded ACM) |

The proposed contamination management and remediation strategy includes a data gap investigation, remediation using one or more of the preferred strategies, and implementation of an unexpected finds protocol. In summary, the preferred remedial strategies include the following:

- Excavation and off-site disposal of waste and contamination soil to a licenced facility;

- Excavation and relocation of contaminated soil to be capped in less sensitive areas (i.e. so as not to trigger a requirement for long term management under and Environmental Management Plan); and
- On-site treatment of soil containing fragments of fibre cement/ACM via picking, followed by appropriate re-use of the treated soil on-site.

EIS are of the opinion that the site can be made suitable for the proposed development described in Section 1.1 provided this RAP is implemented accordingly. A site validation report should be prepared on completion of remediation activities and should be submitted to the consent authority. If required, remediation and validation can be staged along with the proposed development. A separate validation report would be required for each development stage.

EIS have assessed that the remediation work is likely to fall within Category 1 due to the heritage (and potentially ecological) constraints. It is noted that the RAP is to be assessed by Council as part of the development application/consent process and conditioned as part of the development consent (if approved). EIS recommend that a specialist planner confirm the remediation category prior to the submission of this report to Council. Other regulatory requirements for remediation are discussed in Section 11.2.

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of the report.

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# ABBREVIATIONS

| | |
|---|---|
| Asbestos Fines/Fibrous Asbestos | **AF/FA** |
| Asbestos Containing Material | **ACM** |
| Area of Environmental Concern | **AEC** |
| Australian Height Datum | **AHD** |
| Acid Sulfate Soil | **ASS** |
| Above-Ground Storage Tank | **AST** |
| Benzo(a)pyrene Toxicity Equivalent Factor (carcinogenic PAHs) | **BaP TEQ** |
| Benzene, Toluene, Ethylbenzene, Xylene | **BTEX** |
| Contaminated Land Management | **CLM** |
| Contaminant(s) of Potential Concern | **CoPC** |
| Conceptual Site Model | **CSM** |
| Development Application | **DA** |
| Data Quality Indicator | **DQI** |
| Data Quality Objective | **DQO** |
| Ecological Investigation Level | **EIL** |
| Environmental Investigation Services | **EIS** |
| Ecological Screening Level | **ESL** |
| Environmental Management Plan | **EMP** |
| Environment Protection Authority | **EPA** |
| Ecological Screening Level | **ESL** |
| Health Investigation Level | **HILs** |
| Health Screening Level | **HSLs** |
| International Organisation of Standardisation | **ISO** |
| Lab Control Spike | **LCS** |
| Light Non-Aqueous Phase Liquid | **LNAPL** |
| Map Grid of Australia | **MGA** |
| National Association of Testing Authorities | **NATA** |
| National Environmental Protection Measure | **NEPM** |
| Organochlorine Pesticides | **OCP** |
| Organophosphate Pesticides | **OPP** |
| Polycyclic Aromatic Hydrocarbons | **PAH** |
| Polychlorinated Biphenyls | **PCBs** |
| Protection of the Environment Operations | **POEO** |
| Practical Quantitation Limit | **PQL** |
| Quality Assurance | **QA** |
| Quality Control | **QC** |
| Remediation Action Plan | **RAP** |
| Sampling, Analysis and Quality Plan | **SAQP** |
| Source, Pathway, Receptor | **SPR** |
| Standing Water Level | **SWL** |
| Trip Blank | **TB** |
| Toxicity Characteristic Leaching Procedure | **TCLP** |
| Total Recoverable Hydrocarbons | **TRH** |
| Trip Spike | **TS** |
| Underground Storage Tank | **UST** |
| Validation Assessment Criteria | **VAC** |

# ABBREVIATIONS

| | |
|---|---|
| Virgin Excavated Natural Material | **VENM** |
| Work Health and Safety | **WHS** |

***Units***

| | |
|---|---|
| Metres | **m** |
| Milligrams per Kilogram | **mg/kg** |
| Percentage | **%** |
| Percentage weight for weight | **% w/w** |

# 1 INTRODUCTION

Mr. David De Angelis of NettCorp, acting on behalf of Catholic Metropolitan Cemeteries Trust ('the client') commissioned Environmental Investigation Services (EIS)[2] to prepare a Contamination Management and Remediation Action Plan (RAP) for the proposed memorial park at 167-177 St Andrews Road, Varroville, NSW. The site location is shown on Figure 1 and the RAP applies to the proposed development area as shown on Figure 2. The proposed development area is referred to as 'the site' in this report.

EIS understand that the client previously lodged a Development Application (DA) for the proposed memorial park to Campbelltown City Council (Ref: 3293/2017/DA-C). Council issued a Request for Additional Information (dated 29 May 2018) that specified (Item 8.0) that a RAP must be prepared and submitted prior to determination of the DA.

The site has previously been investigated by Douglas Partners. The results of the Douglas Partners investigation are summarised in Section 2 and have been considered in the development of this plan.

## 1.1 Proposed Development Details

Based on the details provided, EIS understand that the proposed development includes the redevelopment of the site for use as a memorial park (Macarthur Memorial Park). The DA described this as the construction and operation of a new cemetery and parklands.

The memorial park will include the construction of roads/driveways, a multi-purpose chapel, gatehouse, function room, café and flower shop, administration building, ground staff facilities, car parks, riparian works/restoration and various burial zones. Restoration of parts of the former homestead buildings is also proposed. Plans showing the general layout of the development are attached in the appendices.

EIS were advised that the existing power poles and above ground power cables that currently extend along the St Andrews Road boundary will be demolished.

## 1.2 Goal, Aims and Objectives

The goal of this plan (referred to herein as the RAP) is to minimise potential risks associated with site contamination and provide a methodology to render the site suitable (and confirm site suitability) for the proposed development from a contamination viewpoint.

The primary aim of the RAP is to provide a methodology to manage and/or remediate actual or potential contamination so that risks to human health and/or the environment (i.e. ecology) during remediation and future site use under the proposed development scenario are low and acceptable.

[2] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

The objectives of the RAP are to:

- Provide a framework and methodology for undertaking further investigations prior to commencement of remediation, in order to better define the remedial extent;
- Provide a methodology to manage contamination, remediate and validate the site;
- Provide a contingency plan for the remediation works;
- Outline site management procedures to be implemented during remediation work; and
- Provide an unexpected finds protocol to be implemented during the development works.

### 1.3 Scope of Work

The plan was prepared in accordance with an EIS proposal (Ref: EP47328KP) of 6 June 2018 and written acceptance from the client's representative of 7 June 2018. The scope of work included a review of relevant reports prepared by others, a detailed site walkover inspection by an EIS Associate Environmental Scientists (Brendan Page), and preparation of a report.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[3], other guidelines made under or with regards to the Contaminated Land Management Act (1997)[4] and State Environmental Planning Policy No.55 – Remediation of Land (1998)[5]. Other guidelines are referenced throughout this report.

[3] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

[4] Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)

[5] *State Environmental Planning Policy No. 55 – Remediation of Land 1998* (NSW) (referred to as SEPP55)

# 2 SITE INFORMATION

## 2.1 Site Identification

Table 2-1: Site Identification

| | |
|---|---|
| Site Address: | 167-177 St Andrews Road, Varroville, NSW |
| Lot & Deposited Plan: | Lot 1 DP218016, Lot 22 DP564065 and Lot B DP370979 |
| Current Land Use: | Predominantly vacant. With a small portion of the northern area used for cattle farming |
| Proposed Land Use: | Cemetery |
| Local Government Authority (LGA): | Campbelltown City Council |
| Current Zoning: | E3 (Environmental Management) and RE1 (Public Recreation)<br>  <br>Zoning based on Campbelltown Local Environmental Plan (2015) |
| Site Area (hectares) (approx.): | 114 |
| RL (AHD in m) (approx.): | 40-140 |
| Geographical Location (decimal degrees) (approx.): | Latitude: -34.00283<br><br>Longitude: 150.823487 |

## 2.2 Site Location and Regional Setting

The site is located in a rural and semi-rural area of Varroville in the northern portion of the Campbelltown City Council Local Government Area. St Andrews Road bounds the site to the west (south-west).

## 2.3 Topography

The site is located on a gently to moderately sloping hillside that grades down to the south east. A maximum elevation relief of approximately 100m exists between the northern corner of the site and the lower eastern corner. The site includes a series of undulating hills, low-lying drainage lines and watercourses. The land generally slopes away from the former homestead and from Varroville House in the southern portion of the site (see Figure 2).

## 2.4 EIS Site Inspection

A walkover inspection of the site was undertaken by Brendan Page of EIS on 18 and 19 June 2018. At the time of the inspection, the majority of the site was vacant farmland and was predominantly surfaced with grasses and weeds, with localised pockets of trees in the riparian zones and around the dams. The far northern site area was more densely vegetated with medium-sized trees and only a limited inspection of this area occurred due to the limited access and steep slopes.

Only part of the northern site area was in use and this included a small-scale cattle farm.

Parts of the hillside in the eastern/south-eastern areas of the site appeared to be terraced, which suggested that this area was formerly a vineyard.

A summary of the other inspection findings are outlined in the following subsections. The potential contamination sources have been referred to as Areas of Environmental Concern (AEC) and are shown on the attached Figure 4 and Figure 5.

### 2.4.1 Buildings, Structures and Roads

A number of small structures/buildings remained in the southern site area at the former homestead (see AEC6, Figure 5). The buildings appeared to be predominantly of brick and/or timber construction. However, fibre cement construction materials (likely to contain asbestos) were also evident. These buildings are referred to as the former coach house, cottage and dairy (see the plans attached in the appendices for further details).

A series of access roads/tracks extended throughout the property. Some of these were surfaced with sandstone gravel and asphalt pavement. The access driveway that extended around the southern and eastern side of the former homestead appeared to have been constructed using recycled materials. Bricks, together with brick, tile and concrete fragments were observed throughout and adjacent to the driveway.

### 2.4.2 Boundary Conditions, Soil Stability and Erosion

The site was surrounded by wire fences and appeared to be secure. Localised soil erosion was observed in some areas, with some broader-scale erosion and scouring in the eastern area of the site to the

north of the former vineyard. This is evident on the aerial photograph used as the base image for the attached Figure 3.

### 2.4.3 Visible or Olfactory Indicators of Contamination

Minor and localised oil/fuel leaks were observed in the vicinity of the cattle farm in the northern area of the site and were associated with a backhoe and the storage of small quantities of engine oil (see AEC2, Figure 4).

Fibre cement (likely to contain asbestos) was observed in the following areas:

- Embedded in the eastern bank (i.e. buried in soil) of the drainage line to the south of Dam 2. The material included a number of fragments (fragments generally less than 10cm in length/width) (see AEC5, Figure 5);
- In the former homestead buildings and at the ground surface around the buildings (see AEC6, Figure 5); and
- In the drainage lines to the north of Dam 11. This included more significant quantities (>10m$^2$) of various fibre cement products including large sheets and fragments (see AEC7, Figure 5).

Minor staining was observed on the timber at the base of several power poles located in the vicinity of the St Andrews Road boundary (see AEC1 PP1 to PP8 inclusive, Figure 4 and Figure 5). A slight hydrocarbon/creosote odour was evident upon closer inspection.

### 2.4.4 Presence of Drums/Chemicals and Waste

Small quantities of oil (~ 100L) appeared to be stored in drums in the vicinity of the cattle farm in the northern area of the site. Various drums were observed in this area and in the vicinity of the former homestead. The writing on many of the drums was illegible, however some drums had labels indicating they were for storage of 'lemon concentrate' and 'sodium hydroxide' detergent. Discussions with the cattle farmer said that the drums were sourced from industries such as breweries and were brought to site containing grains/cattle feed.

An above-ground storage tank (AST) was observed in the vicinity of the former coach shed building in the former homestead area. It was unclear what the AST contained and/or whether the contents were still present. Other waste such as tyres, timber and various metal items were also in AEC6.

Relatively large quantities of waste were observed in the drainage lines to the north of Dam 3 (see AEC3, Figure 5), south of Dam 2 (see AEC4, Figure 5) and north of Dam 11 (see AEC7, Figure 5). The waste included the following:

- AEC3 and AEC4 – concrete slabs, and to a lesser extent bricks, timber and metal; and
- AEC7 – household rubbish (such as tin cans, plastic and glass bottles, together with metal wire, timber furniture) and demolition waste such as bricks, clay/terracotta pipe, concrete and fibre cement sheets/fragments.

The waste associated with AEC4 and AEC7 appeared to generally be dumped over the side of the embankment of the drainage line, although some of the waste in AEC4 was partially buried by soil (presumably via collapse/erosion of the embankment). The waste in AEC3 was predominantly buried.

A small stockpile (<15m$^3$) of soil was observed in the south-western section of the site (see AEC9, Figure 5). The stockpile comprised clayey soil with inclusions of brick, concrete, metal and sandstone gravel/cobbles.

#### 2.4.5 Sensitive Environments

Nine dams are located throughout the site as shown on the attached Figures 2 and 3. The dams intercept overland flows via the various drainage lines. Based on the topography, excess surface water would be expected to flow off-site towards the south/south-east (via the drainage lines) during rain events.

#### 2.4.6 Landscaped Areas and Visible Signs of Plant Stress

The vegetation on site appeared to be in relatively good condition based on a cursory inspection. There were no obvious signs of vegetation stress (e.g. dieback) across the broader site area.

#### 2.4.7 Surrounding Land Use

The site was generally surrounded by rural/semi-rural properties comprising open farmland. A church, educational facility and retreat centre were located to the west/south-west of the site beyond St Andrews Road.

### 2.5 Previous Investigations

EIS were provided with a copy of the Douglas Partners report titled "*Report on Detailed Site Investigation for Contamination, Proposed Memorial Park, 167-177 St Andrews Road, Varroville, NSW*" (Ref: Project 92237.00, dated 1 September 2017) (referred to herein as the DP report or DP investigation). The DP investigation included a site walkover, limited site history assessment (discussed as further detail in Section 2.6), soil sampling from 41 locations and analysis of 41 soil samples for the identified contaminants of potential concern (CoPC). A copy of the DP sample location plan is attached in the appendices.

Seven potential sources of contamination (AEC) were documented in the Conceptual Site Model (CSM) and included the former vineyard, stockpiles, storage and use of fuels/oils, timber power poles, residual building materials on the ground surface, agricultural land use and potential filling/ground disturbance. An excerpt from the DP report outlining the CoPC and sources of contamination/AEC is provided on the following page:

| Potential Source | Description of Potential Source | Contaminants of Potential Concern |
|---|---|---|
| Former vineyard (S1) | The former vineyard operated in the 19th Century, before manufactured organochlorine / organophosphorus pesticides were available. However, historic pesticides / herbicides are known to have contained elevated heavy metals. | Heavy metals |
| Stockpiles (S2) | Stockpiles of construction and demolition materials observed throughout site. | Metals, petroleum hydrocarbons, pesticides, PAHs, phenols and asbestos |
| Storage and use of fuels and oils (S3) | Fuels / oils stored and used at the site. | Metals, TRH, BTEX, PAHs, cresol, phenols and MTBE |
| Timber power poles (S4) | Historical timber power lines are located throughout site | Metals, pesticides, petroleum hydrocarbons, PAHs, creosote and ammonia |
| Residual building materials from homestead / sheds (S5) | Fragments of ACM and paint flakes were observed on the site surface. | Asbestos, lead |
| Agricultural land use (S6) | The site has historically been used for agricultural (pastoral) purposes. | Heavy metals, nutrients, pesticides, herbicides and insecticides |
| Potential filling (S7) | Localised ground disturbance observed on historical aerial photographs may potentially have been historically filled. | Metals, petroleum hydrocarbons, pesticides, PAHs, phenols and asbestos |
| Suspected ACM in homestead and adjacent structures | Not further assessed here. Refer to Section 0. | |

Source: Table 1 of DP report

The DP report did not accurately delineate or define specific areas for the potential sources of contamination/AEC.

The DP investigation data for soil samples were assessed against the Tier 1 NEPM (2013) criteria for land use type C ('public open space/recreational') and other criteria for direct contact with petroleum hydrocarbons, produced by CRC Care. Asbestos was assessed as present/absent as quantification sampling/analysis was not undertaken. Ecological criteria were adopted based on an 'urban residential and public open space' scenario. In summary:

- The lead concentration (790mg/kg) exceeded the Health Investigation Level (HIL) C in surface soil from TP17;
- Zinc concentrations exceeded the Ecological Investigation Level (EIL) in surface soils in TP17, TP39 and TP41 (maximum of 2,000mg/kg);
- Total Polycyclic Aromatic Hydrocarbon (PAH) and carcinogenic PAH concentrations exceeded the HIL C and Ecological Screening Level (ESL) in TP21 (maximum total PAHs of 1,800mg/kg and maximum carcinogenic PAH concentration of 360mg/kg);

- Total Recoverable Hydrocarbons (TRH) and Total Petroleum Hydrocarbons (TPH) concentrations in surface soils from TP14, TP17 and TP21 exceeded various Health Screening Level (HSL), management limit and ESL criteria with maximum TRH (F1) and TRH (F2) concentrations of 250mg/kg and 47,000mg/kg respectively. TRH (F3 and F4) was also encountered in TP14 at concentrations up to 160,000mg/kg;
- The Organochlorine Pesticide (OCP) concentrations for aldrin and dieldrin (total 26.2mg/kg) in surface soil from TP17 exceeded the HIL C criterion; and
- Asbestos was not detected in the soil samples analysed. However asbestos was detected in a fragment of fibre cement collected from within the soil profile at TP39 (0-0.15m depth). EIS note that TP39 does not appear to be shown on the DP investigation location plan (attached in the appendices), however it is assumed based on other information within the report that TP39 was within the former homestead area near TP41 and TP17.

## 2.6 Summary of Site History

The DP report included a limited site history assessment comprising a review of historical aerial photographs and statutory notices by the NSW EPA. EIS were also provided with a Conservation Management Plan by Urbis (Ref: SH349, Report 01, dated October 2015). Based on EIS' interpretation of the information in these reports, the site history can be summarised as follows:

- The site originally formed part of an area referred to as Varroville Estate for which the land was granted in the early 1800s and was used for farming purposes, including grazing, cultivation and potentially a slaughterhouse;
- Varroville House and the homestead buildings were progressively constructed and altered throughout the 1800s and 1900s, and various agricultural (including a dairy farm) and horticultural activities likely continued throughout this period;
- A new driveway to the property (presumably the driveway that extends towards the homestead) was established in the 1950s; and
- The land occupied by Varroville House was excised from the estate in the 1970s.

## 2.7 Summary of Geology and Hydrogeology

### 2.7.1 Regional and on-site Geology

The regional geology includes Bringelly Shale of the Wianamatta Group which typically consists of shale, carbonaceous claystone, laminate and fine to medium-grained lithic sandstone (DP report).

The DP investigation typically encountered clayey/silty topsoil overlying clayey soil and shale bedrock. Fill (soil) was encountered at a limited number of locations.

### 2.7.2 Acid Sulfate Soil Risk

The site is not mapped as being within an acid sulfate soil risk area (DP report).

### 2.7.3 Hydrogeology

There is limited data on the hydrogeological conditions. The DP report indicates that there are no registered groundwater users within 1km of the site. Groundwater may be present as perched seepage above the bedrock, or within a deeper aquifer within the bedrock itself. There is anticipated to be connectivity between the dams and the groundwater.

### 2.7.4 Receiving Water Bodies

The on-site dams are expected to receive overland surface water flows during rain events. Overall, the site drains towards the south-east, with surface water moving through a series of drainage lines before discharging into Bunbury Creek, in the vicinity of the Hume Highway.

# 3 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information (including the site inspection information) assessed by EIS. Reference should also be made to the figures attached in the appendices.

## 3.1 AEC and Contaminants

The AEC and CoPC are outlined in the table below:

Table 3-1: AEC and Contaminants

| AEC | Contaminants / CoPC |
|---|---|
| AEC1 (PP1 to PP8 inclusive)<br><br>Power poles along the western boundary. Elevated PAHs and TRHs were identified during the DP investigation. | Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (TRHs), PAHs organochlorine pesticides (OCPs) and organophosphate pesticides (OPPs). |
| AEC2<br><br>Oil/fuel spills associated with machinery and storage in the vicinity of the cattle yard. Elevated PAHs were identified during the DP investigation. | TRHs and PAHs. |
| AEC3<br><br>Buried demolition waste in drainage line. | Heavy metals (as above), TRH, benzene, toluene, ethylbenzene xylenes (BTEX), PAHs, OCP/OPPs, polychlorinated biphenyls (PCBs) and asbestos. |
| AEC4<br><br>Dumped and partially buried demolition waste in drainage line. | As for AEC3. |
| AEC5<br><br>Fibre cement buried on eastern embankment of drainage line. Possibly includes imported fill. | As for AEC3. |
| AEC6<br><br>Former homestead. Fibre cement fragments (buried), OCPs Aldrin and dieldrin, lead and zinc were identified during the DP investigation. Area includes AST and various waste storage. | As for AEC3. |

| AEC | Contaminants / CoPC |
|---|---|
| | |
| AEC7<br><br>Dumped waste in drainage line. This includes fibre cement sheeting, other demolition waste and household waste such as tin cans, bottles and furniture. | As for AEC3. |
| AEC8<br><br>Driveway comprising imported fill with building/demolition waste. | As for AEC3. |
| AEC9<br><br>Stockpile of unknown origin. Elevated contaminants were not detected during the DP investigation (TP20). However, further consideration of asbestos in the form of bonded fibre cement is required. | Asbestos (bonded ACM) |

### 3.2 Mechanism for Contamination, Affected Media, Receptors and Exposure Pathways

The primary mechanisms for contamination at the site are considered to be from 'top-down' sources and spills. The affected medium includes the soil (likely confined to shallow soils and fill), and potentially affected media soil vapour and air. EIS are of the opinion that there is a low potential for groundwater impacts considering the geological conditions and contaminants/sources of contamination identified to date. This needs to be confirmed via the site validation process.

Humans (adults and children) and terrestrial ecology (plants and animals) are the primary receptors. Potential human receptors can be broken down further as follows:

- Site workers during remediation/development (adults);
- Visitors/future site users (adults and children) in a non-residential scenario; and
- Future site workers, including intrusive maintenance works (adults).

Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants), vapours (volatile TRH, naphthalene and BTEX) and asbestos fibres. Inhalation of vapours is a valid exposure pathway in the proposed buildings.

Potential exposure pathways for ecological receptors include primary contact and ingestion.

## 3.3 Assessment of Data Gaps

The DP investigation has not characterised the extent of contamination (laterally or vertically). This is to be addressed via data gap investigations prior to the commencement of remedial works. The requirements for the data gap investigations are outlined in Section 4.

## 4 DATA GAP INVESTIGATION

Prior to commencement of remediation, data gap investigations are required for AEC1, AEC2, AEC3, AEC5, AEC6 and AEC8. The primary objective of the data gap investigations is to characterise the nature and extent of the contamination (actual or potential) in order to better define the remedial extent and select the remediation option.

An outline of the sampling plan required for each AEC is provided below:

Table 4-1: Data Gap Investigations

| AEC | Sampling Plan Outline |
|---|---|
| AEC1 (PP1 to PP8 inclusive)<br><br>Power poles along the western boundary. Elevated PAHs and TRHs were identified during the DP investigation. | Five sampling points at each power pole, including four points approximately 1m away (i.e. horizontal distance) from the base of the pole and one point as close to the base of the pole as possible. Stratified sampling should be undertaken to a minimum depth of 3m at the base of the pole, and to a depth of 1-1.5m at the remaining four locations (based on field indicators). |
| AEC2<br><br>Oil/fuel spills associated with machinery and storage in the vicinity of the cattle yard. Elevated PAHs were identified during the DP investigation. | Sampling on a grid-based pattern with a maximum spacing of 15m between sampling points. Additional targeted locations are to be included in areas of visible spills or suspected contamination. Stratified sampling is required to confirm vertical extent of contamination. |
| AEC3<br><br>Buried demolition waste in drainage line. | Judgemental sampling is required using an excavator to establish the extent of the buried waste. Once the area of waste is delineated, sampling is to be on a grid-based pattern with a maximum spacing of 15m between sampling points. Sampling should extend to the base of the fill and at least 0.5m into the natural soil (based on field observations). Assessment of asbestos should include bulk sampling/ screening in accordance with NEPM (2013). |
| AEC5<br><br>Fibre cement buried on eastern embankment of drainage line. Possibly includes imported fill. | Judgemental sampling is required using an excavator to establish the lateral extent of the buried waste. Once the fill/extent of buried fibre cement is delineated, sampling is to be on a grid-based pattern with a maximum spacing of 15m between sampling points. Sampling should extend to the base of the fill and at least 0.5m into the natural soil (based on field observations). Assessment of asbestos should include bulk sampling/ screening in accordance with NEPM (2013). |
| AEC6 | Sampling on a grid-based pattern with a maximum spacing of 15m between sampling points. Additional targeted |

| AEC | Sampling Plan Outline |
|---|---|
| Former homestead. Fibre cement fragments (buried), OCPs Aldrin and dieldrin, lead and zinc were identified during the DP investigation. Area includes AST and various waste storage. | locations are to be included in areas of spills or suspected contamination. Stratified sampling is required to confirm vertical extent of contamination. Sampling should extend to the base of the fill and at least 0.5m into the natural soil (based on field observations). Assessment of asbestos should include bulk sampling/screening in accordance with NEPM (2013). |
| AEC8<br><br>Driveway comprising imported fill with building/demolition waste. | Sampling along the alignment of the driveway, with a maximum spacing of 15m between sampling points. Stratified sampling is required to confirm vertical extent of contamination. Sampling should extend to the base of the fill. Assessment of asbestos should include bulk sampling/screening in accordance with NEPM (2013). |

In addition to the above, a waste classification will be required prior to off-site disposal of soil or other waste removed from the site as part of the remediation process.

An appropriate number of samples should be submitted for analysis in order to achieve the data gap investigation objectives for each AEC. The analysis should target the contaminants/CoPC identified for each respective AEC as specified in Section 3.1. In relation to asbestos, it is intended that this contaminant be assessed in the field via bulk sampling/screening in accordance with the quantification methods outlined in NEPM (2013). Analysis of asbestos at the laboratory should be limited to fibre cement fragments (for confirmation of presence/absence of asbestos), unless suspected friable asbestos materials are encountered.

Appropriate QA/QC samples should be obtained and analysed. As a minimum, QA/QC sampling should include duplicates (5% inter-laboratory and 5% intra-laboratory), trip spikes, trip blanks and rinsate samples.

Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) should be clearly outlined and assessed as part of the data gap investigations. A framework for the DQO and DQI process is outlined below (based on NEPM 2013) and should be reflected in the investigation reports. The seven DQO steps include the following:

- State the problem;
- Identify the decisions/goal of the study;
- Identify information inputs;
- Define the study boundary;
- Develop the analytical approach/decision rule;
- Specify the performance/acceptance criteria; and
- Optimise the design for obtaining the data.

DQIs are to be assessed based on field and laboratory considerations for precision, accuracy, representativeness, completeness and comparability.

The results of the data gap investigations can either be incorporated into the site validation report, or a separate report can be issued to document the findings. It would be preferable for the data gap investigations to be undertaken by the site validation consultant.

## 5 REMEDIATION EXTENT

The remediation extent is to be confirmed based on three primary information inputs:

- The outcome of the data gap investigations;
- Validation sampling/analysis; and
- The identification of any unexpected finds.

A discussion of the anticipated extent of remediation based on the current data is provided below. Reference should also be made to the attached Figure 3 and Figure 4.

Table 5-1: Remediation Extent

| AEC | Extent |
|---|---|
| AEC1 | The remediation is limited to the contaminated soil at the eight power pole locations (PP1 to PP8 inclusive). Based on EIS experience, contamination may extend beyond the base of the power pole installation, and several metres (horizontally) away from the base of the pole. |
| AEC2 | Currently unknown. Likely to be limited to soils impacted by localised spills and stained areas. Impacts are not expected below 0.5m due to the soil conditions and contaminant types. The nominal extent of AEC2 shown on Figure 4 is ~ 2,000m$^2$. |
| AEC3 | Currently unknown. The nominal extent of AEC3 shown on Figure 4 is ~ 5,000m$^2$. The remediation is to include all building/demolition waste, together with any contaminated soil identified during the data gap investigation. |
| AEC4 | To be confirmed based on field observations during removal of the waste. Nominal extent of AEC4 shown on Figure 4 is ~ 100m$^2$. The remediation is to include all building/demolition waste. Remediation of soil may also be required subject to the validation results. |
| AEC5 | Currently unknown. The section of the embankment where buried fibre cement was observed was less than 10-15m lineal. The remediation is to include all building/demolition waste, together with any contaminated soil identified during the data gap investigation. |
| AEC6 | Currently unknown. Nominal extent of AEC6 shown on Figure 4 is ~ 1,500m$^2$. The remediation is to include all waste, together with any contaminated soil. |
| AEC7 | To be confirmed based on field observations during removal of the waste. Nominal extent of AEC7 shown on Figure 4 is ~ 5,000m$^2$. The remediation is to include all waste material and may also include remediation of soil subject to the validation results. |
| AEC8 | Approximately 500m in length and estimated to be ~ 5m wide including the batters adjacent to the roadway. Depth is unknown. |
| AEC9 | Localised to stockpile, estimated to be approximately 15m$^3$. |

# 6 REMEDIATION OPTIONS

## 6.1 Soil Remediation Options

The NSW EPA follows the hierarchy set out in NEPM 2013 for the remediation of contaminated sites. The preferred order for soil remediation and management is as follows:

1. On-site treatment of soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated material 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;

Or if the above are not practicable:

3. Consolidation and isolation of the soil by on-site by containment within a properly designed barrier; and
4. Removal of contaminated material to an approved site or facility, followed where necessary by replacement with clean material; or
5. Where the assessment indicates that remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

For simplicity herein, the above hierarchy are respectively referred to as Option 1, Option 2, Option 3 etc.

The Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)[6] provides the following additional requirements to be taken into consideration:

- Remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed; and
- Where there are large quantities of soil with low levels of contamination, alternative strategies should be considered or developed.

[6] NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme, 3rd ed.* (referred to as Site Auditor Guidelines 2017)

## 6.2 Consideration of Remediation Options

The tables below discusses a range of remediation options:

Table 5-1: Consideration of Remediation Options

| Option | Discussion | Applicability |
|---|---|---|
| Option 1<br>On-site treatment of contaminated soil | Various on-site treatment technologies exist such as bio-remediation, air sparging and soil vapour extraction, and thermal desorption.<br><br>With regards to fibre cement/bonded asbestos containing material (ACM), the only relevant on-site treatment option would include the physical removal of bonded ACM via picking. This would include a systematic process whereby the impacted fill is excavated and ACM fragments are physically removed from the soil by hand. | Physical removal of bonded asbestos materials via hand picking is a viable approach. Other treatment technologies are unlikely to be applicable (or viable) for addressing the variety of contaminants/CoPC for this project. |
| Option 2<br>Off-site treatment of contaminated soil | Contaminated soils are excavated, transported to an approved/ licensed treatment facility, treated to remove/stabilise the contaminants then returned to the subject site, transported to an alternative site or disposed to an approved landfill facility. This option provides for a relatively short program of on-site works, however there may be some delays if the material is to be returned to the site following treatment and regulatory requirements would need to be carefully considered. The cost per tonne for transport to and from the site and for treatment is considered to be relatively high. The material would also have to be assessed in terms of suitability for reuse as part of the proposed development works. | Not applicable for this project considering the limited volumes of material to be remediated, the limitations associated with treatment technologies, and the regulatory implications. |
| Option 3<br>Consolidation and isolation of impacted | This would include the placement of a warning layer (such as geo-grid or geofabric) and pavement over the surface of the contaminated soil to isolate the material and thereby reduce the health risk to future site users. | Capping is a viable option for the contamination at the site. Relocation and capping of impacted soil in less sensitive land use areas would not require on-going |

| Option | Discussion | Applicability |
|---|---|---|
| soil by cap and containment | The capping and/or containment must be appropriate for the specific contaminants of concern. An ongoing Environmental Management Plan (EMP) would be required and site identification documentation, including the Section 10.7 Council planning certificate (or other appropriate notification mechanism), would be modified to note the presence of the contamination/EMP in the event that contamination remains at concentrations that exceed the Validation Assessment Criteria (VAC). This may impact upon development approval conditions, place restrictions on the use of the land and limit the future potential land value. | management via an EMP provided that the contaminant concentrations are below the land use-based VAC for that area. |
| Option 4<br>Removal of contaminated material to an appropriate facility and reinstatement with clean material | Contaminated soils would be classified in accordance with NSW EPA guidelines for waste disposal, excavated and disposed of off-site to an appropriately licensed facility. The material would have to meet the requirements for landfill disposal. Landfill gate fees (which may be significant) would apply in addition to transport costs. | This is considered to be the most practical and viable option for this project considering the variety of contaminant types present. |

## 6.3 Preferred Remediation Options and Rationale

In the absence of detailed characterisation and delineation data for all AEC, the RAP has outlined a number of options that can be selected. These are discussed in detail below:

- Preferred Option A – this includes excavation and off-site disposal of waste and contaminated soil to a suitably licensed landfill (Option 4 in the remediation hierarchy). This option provides for a relatively short programme of on-site works and is the only valid option for the general waste materials. The other preferred options below could also be applied for remediation of soil depending on the contamination/contaminants present;
- Preferred Option B – this includes excavation and relocation of contaminated soil to be capped in less sensitive areas including the proposed car parks and beneath the proposed buildings (commercial use). This is only applicable for contaminated soil with concentrations that do not exceed the commercial/industrial criteria (VAC D). An EMP would not be required to manage these areas (this is a hybrid version of Option 3 in the remediation hierarchy); and
- Preferred Option C – this includes on-site treatment of soil containing fragments of fibre cement/ACM via picking, followed by appropriate re-use of the soil on-site (Option 1 in the remediation hierarchy). This is only applicable for soil containing bonded ACM.

The preferred remedial options were selected based on technical feasibility and waste reduction principles, and are considered valid to achieve the remedial goals/aims. With regards to Preferred Option B, the following rationale has been applied:

- The approach is risk-based and will result in removal of impacted soil from areas that reflect a public open space-type exposure scenario (in the context of the proposed development) to areas that reflect a commercial/industrial-type exposure scenario; and
- Material placed in the carparks/beneath buildings will be beneath fully paved surfaces and is not expected to be influenced by groundwater or surface water infiltration. On this basis, there will be no significant transport mechanism (i.e. leaching to groundwater) for contaminants to migrate to groundwater.

# 7 REMEDIATION DETAILS

## 7.1 Roles and Responsibilities

The two primary roles under the RAP include the validation consultant and the remediation contractor. The validation consultant should be engaged to undertake the data gap investigation and to implement the validation plan outlined in this RAP. It would be prudent to select a consultant that is a Certified Environmental Practitioner (Site Contamination Specialist) under the Environment Institute of Australia and New Zealand scheme.

The remediation contractor should be engaged to carry out the remediation tasks required under this RAP. The role of the contractor is to remediate the site in accordance with the remediation methods and the validation consultant's advice, apply for any necessary permits/licenses required for remediation, retain all necessary documentation for waste disposal, imported materials etc, and to keep the validation consultant informed regarding the progress of the site works and any unexpected finds.

## 7.2 Sequence of Works

EIS anticipate the following sequence of work for the project (in the context of the remediation):

1. Data gap investigation;
2. Demolition/salvage and removal of any obvious waste from across the entire site (excluding the waste in the AEC);
3. Remediation of the AEC;
4. Validation of the AEC (progressively as remediation occurs); and
5. Validation of any imported soil materials (even those not intended for remediation purposes) until the finalisation of the site validation report. This includes bulk fill and/or engineering material such as recovered aggregate etc for roadmaking.

Prior to commencement of remediation, appropriate steps should be taken to implement the *Site Management Plan for Remediation Works* (Section 10). Advice regarding shoring and excavation in relation to the remediation should also be provided by a suitably qualified geotechnical engineer, and this advice should also be implemented to the extent required to facilitate the remediation.

## 7.3 Remedial Actions - Preferred Option A (off-site disposal)

The following procedure (Preferred Option A) will apply to AEC1, AEC2 and for the demolition/household waste in AEC3, AEC4 and AEC7. This may also be applied for soil in AEC3, AEC4 and AEC7, or for the other AEC depending on the outcome of the data gap investigation/validation.

Table 7-1: Remedial Actions – Preferred Option A

| Step | Procedure |
|---|---|
| 1. | Establish Asbestos Related Controls and Arrange Licenses and Tracking Requirements:<br>Prior to commencement:<br>• Notification of bonded asbestos removal should be submitted to SafeWork NSW by the remediation contractor (who must have a Class B asbestos removal license);<br>• Register with NSW EPA WasteLocate for the transport of asbestos waste. Other notifications may also be required depending on the waste classification of the fill; and<br>• An asbestos removal control plan should be prepared by the remediation contractor for the works required. This should include details for works health and safety (WHS) and personal protective equipment (PPE), which as a minimum should include requirements for wearing safety helmets and steel capped boots, disposable coveralls rated type 5 category 3 (prEN ISO 13982–1) or equivalent and P2 masks conforming to the requirements of AS/NZS 1716:2009, and use of appropriate gloves. |
| 2. | Waste Classification:<br>A waste classification report should be prepared for the waste in accordance with the NSW Waste Classification Guidelines, Part 1: Classifying Waste (2014)[7]. The fibre cement/ACM is to be classified as special waste (asbestos). Subject to appropriate segregation, the building/demolition and other household waste is likely to be pre-classified as 'general solid waste (non-putrescible)'. This is to be confirmed in the waste classification report. |
| 3. | Initial sorting and removal of fibre cement:<br>• Where fibre cement is mixed with building/demolition and/or household waste, the fibre cement should be removed by hand or with the assistance of a small excavator, prior to excavation of the remaining waste;<br>• Load the waste onto trucks and dispose to a licenced facility in accordance with the assigned waste classifications; and<br>• If excavation of the underlying soil is not deemed necessary, validate the area in accordance with Section 8. |
| 4. | Shoring / stabilisation:<br>For areas where soil is to be excavated, or if buried waste is identified, any necessary requirements for shoring or stabilising the remediation area should be implemented based on the advice of the geotechnical engineer. |
| 5. | Removal of fill/soil:<br>Remediation of fill/soil will be undertaken as follows:<br>• The extent of the contamination should be established and the area is to be marked out using appropriate methods (pegs/marking paint); |

[7] NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

| Step | Procedure |
|---|---|
| | • Excavate the fill/soil to the full extent of remediation under the guidance of the validation consultant;<br>• Load the fill onto trucks and dispose to a licenced facility in accordance with the assigned waste classification;<br>• Validate the excavation in accordance with Section 8; and<br>• Reinstate the area (if required) to an appropriate level using clean material. Preferably this material should be sourced from the site, in an area that falls outside of the nominated AEC. |

## 7.4 Remedial Actions - Preferred Option B (excavation, relocation, capping)

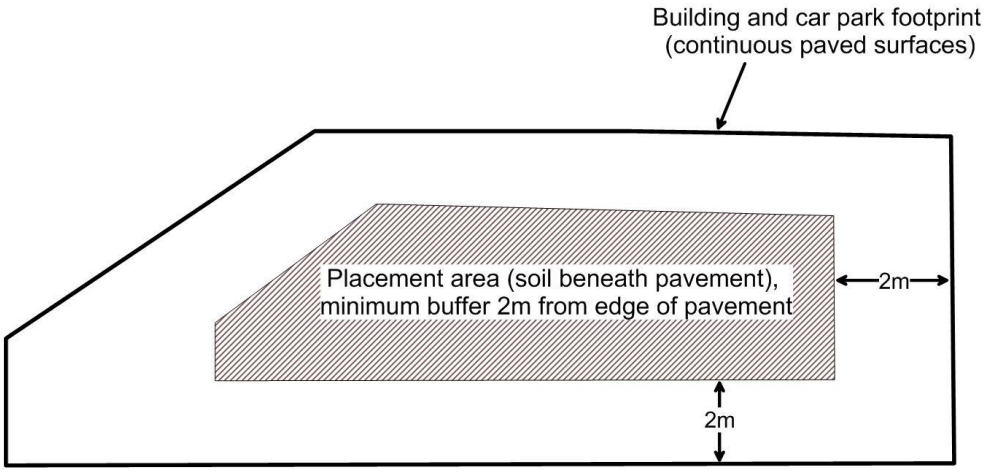
Preferred Option B should only be applied in the following circumstances:

- Where soil contaminant concentrations are above the health-based VAC C, and are below the health-based VAC D (no single value should exceed 250% of the VAC if statistical analysis is adopted); and
- Where soil contaminant concentrations are above the environmental/ecological VAC, and are below the health-based VAC D (no single value should exceed 250% of the VAC if statistical analysis is adopted).

Based on the existing data, this approach may be applicable for the lead, zinc and OCP (Aldrin and dieldrin) impacted soil in AEC6. The results of the data gap investigations and other validation tasks are to be used to confirm whether this option is appropriate for other soils.

Table 7-2: Remedial Actions – Preferred Option B

| Step | Procedure |
|---|---|
| 1. | Establish Appropriate Controls (WHS and Earthworks) and Licenses:<br>Prior to commencement, appropriate controls should be setup and licenses obtained as outlined in Steps 1 and 4 of Section 7.3. |
| 2. | Establish Source Area:<br>The extent of the contamination (requiring relocation) should be established and the remediation area (referred to as the source area) is to be marked out using appropriate methods (pegs/marking paint). |
| 3. | Establish Placement Area:<br>The proposed placement area should be established via survey and the area should be appropriately marked out. The area should only be established beneath fully paved surfaces such as car parks and beneath buildings to be constructed with a slab on-grade. Paved roads should not be used as placement areas. |

| Step | Procedure |
|---|---|
| | There should be a buffer of at least 2m between the placement area and the edge of the proposed pavement so as to minimise the potential for the soil to be exposed or cross-contaminate the adjoining un-paved areas. This is indicated schematically in the following drawing:<br>  <br><br>Drawing 1: Schematic drawing of Soil Placement Area – Option B |
| 4. | Excavation and Placement:<br>• Excavate the soil from the source area, load the soil into trucks and transport directly to the placement area. Temporary stockpiling should not occur;<br>• The soil should be compacted using an appropriate earthworks specification to meet the engineering requirements for the project. Advice should be sought from a suitably qualified geotechnical engineer as required;<br>• Validate the source area in accordance with Section 8;<br>• In the event that the overlying pavement/slab is not to be constructed immediately, the placement area is to be covered using a geo-fabric marker that is pinned down using soil nails. The geofabric should extend at least 1m beyond the edge of the placement area; and<br>• The pavement/building should be constructed as required. |

## 7.5 Remedial Actions - Preferred Option C (on-site treatment of soil containing bonded ACM)

Preferred Option C can be implemented for soils impacted by bonded ACM, following consideration/validation for the other relevant contaminants/CoPC.

Table 7-3: Remedial Actions – Preferred Option C

| Step | Procedure |
|---|---|
| 1. | Establish Appropriate WHS and Earthworks Controls:<br>Prior to commencement, WHS/earthworks controls and licencing requirements should be addressed as outlined in Steps 1 and 4 of Section 7.3. |

| Step | Procedure |
|---|---|
| 2. | Establish Remediation Area:<br>The extent of the contamination (requiring remediation) should be established and the remediation area is to be marked out using appropriate methods (pegs/marking paint). |
| 3. | Establish Treatment Area:<br>Preferably the treatment should occur at the location of, or in close proximity to, the contaminated soil to minimise the potential for cross-contamination. However, the treatment area should be an appropriate distance from ecologically sensitive areas such as dams and riparian vegetation etc. The area should be adequate to facilitate the excavation, spreading out and subsequent stockpiling of treated soil. |
| 4. | Treatment:<br>The treatment should be completed in accordance with the Safe Work Australia National Code of Practice, How to Manage and Control Asbestos in the Workplace (2011). Treatment should be undertaken as follows:<br>• Excavate the contaminated soil from the remediation area in batches. During excavation, any large sheets or obvious fragments of fibre cement/ACM should be removed by hand;<br>• Spread the excavated soil out across the treatment area in layers no greater than 0.1m thick;<br>• The surface of each batch within the treatment area should be inspected by walking in a north-south direction then east-west direction on a 2m transect (it is anticipated that such works can be undertaken by a Class B licensed asbestos removalist/remediation contractor under observation of the validation consultant);<br>• During the inspection, all visible fragments of fibre cement/ACM should be picked from the surface and placed in a plastic bag. The bag should be sealed upon completion of remediation, 'double bagged' and placed in a nominated storage container;<br>• All bagged fibre cement/ACM should be disposed of to an appropriate facility. The tracking of fibre cement/ACM disposal is required in accordance with the NSW EPA WasteLocate tracking system;<br>• The inspection and surface pick of the material in one direction of the transect (e.g. north-south) will be considered as one "pass" for the purpose of the validation. After each pass, the soil should be turned over using an excavator and the process repeated. A minimum of two passes is required prior to attempting validation; and<br>• The inspection and picking process will need to be documented and each batch is to be validated (see Section 8). The validation should be undertaken on batches no larger than 70m$^3$. Each batch should have an appropriate identifier and this process should be adequately documented in the validation report. |
| 5. | Re-use of Treated Soil<br>Successfully treated/validated soils can be re-used on site provided that the material has a minimum of 0.1m of clean soil (i.e. material sourced from on-site outside the nominated AEC) placed over it. The placement of validated material beneath paved surfaces would also be acceptable. This process should be tracked and documented appropriately (e.g. by surveys) and the fate of the validated/treated material must be reconciled in the validation report. |

## 7.6 Remediation Documentation

The remediation contractor must retain all documentation associated with the remediation, including but not limited to:

- Waste classification and waste tracking documentation;
- Soil/waste disposal dockets;
- Photographs of remediation works;
- Asbestos removal documentation, including licences, removal control plans and air monitoring results; and
- Imported materials information.

Copies of the above documentation must be forwarded to the validation consultant for review and inclusion in the final site validation report.

# 8 VALIDATION PLAN

Validation is necessary to demonstrate that remedial measures described in this RAP have been successful and that the site is suitable for the intended land use. The sampling program for the validation is outlined in Section 8.1. This is the minimum requirement based on the remedial strategies provided. Additional validation sampling may be required based on site observations made during remediation.

Site observations will also be used as a validation tool to assess the extent of site contamination. In particular visual and olfactory indicators such as petroleum odours, staining and visible occurrence of fibre cement/ACM should be recorded.

## 8.1 Validation Sampling and Documentation

The table below outlines the validation requirements for the site.

Table 8-1: Validation Requirements

| Aspect | Sampling | Analysis | Observations and Documentation |
|---|---|---|---|
| ***Excavations / Waste Removal*** | | | |
| Base of excavation after remediation (includes soil surfaces following removal of surface waste in the AEC)<br><br>Walls of excavations after remediation | One sample per 100m$^2$ (10m by 10m grid), with a minimum of one sample per excavation base.<br><br>One sample per 10m lineal, with a minimum of one sample per excavation wall. | As specified for each AEC in Section 3.1. This may be reduced to target specific contaminants based on the results of the data gap investigations. | Observations of staining/odours and presence/absence of fibre cement to be recorded.<br><br>Photographs to be taken.<br><br>Disposal dockets and waste tracking documentation to be retained. |
| ***Relocation / capping*** | | | |
| Source area excavations to be validated as outlined above | - | - | Placement area to be confirmed by survey and inspection.<br><br>Inspection required and photographs to be taken to confirm construction of overlying pavement/slab. |
| ***Treated Soil*** | | | |
| Validation of treated soil | One sample per 70m$^3$ of treated | Field screening (bulk 10L) sample for ACM. | Field records to be maintained documenting the following: |

| Aspect | Sampling | Analysis | Observations and Documentation |
|---|---|---|---|
| Base of excavation after remediation | material (minimum)<br><br>Not required unless friable asbestos materials are encountered. | Laboratory analysis may be required if deemed necessary by the validation consultant. This will be considered based on condition and type(s) of fibre cement/asbestos encountered. | • Location of treatment area;<br>• Number of passes for each batch and the number of ACM fragments identified during each pass; and<br>• Validation bulk screening results for each treated batch.<br><br>Visual surface clearance required for base and walls of remediation area.<br><br>Placement of treated material to be tracked/recorded.<br><br>Survey required to confirm treated material is covered by at least 0.1m of clean soil (or visual inspection is required to confirm placement of overlying pavement).<br><br>Air monitoring results to be reviewed.<br><br>Photographs to be taken. |
| ***Imported Material*** | | | |
| Imported virgin excavated natural material (VENM) backfill (if required) | Minimum of three samples per source | Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRH, BTEX PAHs, OCP/OPP, PCBs and asbestos.<br><br>Additional analysis may be required depending on site history. | VENM documentation/ report required (should include source site history to demonstrate analytes are appropriate).<br><br>Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. |
| Imported engineering materials such as recycled | Minimum of three samples per | Asbestos (40-50g analysis) and heavy metals | Documentation required to confirm material has been classified with reference to a relevant exemption and is fit for purpose on site. |

| Aspect | Sampling | Analysis | Observations and Documentation |
|---|---|---|---|
| aggregate, road base etc | source/material type. | | Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation.<br><br>Dockets for imported material to be provided. |
| Imported engineering materials comprising only natural quarried products such as blue metal etc | At the validation consultant's discretion based on supplier documentation. | At the validation consultant's discretion based on supplier documentation. | Documentation to be provided from the supplier confirming the material is a product comprising only VENM (i.e. quarried product).<br><br>Review of quarry Environment Protection Licence.<br><br>Material to be inspected upon importation to confirm it is free of anthropogenic materials, visible and olfactory indicators of contamination, and is consistent with documentation.<br><br>Dockets for imported material to be provided. |
| Imported landscaping materials | Minimum of three samples per source/material type. | Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRHs, BTEX, PAHs, OCPs, OPPs, PCBs and asbestos. | Documentation required to confirm material has been produced under an appropriate standard and is fit for purpose on site.<br><br>Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation.<br><br>Dockets for imported material to be provided. |

## 8.2 Validation Assessment Criteria and Data Assessment

The VAC for the site are provided in the following table. Criteria have only been provided for the contaminants/CoPC identified previously in this report. In the event that other contaminants are identified (e.g. as a result of an unexpected find), additional validation criteria must be developed by the validation consultant.

Table 8-2: Summary of Validation Criteria (in mg/kg unless stated otherwise)

| Contaminant | VAC D | VAC C | VAC Ecological/Environmental |
|---|---|---|---|
| Asbestos (40-50g samples) | Absent | Absent | - |
| ACM (bulk) | ≤ 0.05 % w/w[a] | ≤ 0.02 % w/w[a] | - |
| AF/FA (500ml) | ≤ 0.001 % w/w | ≤ 0.001 % w/w | - |
| Arsenic | ≤3,000 | ≤300 | ≤100 |
| Cadmium | ≤900 | ≤90 | - |
| Chromium | ≤3,600 | ≤300 | ≤190 |
| Copper | ≤240,000 | ≤17,000 | TBC[e] |
| Lead | ≤1,500 | ≤600 | ≤1,100 |
| Mercury | 180 | 30 | - |
| Nickel | ≤6,000 | ≤1,200 | TBC[e] |
| Zinc | ≤400,000 | ≤30,000 | TBC[e] |
| TRH F1 | ≤260 (sand)<br>≤250 (silt)<br>≤310 (clay) | ≤700 (coarse)[c]<br>≤800 (fine)[c] | ≤180 |
| TRH F2 | ≤1,000[c] | ≤1,000[c] | ≤120 |
| TRH F3 | ≤3,500 (coarse)[c]<br>≤5,000 (fine)[c] | ≤2,500 (coarse)[c]<br>≤3,500 (fine)[c] | ≤300 (coarse)<br>≤1,300 (fine) |
| TRH F4 | ≤10,000[c] | ≤6,300[d] | ≤2,800 (coarse)<br>≤5,600 (fine) |

| Contaminant | VAC D | VAC C | VAC Ecological/Environmental |
|---|---|---|---|
| Benzene | ≤3 (sand)<br>≤4 (silt and clay) | ≤100[d] | ≤50 (coarse)<br>≤65 (fine) |
| Toluene | ≤99,000[d] | ≤1,400[d] | ≤85 (coarse)<br>≤105 (fine) |
| Ethylbenzene | ≤27,000[d] | ≤4,500[d] | ≤70 (coarse)<br>≤125 (fine) |
| Total xylenes | ≤230 | ≤12,000[d] | ≤105 (coarse)<br>≤45 (fine) |
| Naphthalene | 27,000[d] | ≤1,400[d] | ≤170 |
| Total PAHs | ≤4,000 | ≤300 | - |
| Carcinogenic PAHs | ≤40 | ≤3 | - |
| Benzo(a)pyrene | - | - | 33 |
| OCPs | ≤45[b] | ≤6[b] | - |
| OPPs | < Laboratory practical quantitation limit (PQL) | < Laboratory PQL | - |
| PCBs | ≤7 | ≤1 | - |

a – Material exceeding this ACM validation criterion can be re-treated and re-validated.
b – Most conservative criteria adopted for aldrin/dieldrin. Alternatively, thresholds for other individual OCP compounds could be considered with regards to Schedule B1 of NEPM (2013).
c – VAC based on Management Limits.
d – VAC based on direct contact criteria which is also applicable for intrusive maintenance workers. The validation should also consider odours and potential impacts to groundwater. Odorous soil should not be retained on-site.
e – VAC to be confirmed based on soil physiochemical parameters.

Data should initially be assessed as above or below the VAC. Statistical analysis may be applied if deemed appropriate by the consultant and undertaken in accordance with the NEPM (2013).

### 8.3 Validation Report

As part of the validation process, a site validation report will be prepared by the validation consultant. The report will outline the remediation work undertaken at the site and will summarise the results of the validation assessment. The report is to be prepared in accordance with the NSW OEH *Guidelines*

*for Consultants Reporting on Contaminated Sites* (2011). The report should draw conclusions regarding the success of the remediation/validation and the suitability of the site for the proposed development (from a contamination viewpoint).

If required, remediation and validation can be staged along with the proposed development. A separate validation report would be required for each development stage. Further input in this regard should be sought from the validation consultant.

### 8.4 Data Quality

All validation sampling should include appropriate QA/QC together with the documentation and assessment of DQOs and DQIs in accordance with the framework set out in Section 4.

# 9 CONTINGENCY PLAN

A review of the proposed remediation works has indicated that the greatest risk that may affect the success of the remediation is an unexpected find. A contingency plan for unexpected finds is outlined below, in conjunction with a selection of other contingencies that may apply to this project.

## 9.1 Unexpected Finds

Residual hazards that may exist at the site would generally be expected to be detectable through visual or olfactory means. At this site, these types of hazards may include: suspected ACM outside of the identified AEC, suspected friable types of asbestos in soil, odorous or stained hydrocarbon impacted soils, and ash/slag impacted soil.

The procedure to be followed in the event of an unexpected find is presented below:

- In the event of an unexpected find, all work in the immediate vicinity should cease and the remediation contractor should contact the validation consultant immediately;
- Temporary barricades should be erected to isolate the area from access to the workers and machinery;
- In the event suspected friable asbestos material is encountered, a qualified occupational hygienist and/or asbestos consultant should be contacted (preferably the validation consultant will have an in-house hygienist or asbestos assessor);
- The validation consultant should attend the site and assess the extent of remediation that may be required and/or adequately characterise the contamination;
- In the event remediation is required, the procedures outlined within this report should be adopted where appropriate, alternatively an addendum RAP should be prepared; and
- Appropriate validation sampling should be undertaken and the results should be included in the validation report.

## 9.2 Soil Validation Failure

In the event of soil validation failure, the excavation should be extended in the direction of the failure (in consultation with the validation consultant) and the area re-validated.

## 9.3 Importation Failure for VENM or other Imported Materials

Where material to be imported onto the site does not meet the importation acceptance criteria detailed in Section 8, the only option is to not accept the material. Alternative material must be sourced that meets the importation requirements.

## 9.4 Disposal of Hazardous Waste

Material classed as ‘Hazardous Waste’ under the Waste Classification Guidelines (2014) may require further assessment and stabilisation prior to off-site disposal. Disposal approval may also be required

from the NSW EPA and EPA licensed landfill facility. The presence of Hazardous Waste may result in significant delays and additional cost to the project.

# 10 SITE MANAGEMENT PLAN FOR REMEDIATION WORKS

The information outlined in this section of the RAP is for the remediation work only. The client should contact the local consent authority (Council or certifier) for specific site management requirements for the overall development of the site.

## 10.1 Interim Site Management

The existing fences should be maintained to reduce the potential for unauthorised dumping of waste/fly-tipping.

A hazardous building material survey should be completed prior to any demolition works. The demolition contractor should provide appropriate clearance documentation following removal of any hazardous building materials.

## 10.2 Project Contacts

Emergency procedures and contact telephone numbers should be displayed in a prominent position at the site entrance gate and within the main site working areas. The contact details of key project personnel are summarised below.

Table 10-1: Project Contacts

| Task | Company | Contact Details |
|---|---|---|
| Project Manager | NettCorp | David De Angelis<br>0418 449 390 |
| Remediation Contractor | To be appointed | - |
| Environmental Consultant | EIS (at the time of the RAP preparation) | Brendan Page<br>9888 5000 |
| Certifier | To be appointed | - |
| NSW EPA | Pollution Line | 131 555 |
| Emergency Services | Ambulance, Police, Fire | 000 |

## 10.3 Security

Prior to the commencement of remediation works, fencing should be installed as required to secure the remediation areas. Warning signs should be erected, which outline the PPE required for remediation work. All excavations should be clearly marked and secured to reduce the risk to site personnel from injury by falling into open excavations.

### 10.4 Timing and Sequencing of Remediation Works

In general, all remedial works should be completed prior to the commencement of any building works (except potentially building associated with the car parks and construction of the concrete floor slabs for the proposed buildings). In the event of unexpected delays, geo-fabric should be used to cover the remediation areas in order to reduce the dust generation, surface water run-off and/or exposure to receptors.

### 10.5 Site Soil and Water Management Plan

The contractor should prepare a detailed soil and water management plan prior to the commencement of remediation works. This should be specific for the remediation tasks. Silt fences should be used to control the surface water runoff at all appropriate locations of the site. Reference should be made to the consent conditions for more details.

All stockpiled materials should be placed within an erosion containment boundary with silt fences and sandbags employed to limit sediment movement. The containment area should be located away from drainage lines, gutters, stormwater pits and inlets and the site boundary. No liquid waste or runoff should be discharged to the stormwater or sewerage system without the approval of the appropriate authorities.

### 10.6 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in AS-2460 (2002)[8] should be adopted. Other measures specified in the consent conditions should also be complied with. Noise producing machinery and equipment should only be operated between the hours approved by Council (refer to consent documents).

All practicable measures should be taken to reduce the generation of noise and vibration to within acceptable limits. In the event that short-term noisy operations are necessary, and where these are likely to affect residences, notifications should be provided to the relevant authorities and the residents by the project manager, specifying the expected duration of the noisy works.

### 10.7 Dust Control Plan

All practicable measures should be taken to reduce dust emanating from the site. Factors that contribute to dust production are:

- Wind over a cleared surface;
- Wind over stockpiled material; and
- Movement of machinery in unpaved areas.

[8] Australian Standard, (2002). *AS2460: Acoustics - Measurement of the Reverberation Time in Rooms.*

Visible dust should not be present at the site boundary. Measures to minimise the potential for dust generation include:

- Use of water sprays on unsealed or exposed soil surfaces;
- Covering of stockpiled materials and excavation faces (particularly during periods of site inactivity and/or during windy conditions) or alternatively the erection of hessian fences around stockpiled soil or large exposed areas of soil;
- Establishment of dust screens consisting of a 2m high shade cloth or similar material secured to a chain wire fence;
- Maintenance of dust control measures to keep the facilities in good operating condition;
- Concrete surfaces brushed or washed to remove dust;
- Stopping work during strong winds;
- Loading or unloading of dry soil as close as possible to stockpiles to prevent spreading of loose material around the site; and
- The expanse of cleared land should be kept to a minimum.

If stockpiles are to remain on-site or an excavation remains open for a period of longer than several days, dust monitoring should be undertaken at the site. If excessive dust is generated all site activities should cease until either wind conditions are more acceptable or a revised method of excavation/remediation is developed.

Dust is also produced during the transfer of material to and from the site. All material should be covered during transport and should be properly disposed of on delivery. No material is to be left in an exposed, un-monitored condition.

All equipment and machinery should be brushed or washed down before leaving the site to limit dust and sediment movement off-site. In the event of prolonged rain and lack of paved areas all vehicles should be washed down prior to exit from the site, and any soil or dirt on the wheels of the vehicles removed. Water used to clean the vehicles should be collected and tested prior to appropriate disposal under the Waste Classification Guidelines.

### 10.8 Air Monitoring

Requirements for air monitoring should be considered by the asbestos removal contractor for any asbestos-related works. EIS recommend that air monitoring be undertaken for the duration of asbestos remediation works.

### 10.9 Odour Control Plan

All activities undertaken at the site should be completed in a manner that minimises emissions of smoke, fumes and vapour into the atmosphere and any odours arising from the works or stockpiled material should be controlled. Control measures may include:

- Maintenance of construction equipment so that exhaust emissions comply with the Clean Air Regulations issued under the Protection of the Environment Operations Act (1997);
- Demolition materials and other combustible waste should not be burnt on site;
- The spraying of a suitable proprietary product to suppress any odours that may be generated by excavated materials; and
- Use of protective covers (e.g. tarpaulins or builder's plastic).

All practicable measures should be taken to reduce fugitive emissions emanating from the site so that associated odours do not constitute a nuisance and that the ambient air quality is not adversely impacted.

The following odour management plan should be implemented to limit the exposure of site personnel and surrounding land users to unpleasant odours during excavation of hydrocarbon impacted soil:

- Excavation and stockpiling of material should be scheduled during periods with low winds if possible;
- A suitable proprietary product could be sprayed on material during excavation and following stockpiling to reduce odours;
- All complaints from workers and neighbours should be logged and a response provided. Work should be rescheduled as necessary to minimise odour problems;
- The site foreman should consider the following odour control measures as outlined in NEPM:
  - reduce the exposed surface of the odorous materials;
  - time excavation activities to reduce off-site nuisance (particularly during strong winds); and
  - cover exposed excavation faces overnight or during periods of low excavation activity.
- If continued complaints are received, alternative odour management strategies should be considered and implemented.

### 10.10 Health and Safety Plan

A site specific WHS plan should be prepared by the contractor for all work to be undertaken at the site. The WHS plan should meet all the requirements outlined in SafeWork NSW WHS regulations.

As a minimum requirement, personnel must wear appropriate protective clothing, including long sleeve shirts, long trousers and steel cap boots. Asbestos-related PPE is also required as outlined in Section 7.3 (and to be formally documented in the asbestos removal control plan). Washroom and lunchroom facilities should also be provided to allow workers to remove potential contamination from their hands and clothing prior to eating or drinking.

### 10.11 Waste Management

Prior to commencement of remedial works and excavation for the proposed development, the contractor should develop a waste management or recycling plan to minimise the amount of waste produced by the site.

### 10.12 Incident Management Contingency

The validation consultant should be contacted if any unexpected conditions are encountered at the site. This should enable the scope of remedial/validation works to be adjusted as required. Similarly if any incident occurs on site, the validation consultant should be advised to assess potential impacts on site contamination conditions and the remediation/validation timetable.

### 10.13 Hours of Operation

Hours of operation should be between those approved by Council under the development approval process. Reference should also be made to any specific conditions imposed by other consent authority/regulatory bodies.

# 11 CONCLUSION

EIS are of the opinion that the site can be made suitable for the proposed development described in Section 1.1 provided this RAP is implemented accordingly. A site validation report should be prepared on completion of remediation activities and should be submitted to the consent authority.

## 11.1 Remediation Category

Site remediation can fall under the following two categories outlined in SEPP55:

Table 11-1: Remediation Category

| Category | Details |
|---|---|
| Category 1 | Category 1 remediation works are those undertaken in the following areas specified under Clause 9 of SEPP55:<br>• A designated development;<br>• Carried out on land declared to be a critical habitat;<br>• Development for which another State Environmental Planning Policy (SEPP) or Regional Environmental Plan (REP) requires a development consent; or<br>• Carried out in an area or zone classified as:<br>➢ Coastal Protection;<br>➢ Conservation or heritage conservation;<br>➢ Habitat protection, or habitat or wildlife corridor;<br>➢ Environmental protection;<br>➢ Escarpment, escarpment protection or preservation;<br>➢ Floodway or wetland;<br>➢ Nature reserve, scenic area or scenic protection; etc.<br>• Work that is not carried out in accordance with the site management provisions contained in the consent authority Development Control Plan (DCP)/Local Environmental Plan (LEP) etc.<br><br>Approval is required from the consent authority for Category 1 remediation work. The RAP needs to be assessed and determined either as part of the existing DA or as a new and separate DA. Category 1 remediation work is identified as advertised development work unless the remediation work is a designated development or a state significant development. |
| Category 2 | Remediation works which do not fall under the above category are classed as Category 2. Development consent is not required for Category 2 remediation works, however the consent authority should be given 30 days' notice prior to commencement of works. |

Considering the above, EIS have assessed that the remediation work is likely to fall within Category 1 due to the heritage (and potentially ecological) constraints. It is noted that the RAP is to be assessed by Council as part of the development application/consent process and conditioned as part of the development consent (if approved). EIS recommend that a specialist planner confirm the remediation category prior to the submission of this report to Council.

## 11.2 Regulatory Requirements

The regulatory requirements applicable for remediation are outlined in the following table:

Table 11-2: Regulatory Requirement

| Guideline | Applicability |
|---|---|
| Duty to Report Contamination (2015) | At this stage, EIS consider that there is no requirement to notify the NSW EPA of the site contamination. This requirement should be reassessed following review of the validation results, including the asbestos air monitoring data. |
| POEO Act 1997 | Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner.<br><br>Appropriate waste tracking is required for all relevant waste that is disposed off-site. Asbestos waste must be tracked using WasteLocate. |
| Water Management Act (2000) | The development (and therefore the remediation) may require a controlled activity approval. This requirement should be assessed by the client and confirmed by the relevant authorities. |
| WHS Code of Practice (2016) | Sites with asbestos become a 'workplace' when work is carried out there and require a register and asbestos management plan. Appropriate SafeWork NSW notification will be required for asbestos removal works or handling. Contractors are also required to be appropriately licensed for the asbestos works undertaken (Class B license is required based on the proposed remediation and existing asbestos data). |

## 12 LIMITATIONS

The report limitations are outlined below:

- EIS accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the EIS proposal; and terms of contract between EIS and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, EIS has not undertaken any verification process, except where specifically stated in the report;
- EIS has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- EIS accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- EIS have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. EIS should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

# LIST OF IN-TEXT TABLES

# IMPORTANT INFORMATION ABOUT THIS REPORT

These notes have been prepared by EIS to assist with the assessment and interpretation of this report.

**The Report is based on a Unique Set of Project Specific Factors:**
This report has been prepared in response to specific project requirements as stated in the EIS proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

EIS/J&K will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by EIS to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

**Changes in Subsurface Conditions:**
Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

**This Report is based on Professional Interpretations of Factual Data:**
Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

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

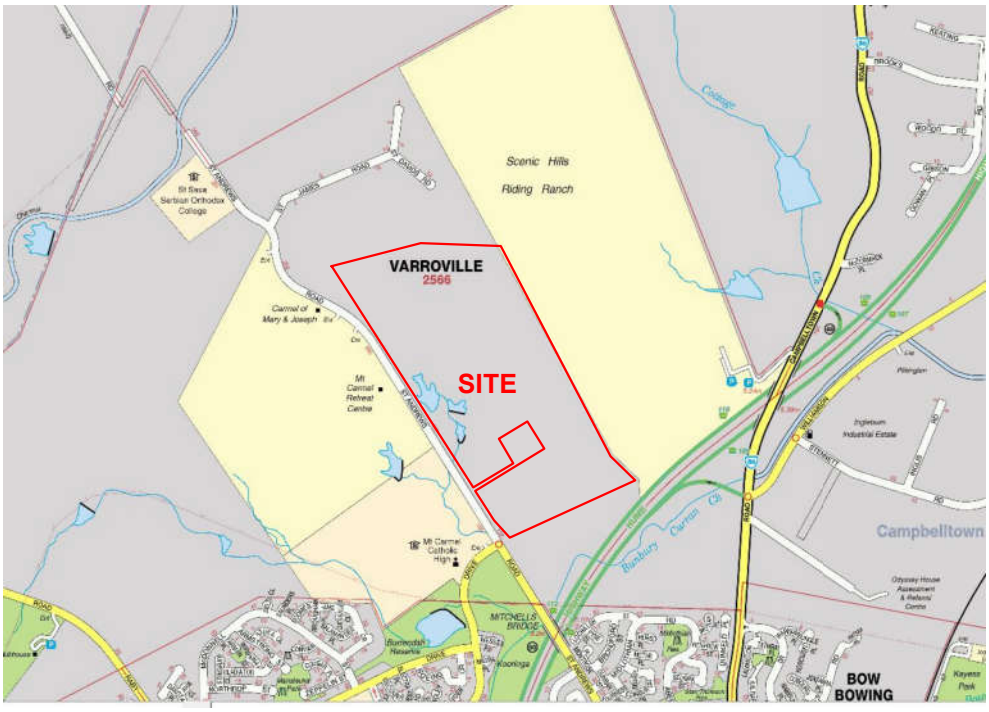
**Misinterpretation of Site Assessments by Design Professionals:**
Costly problems can occur when other design professionals develop plans based on misinterpretation of an assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

**Logs Should not be Separated from the Assessment Report:**
Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

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

**Read Responsibility Clauses Closely:**
Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

# REPORT FIGURES



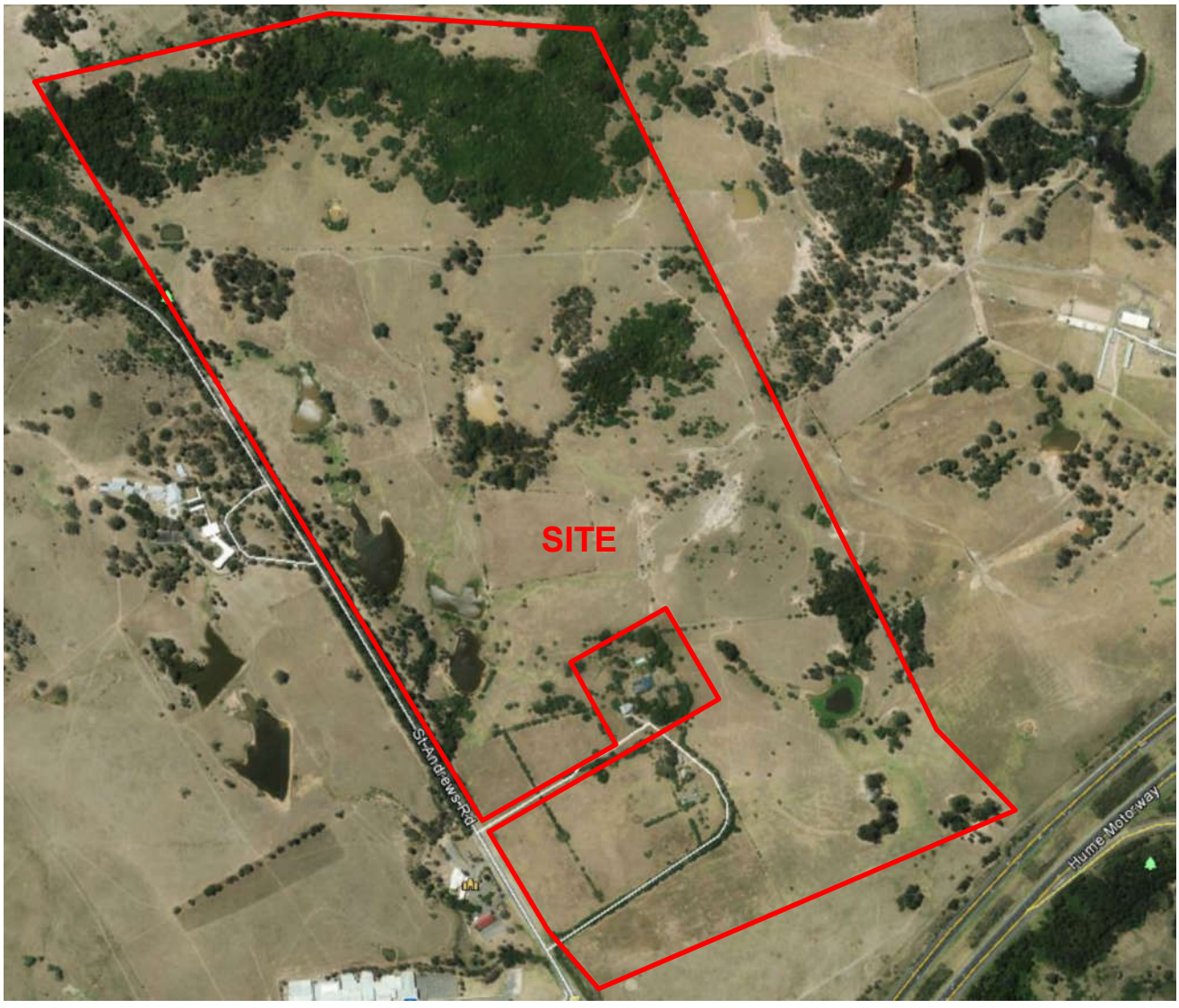
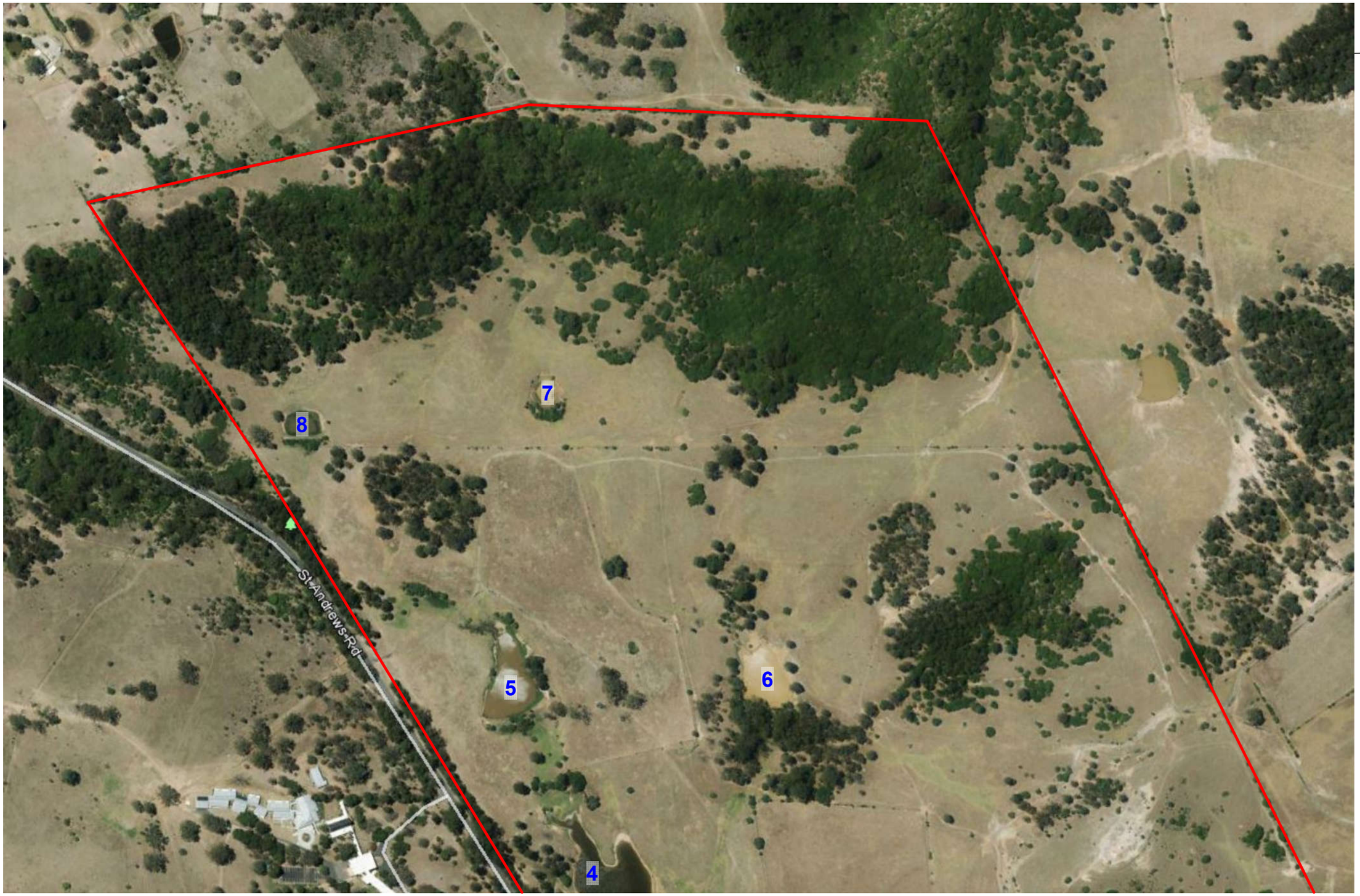




Image Sources:
Google Earth - 2014 image
UBD on disk v7.0.0

| | |
|---|---|
| Title: | **SITE LOCATION PLAN** |
| Location: | 167-177 ST ANDREWS ROAD, VARROVILLE, NSW |
| Report No: E30510KP | Figure No: 1 |

**ENVIRONMENTAL INVESTIGATION SERVICES**




LEGEND:

APPROXIMATE SITE BOUNDARY

5 DAM LOCATION / IDENTIFICATION

Image Source:
Google Earth - 2014 image

Notes: Reference should be made to the report text for a full understanding of this plan. Scale is approximate.

0 200
Scale Metres

Title: **SITE LAYOUT PLAN - NORTH**

Location: 167-177 ST ANDREWS ROAD, VARROVILLE, NSW

Report No: E30510KP

Figure No: 2

**ENVIRONMENTAL INVESTIGATION SERVICES**

EIS


LEGEND:

APPROXIMATE SITE BOUNDARY

5 DAM LOCATION / IDENTIFICATION

Image Source:
Google Earth - 2014 image

Notes: Reference should be made to the report text for a full understanding of this plan. Scale is approximate.

0 200
Scale Metres

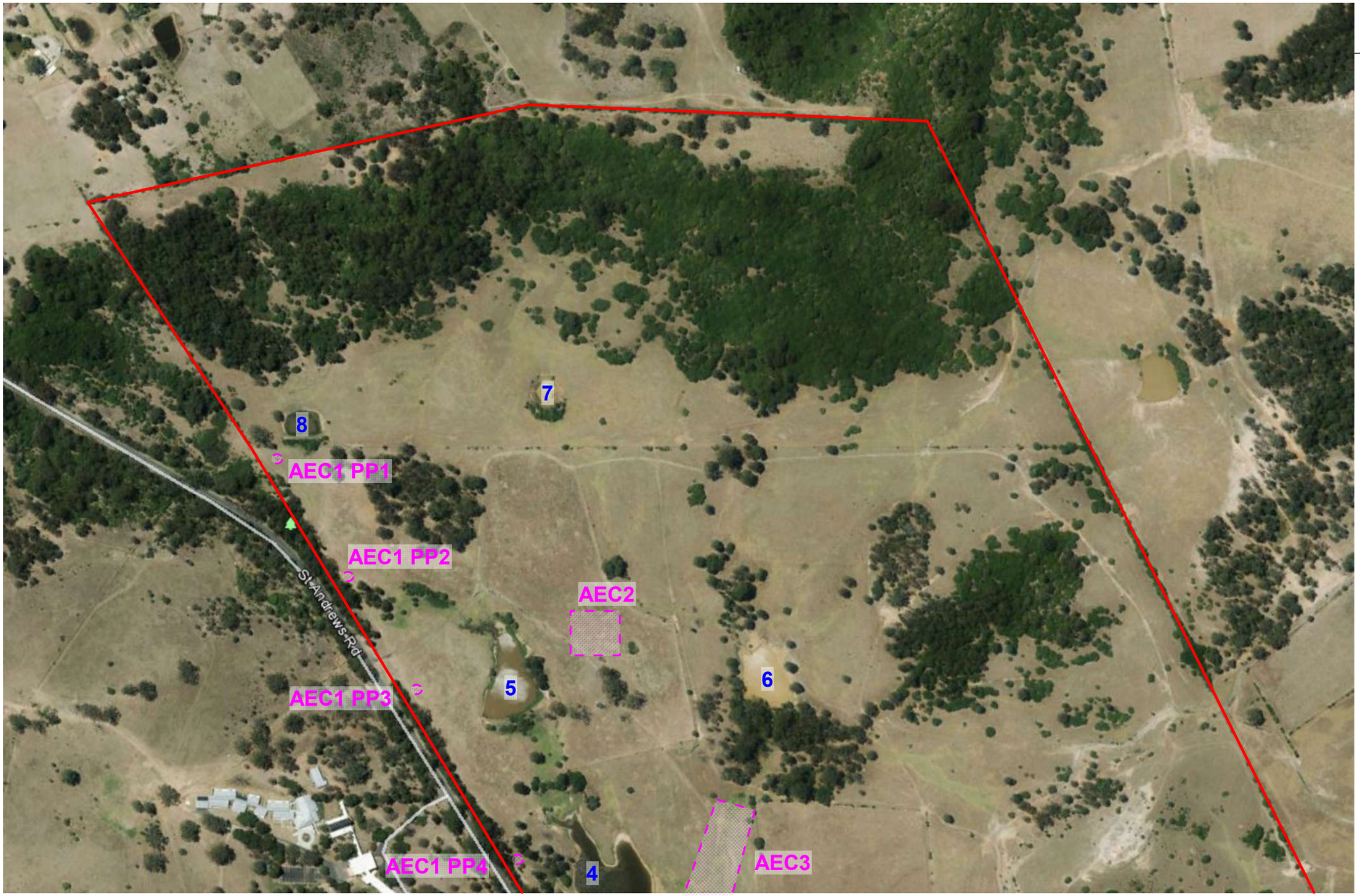
Title: **SITE LAYOUT PLAN - SOUTH**

Location: 167-177 ST ANDREWS ROAD, VARROVILLE, NSW

Report No: E30510KP

Figure No: 3

**ENVIRONMENTAL INVESTIGATION SERVICES**




LEGEND:

- APPROXIMATE SITE BOUNDARY
- 5 DAM LOCATION / IDENTIFICATION
- AEC8 AREA OF ENVIRONMENTAL CONCERN (AEC) (APPROXIMATE)

Image Source:
Google Earth - 2014 image

Notes: Reference should be made to the report text for a full understanding of this plan. Scale is approximate.

Scale 0 200 Metres

Title: **AEC PLAN - NORTH**

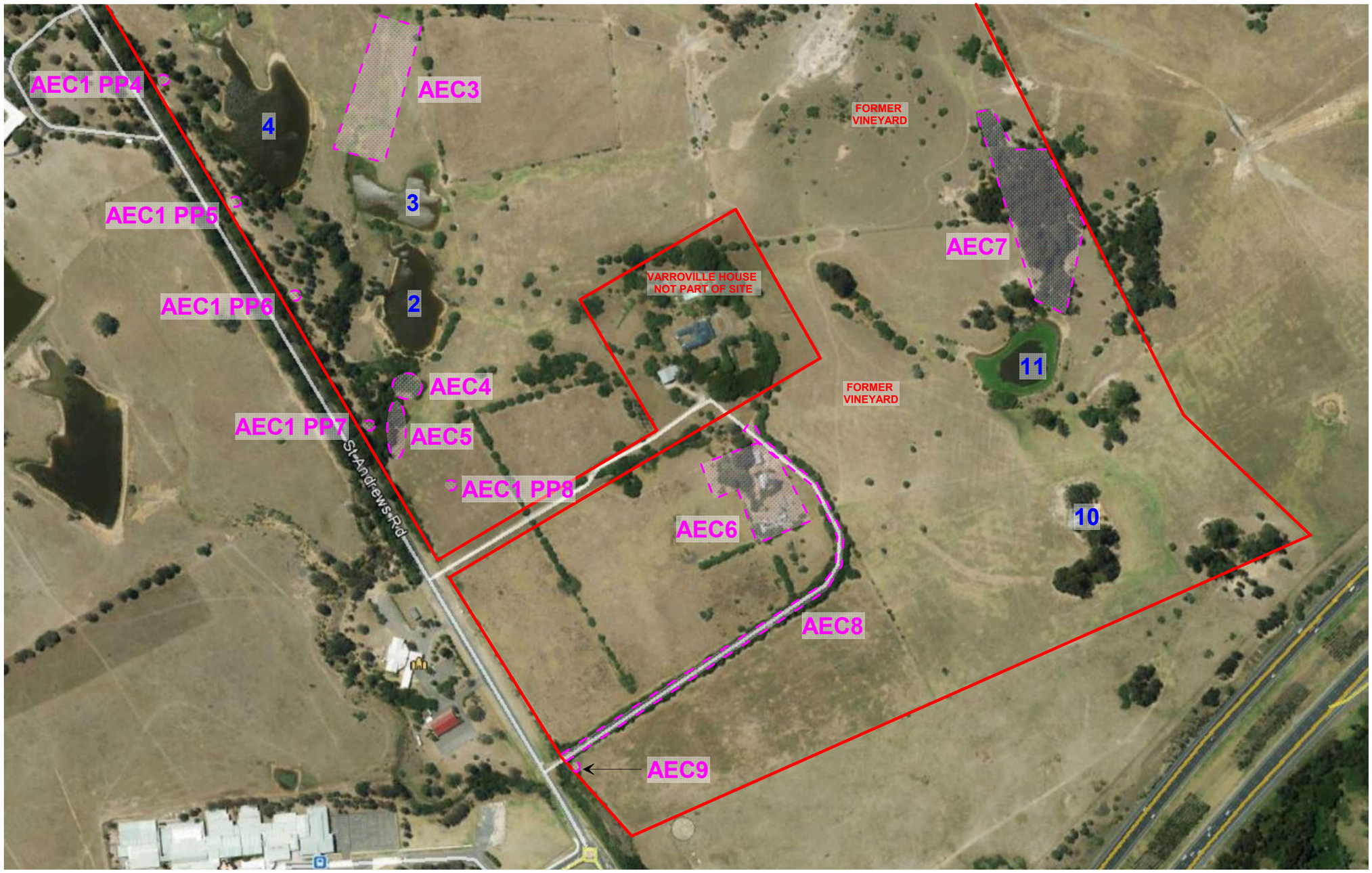
Location: 167-177 ST ANDREWS ROAD, VARROVILLE, NSW

Report No: E30510KP

Figure No: 4

**ENVIRONMENTAL INVESTIGATION SERVICES**

EIS




LEGEND:

- APPROXIMATE SITE BOUNDARY
- 5 DAM LOCATION / IDENTIFICATION
- AEC8 AREA OF ENVIRONMENTAL CONCERN (AEC) (APPROXIMATE)

Image Source:
Google Earth - 2014 image

Notes: Reference should be made to the report text for a full understanding of this plan. Scale is approximate.

0 200
Scale Metres

Title: **AEC PLAN - SOUTH**

Location: 167-177 ST ANDREWS ROAD, VARROVILLE, NSW

Report No: E30510KP

Figure No: 5

**ENVIRONMENTAL INVESTIGATION SERVICES**

EIS

# Appendix A: Proposed Development Plans

BURIAL ZONES:

LEGEND:

- NATURAL BURIALS
- LAWN WITH CONCEALED CONCRETE BEAMS
- LOW HEADSTONE (300mm) WITH CONCEALED CONCRETE BEAMS
- HIGH HEADSTONE (1200mm) WITH CONCEALED CONCRETE BEAMS
- TERRACED
- CRYPTS
- DAM


| Issue: | Rev: | Description: | Date: |
|---|---|---|---|
| DA | | COUNCIL | 18.09.2017 |
| | | | |
| | | | |

**Project title:**

MACARTHUR MEMORIAL PARK
VARROVILLE

**Drawing title:**

BURIAL EXTENT AND TYPES


**Principal consultant:**

Florence Jaquet
Landscape architect

A: 8 Rowell Avenue, Camberwell 3124
E: flo@fjla.com.au
M: 0419 983 641


**Client:**

Macarthur Memorial Park
Care,Compassion,Choice

**Job no:** 1210

**Drawn by:** OK

**Checked by:** FJ

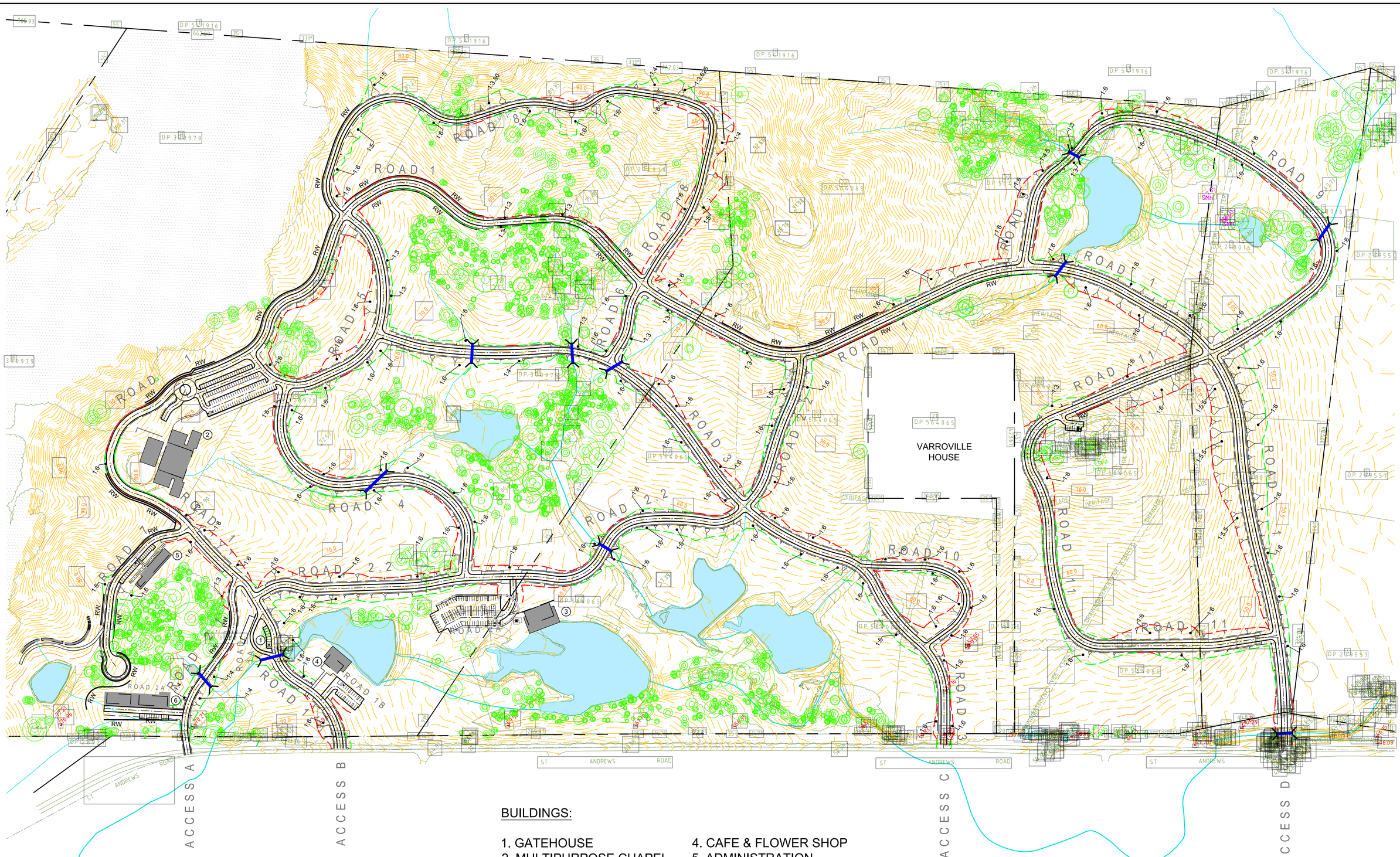
**Scale:** 1:2500

**Drw no:** L102

**CAD file name:** L100 OVERALL SITE PLAN.dwg

**Plot date:** 18/09/2017

**Sheet no:** 04




## BUILDINGS:

1. GATEHOUSE
2. MULTIPURPOSE CHAPEL
3. FUNCTION ROOM
4. CAFE & FLOWER SHOP
5. ADMINISTRATION
6. GROUND STAFF FACILITIES

PRELIMINARY - NOT FOR CONSTRUCTION

NORTH

20 0 20 40 60 80 100m
PLAN SCALE 1:2000 A1 SHEET

| REVISION | AMENDMENT | DATE | REVISION | AMENDMENT | DATE |
|---|---|---|---|---|---|
| 1 | DEVELOPMENT APPLICATION | 24/08/17 | | | |
| 2 | REISSUE FOR DEVELOPMENT APPLICATION | 01/09/17 | | | |

CLIENT
Catholic Cemeteries & Crematoria
Care,Compassion, Choice

PROJECT
MACARTHUR MEMORIAL PARK

PREPARED BY
Warren Smith & Partners
Warren Smith & Partners Pty Ltd
1st Floor, 123 Clarence Street, Sydney 2000 NSW Australia
T 02 9299 1312 F 02 9290 1295 wsp@warrensmith.com.au
www.warrensmith.com.au ABN 36 300 430 126
CONSULTING ENGINEERS
Hydraulic Services Fire Protection Civil Engineering
Sydney Water Accredited Water Servicing Co-ordinator
- Design Project Management - Building Plan Approvals
SERVING THE CONSTRUCTION INDUSTRY SINCE 1981.
Lic No: QAC/RE10771

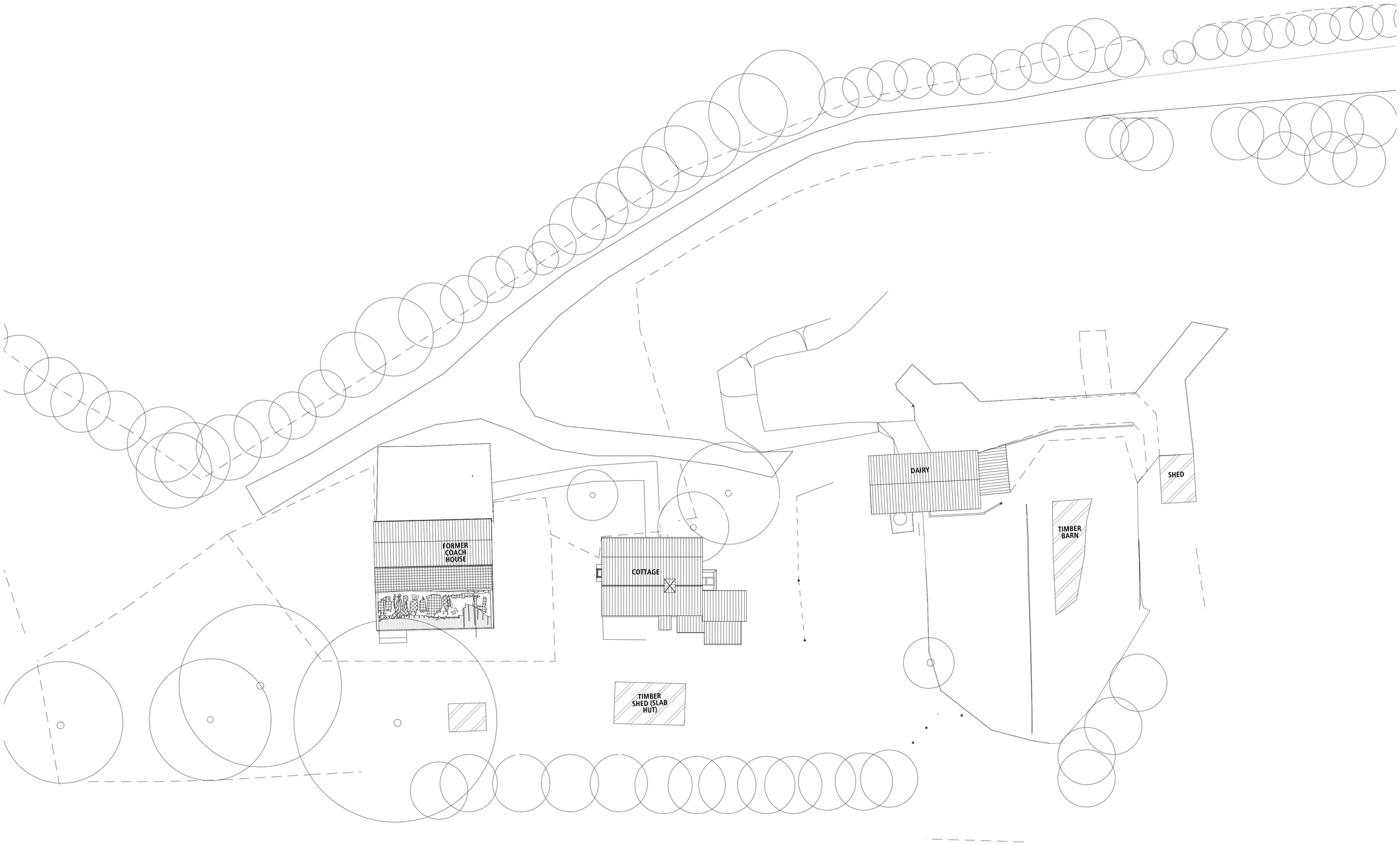
TITLE
# GENERAL ARRANGEMENT PLAN

| SCALE | DRAWN | DESIGNED | CHECKED | APPROVED |
|---|---|---|---|---|
| AS SHOWN | J.W. | C.S. | N.M. | M.C. |

| JOB No. | DRAWING No. | ISSUE |
|---|---|---|
| 5162001 | C1.03 | 2 |

DATE AUG 2017
STATUS DEVELOPMENT APPLICATION

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150




Site Plan- Existing
SCALE 1:200@A1

0 2 4 8 10 20m

**PRELIMINARY**
**NOT FOR CONSTRUCTION**

File Path -
/Volumes/Server Files/04. CAD/Current projects/1711 166-170 St Andrews Road Varoville/2. Models/166- 170 St Andrews Road Varoville V21with Diary 8.pln



The contractor shall confirm on site existing dimensions and conditions before commencement of works. All discrepancies should be reported to the architect for instructions

Architectural Projects does not accept responsibility for the dimensional accuracy of any data contained in CAD or other attachements as it may be based on third party origin information. All information should be verified in writing.

This drawing has been prepared in conjunction with the following drawings:

| | |
|---|---|
| Structural | - |
| Electrical | - |
| Mechanical | - |
| Hydraulic | - |
| Landscape | - |
| Survey | - |

N

| issue | amendment | date |
|---|---|---|
| A | Development Application | 25 08 17 |
| - | Preliminary Issue | 01 06 17 |

Architectural Projects

the Foundry -, Studio 1 / 181 Lawson St, Darlington -, NSW Australia 2008
architects@architectural projects.net.au - www.architectural projects.net.au
Architectural Projects Pty. Ltd -, ABN 78 003 526 823
tel +61 (02) 8303 1700 -, fax +61(02) 9319 1128 -,

project

**Macarthur Memorial Park**
**Varroville Outbuildings**
**166-170 St Andrews Road**
**Varroville**

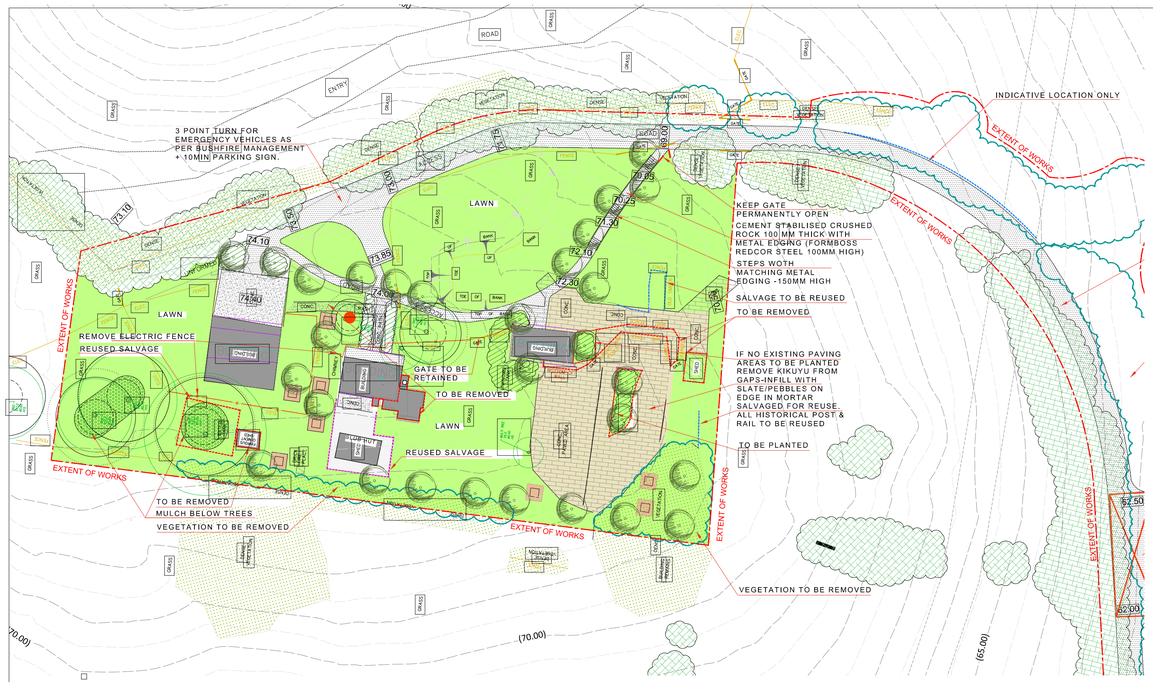
drawing

Site Plan-Existing

| plot date | scale | drawn | checked |
|---|---|---|---|
| 29/1/18 | - @ A3<br>1:200 @ A1 | TC | GO |

| Project No. | drawing No. | revision |
|---|---|---|
| 1711 | MD.100 | A |

File Path -
/Volumes/Server Files/04. CAD/Current projects/1711 166-170 St Andrews Road Varoville/2. Models/166- 170 St Andrews Road Varoville V21with Diary 8.pln




SCALE 1:500


SCALE 1:750

## EXISTING CONDITIONS

LEGEND:

- TREE
- TREE TO BE REMOVED
- CONCRETE PAVING
- FENCE
- EXISTING VEGETATION

## PROPOSALS

LEGEND:

- NEW TREE
- SEATING BLOCK (2*2*0.5M)
- GARDEN BED / PLANTING
- VEGETATION TO BE REMOVED
- CEMENT STABILIZED CRUSHED ROCK SURFACE

| Issue: | Rev: | Description: | Date: |
|---|---|---|---|
| COM | | TEAM | 13/04/2018 |

**Project title:**

MACARTHUR MEMORIAL PARK
VARROVILLE

**Drawing title:**

# OUTBUILDINGS

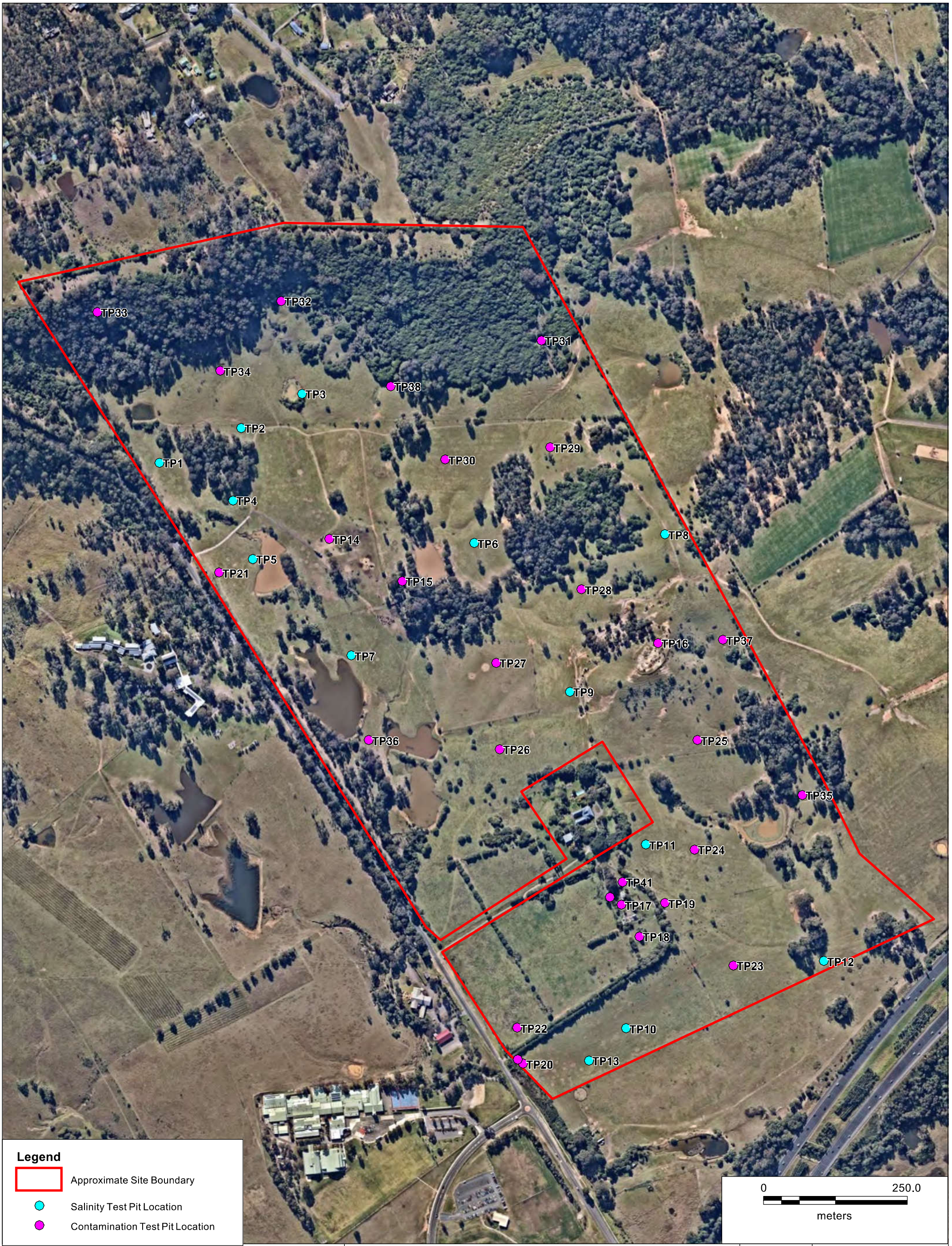
**Principal consultant:**

*Florence Jaquet*
*Landscape architect*

A: 8 Rowell Avenue, Camberwell 3124
E: flo@fjla.com.au
M: 0419 983 641

**Job no:** 1210
**Drawn by:** OK
**Checked by:** FJ
**Scale:** VARIABLE
**Drw no:**
**CAD file name:** L200 SITE PLAN.dwg
**Plot date:** 13/04/2018
**Sheet no:**

# Appendix B: DP Investigation Location Plan




Douglas Partners
Geotechnics | Environment | Groundwater

TITLE: Test Pit Locations
Detailed Site Investigation
167 to 177 St Andrews Rd, Varoville, NSW

OFFICE: Macarthur
DRAWN BY: CLN
DATE: 25.08.2017

CLIENT: Catholic Metropolitan Cemetries Trust
PROJECT No: 92237.00
DRAWING No: 9
REVISION: A
SCALE: As shown