APPENDIX G

Historical Heritage Assessment

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Dendrobium Mine

Plan for the Future: Coal for Steelmaking:

Historical Heritage Assessment

Illawarra Coal Holdings Pty Ltd - South32 Limited

Prepared by Niche Environment and Heritage | 8 May 2019

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Document control

Project number	Client	Project manager	LGA
4798	Illawarra Coal Holdings Pty Ltd - South32 Limited	Joshua Madden	Wollongong, Wingecarribee and Wollondilly

Version	Author	Review	Status	Date
1	Aleisha Buckler, Clare Leevers	Fiona Lesley	Draft	19 July 2017
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4	Joshua Madden		Draft	8 March 2019
5	Joshua Madden	Joshua Madden	Draft	29 March 2019
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Cover photograph: Map of the County of Camden in 1895 (Source: NLA 1895).

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Executive Summary

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Illawarra Coal Holdings Pty Ltd, a wholly owned subsidiary of South32 Limited (South32), to complete a Historical Heritage Assessment for the Dendrobium Mine – Plan for the Future: Coal for Steelmaking (the Project).

This Historical Heritage Assessment includes the results of heritage register searches, summary of historical background, the results of a field survey, significance and impact assessment, conclusions and the provision of management recommendations. This assessment has been prepared in accordance with best practice in historical heritage management as guided by the *NSW Heritage Manual* (Department of Urban Affairs and Planning 1996) and the *Australia ICOMOS Charter for Places of Cultural Significance, The Burra Charter* (Australia ICOMOS 2013) with reference to the provisions of the *NSW Heritage Act 1977* and the *Wollondilly Local Environmental Plan 2011*, *Wollongong Local Environmental Plan 2009* and *Wingecarribee Local Environmental Plan 2010*.

The Project seeks to extend underground mining operations into two future mining areas known as Area 5 and Area 6, and would involve the development of supporting infrastructure and the use and augmentation of existing Dendrobium Mine surface facilities.

Future Mining Area 5 and Area 6

Only two heritage items were identified within the areas considered by this historical heritage assessment. These items are the Cordeaux and Avon Dams, which are State significant heritage items listed on the NSW State Heritage Register (SHR ID: 01358 & 1360). This assessment has found that the proposed mining of Areas 5 and 6 would result in a negligible impact on the heritage significance of the two dams and their associated infrastructure, provided proper precautions and monitoring are put in place to prevent impacts from subsidence movements.

Strategies to mitigate the potential visual impact of above-ground infrastructure on the views and vistas from Cordeaux Dam have also been recommended, including the colour choice for materials used for the Project surface infrastructure. The report also concludes that there is a low likelihood for historical archaeological deposits to exist within the subject areas. As such, no further historical heritage assessment of the subject areas is required, prior to commencement of Project works.

Dendrobium Pit Top

The Dendrobium Pit Top is located within two locally listed heritage items including; Nebo Colliery' (7104) and the Kembla Heights Mining Village (Heritage Conservation Area). South32 plans to upgrade, expand and decommission portions of the existing infrastructure at the Dendrobium Pit Top to support the Project. Although the locations of proposed infrastructure works are known, the construction and concept design have not been developed. However, based on the conceptual designs, it is unlikely that the heritage values of the Nebo Colliery would be significantly adversely impacted by the Project. The Project represents continued and adaptive use wholly consistent with the nature of the item, which is an operational colliery. This assessment has found that prior to the commencement of works, a Conservation Management Plan (CMP) should be developed by a suitably qualified heritage consultant. The CMP would provide guidance for management and conservation of heritage items during the detailed design, construction and operational phases of the Project.

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1. Introduction

1.1 Project Background

The Dendrobium Mine is an underground coal mine situated in the Southern Coalfield of New South Wales (NSW), approximately 8 kilometres (km) west of Wollongong (see **Figure 1**). The Dendrobium Mine was approved in 2001 and has operated since that time under approvals from both the NSW Government (under the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act)) and the Commonwealth Government (under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)).

The Dendrobium Mine is owned and operated by Illawarra Coal Holdings Pty Ltd (Illawarra Coal), a wholly owned subsidiary of South32 Limited (South32). The existing mining operations are undertaken in accordance with Development Consent DA 60-03-2001 (as modified), as well as the Approval Decision (EPBC 2001/214) under the EPBC Act. Construction for the Dendrobium Mine commenced in January 2002, with longwall mining commencing in April 2005.

South32 seeking approval to:

- extend the current mining operations into two potential future mining areas within Consolidated Coal Lease (CCL) 768 which are known as 'Area 5' and 'Area 6' (the new areas will be serviced by associated infrastructure such as ventilation shafts).
- use the existing Dendrobium Pit Top with minor upgrades and extensions.

The proposed works are known as the Dendrobium Mine – Plan for the Future: Coal for Steelmaking Project (the Project).

Niche Environment and Heritage (Niche) was commissioned to prepare a Historical Heritage Assessment (HHA) in support of a State Significant Development (SSD) Application for the Project.

1.2 Site Location

The Dendrobium Mine is located in the Southern Coalfield of NSW, approximately 8 km west of Wollongong with the Dendrobium Pit Top located within Kembla Heights. The Project areas are located within the Local Government Areas (LGAs) of Wollongong City Council, Wingecarribee Shire Council and Wollondilly Shire Council. The Dendrobium Pit Top, is located along Cordeaux Road approximately 400 metres (m) east of the intersection of Cordeaux Road and Harry Graham Drive, Kembla Heights (**Figure 2**).

The proposed underground mining areas and additional ventilation shaft sites are located within the catchments of the Avon and Cordeaux Rivers, which are situated within the Metropolitan Special Area declared under the *Water NSW Act 2014*. Area 5 is situated just to the east of the Avon River within the suburb of Avon. Area 6 is located to the northeast of the Cordeaux River, within the suburbs of Cordeaux, Cataract and Wilton.

1.3 Proposed Works

The Project involves the extension of underground mining operations at the Dendrobium Mine into additional areas within CCL 768, being Area 5 and Area 6 (see **Figure 2** and **Figure 3**). The extension of the mining operations would also require the construction of surface infrastructure to support underground mining operations, such as ventilation shafts (Shaft Sites Nos. 5A, 5B, 6A and 6B) and enclosed flare stacks approximately 15 m high.

Monitoring and investigation works would be conducted at, and surrounding, the Avon Dam and Cordeaux Dam to maintain the structures in a safe and serviceable condition. This would include:

- surface and subsurface geotechnical investigations;
- monitoring of subsidence movements on and near the structures with temporary sensors;
- installation of temporary fixtures to allow access to the structures for these activities; and
- radar, and other remote scanning, of the structures.

The underground mining layout has been designed to reduce any subsidence impacts on the Avon Dam and Cordeaux Dam walls and would result in negligible impacts on the structural integrity or external fabric. There would be a minimum 1 km offset of any longwall extraction from the dam wall structures.

Upgrades and extensions at the Dendrobium Pit Top for the Project would include:

- construction of additional car parking facilities on the southern side of Cordeaux Road, including an additional intersection with Cordeaux Road;
- extension and relocation of bathhouses (e.g. change rooms), locker facilities and administration buildings; and
- additional electricity distribution infrastructure.

Other minor upgrades and augmentations would occur within the current disturbance footprint. Existing infrastructure at the Dendrobium Pit Top that is no longer required may be decommissioned and removed (e.g. demountable buildings).

1.4 Aims

This HHA aims to assess the potential impacts of the Project on historical heritage items and provide recommendations for impact mitigation and management. This assessment has been prepared in accordance with best practice in historical heritage management in NSW, as guided by the *NSW Heritage Manual* (Department of Urban Affairs and Planning 1996) and the *Australia ICOMOS Charter for Places of Cultural Significance, The Burra Charter* (2013).

1.5 Methodology and Report Outline

The assessment was prepared by undertaking the following tasks:

Review of Heritage Listings

The results of searches of relevant statutory Commonwealth, National and State heritage registers and local planning instrument schedules to identify any known items of heritage significance within the subject areas, is presented in Section 2 and preceded by a summary of relevant legislation.

Historical Research

A historical context for the assessment, used to assist in identifying potential historical heritage items and values within the subject areas, is presented in Section 3.

Review of Previous Heritage Assessments

A summary of heritage literature, reviewed to gain an understanding of previous work and potential heritage issues within the subject areas, is provided in Section 4.

Visual Inspection

The methodology and results of the visual inspection undertaken for the Project are documented in Section 5.

Significance Assessment

Significance assessments of identified heritage items are presented in Section 6.

Impact Assessment

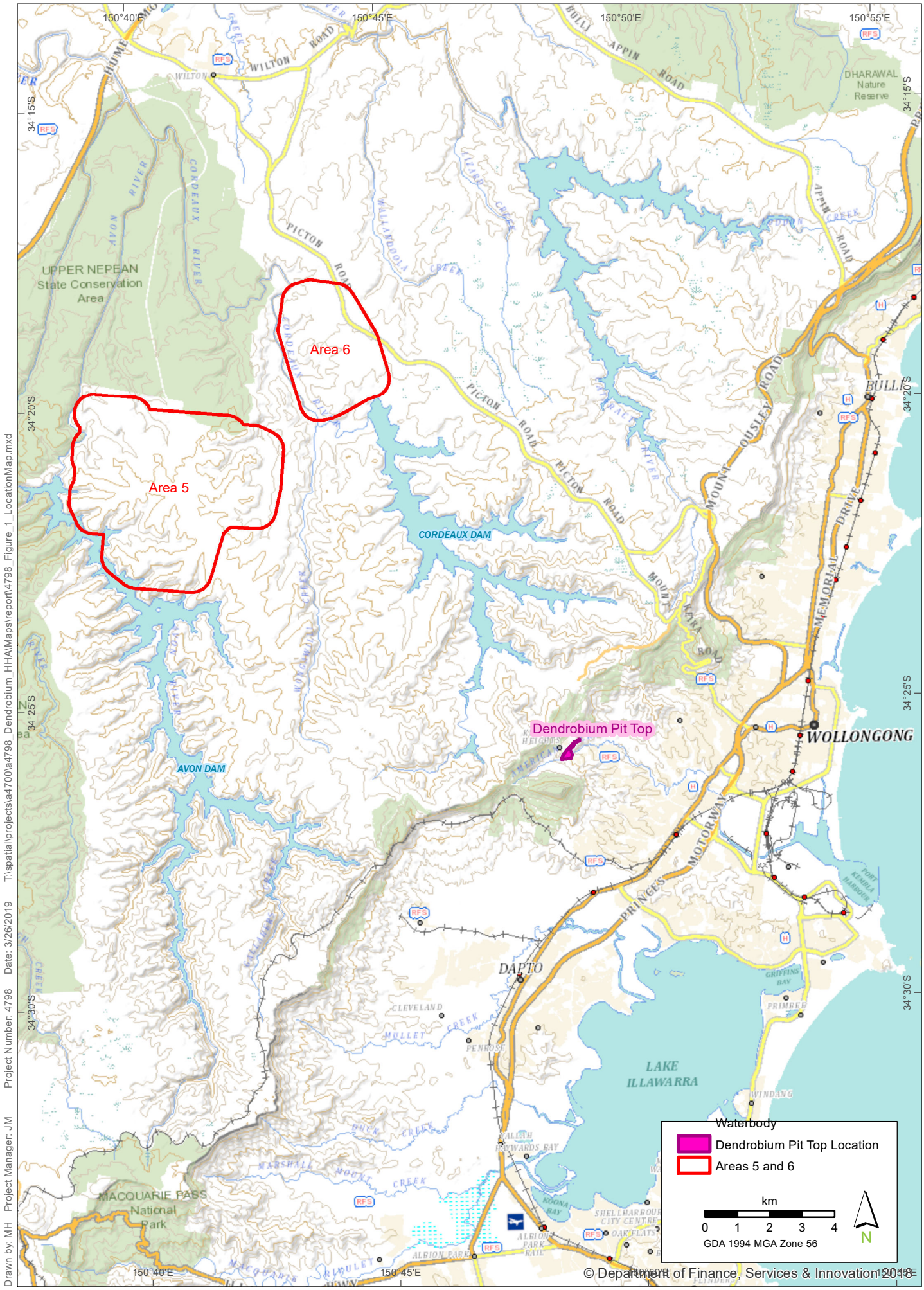
Assessment of the potential impacts of the Project on historical heritage items is discussed in Section 7.

Recommendations and Conclusions

Recommendations to manage, minimise or avoid potential heritage impacts on items of historical heritage are presented in Section 8.

1.6 Authorship and Acknowledgements

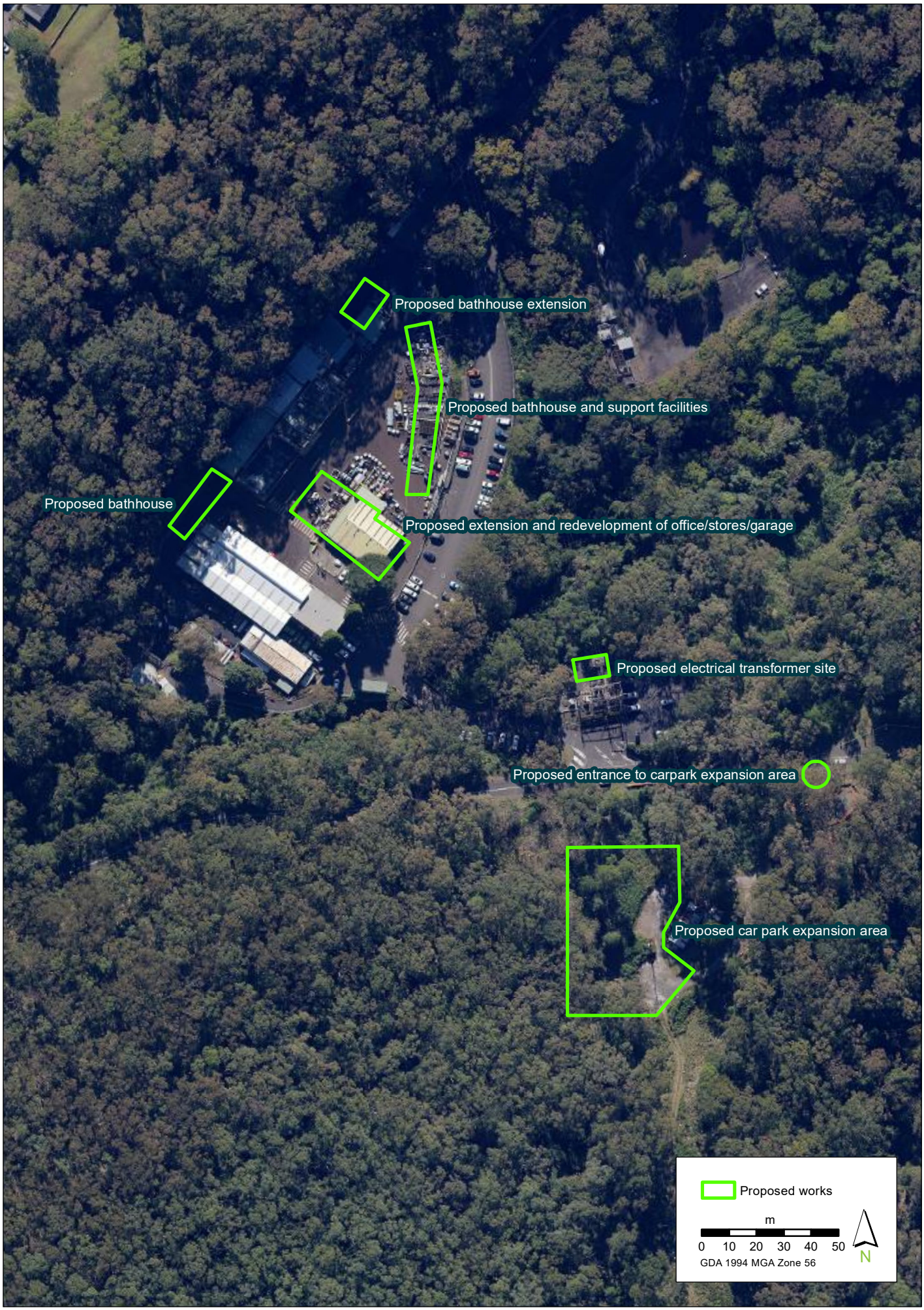
This report has been prepared by Aleisha Buckler (former Heritage Consultant, Niche), Clare Leevers (former Archaeologist and Heritage Consultant, Niche), Fiona Leslie (former Principal Heritage Consultant, Niche) and Joshua Madden (Team Leader – Historic Heritage, Niche).



Location Map

Dendrobium Mine Plan for the Future: Coal for Steelmaking. Historical Heritage Assessment

FIGURE 1



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Dendrobium Pit Top Showing Locations of Proposed Works (Source: South 32)

Dendrobium Mine Plan for the Future: Coal for Steelmaking. Historical Heritage Assessment

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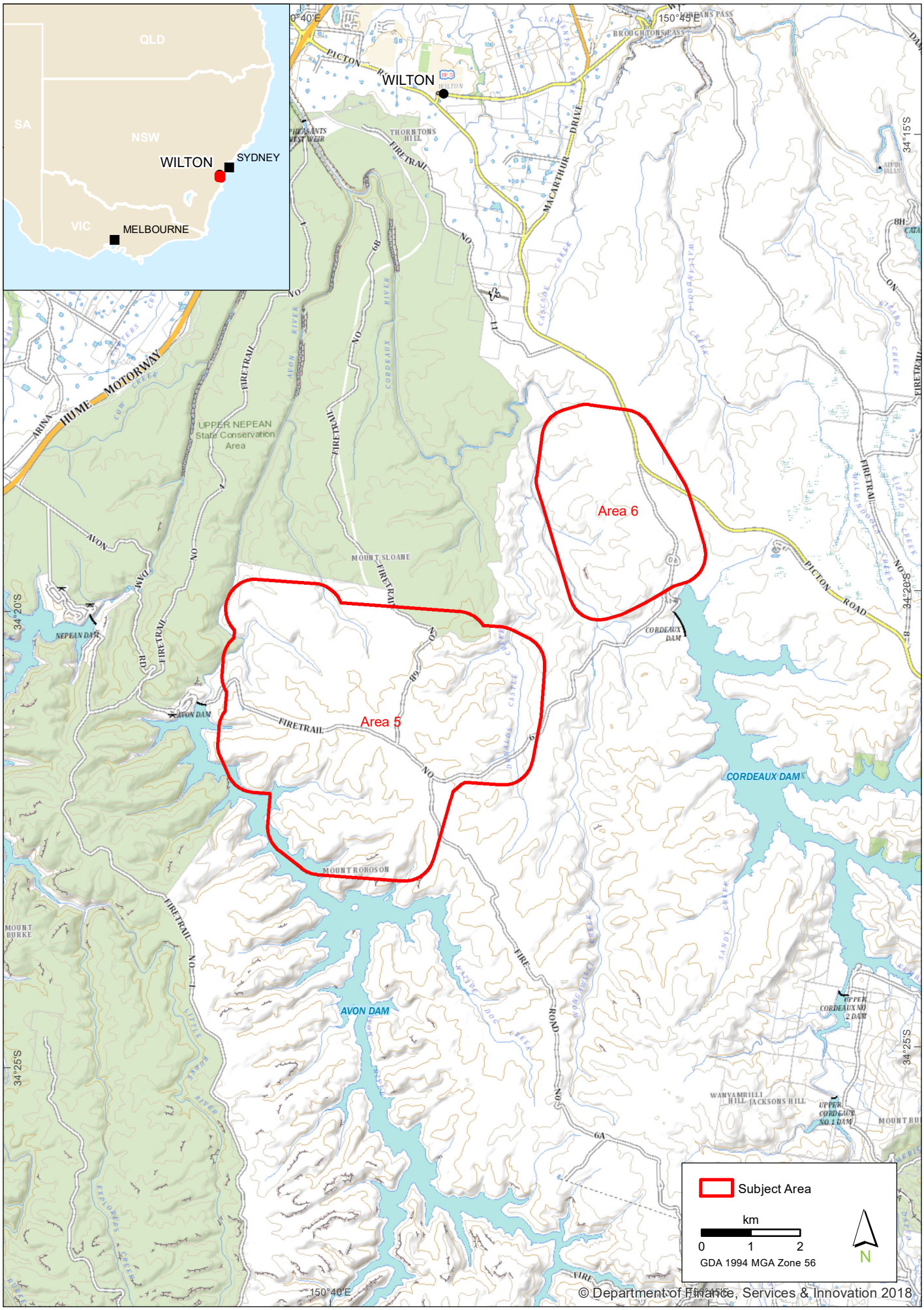
FIGURE 2



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Area 5 and Area 6 Locations

Dendrobium Mine Plan for the Future: Coal for Steelmaking. Historical Heritage Assessment

FIGURE 3

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2. Statutory Background

2.1 Preamble

The following subsections present a summary of relevant Commonwealth, National and State legislation and associated local planning instruments, designed to protect and conserve significant historical heritage items and their values, as they relate to SSDs. The results of heritage register searches for historical heritage items located within, or in close proximity to, the subject areas are also summarised and presented in Section 2.3.

2.2 Regulatory and Assessment Framework

2.2.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places.

The Dendrobium Mine operates in accordance with the Approval Decision (EPBC 2001/214) granted on 20 December 2001 under the EPBC Act.

The Project was determined to be a 'controlled action' under the EPBC Act (EPBC 2017/7855) and will be assessed under the NSW Assessment Bilateral Agreement.

2.2.2 NSW Environmental Planning and Assessment Act 1979

The EP&A Act establishes the framework for cultural heritage values to be formally assessed in the land use planning and development consent process in NSW. The EP&A Act requires that environmental impacts, including impacts on heritage items, are considered prior to land development. The EP&A Act also requires local governments to prepare planning instruments (such as Local Environmental Plans [LEPs]) in accordance with the principles of the legislation, to provide guidance on the level of environmental assessment required.

The Dendrobium Mine was approved by the NSW Minister for Urban Affairs and Planning on 20 November 2001 under the EP&A Act. The existing mining operations are undertaken in accordance with NSW Development Consent DA 60-03-2001.

A specific assessment system has been created under Part 4, Division 4.7 of the EP&A Act, to consider projects classed as SSD. A range of development types, such as mines and manufacturing plants, as well as warehousing, waste, energy, tourism, education and hospital facilities, are considered to be SSD if they are over a certain size or located in a sensitive environmental area.

The Project falls under the SSD system and Development Consent is being sought from the Minister for Planning (or delegate).

2.2.2.1 Secretary's Environmental Assessment Requirements (Project Specific)

Secretary's Environmental Assessment Requirements (SEARs) have been issued for the Project under clause 3, Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. The SEARs outline the requirements for the Environmental Impact Statement (EIS) for the Project.

Specific to Heritage, the SEARs state that the EIS must include an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, having regards to the Office of

Environment and Heritage's (OEH's) requirements. For historic heritage, the OEH's requirements are as follows:

5. *The EIS must provide a heritage assessment including but not limited to an assessment of impacts to State and local heritage including conservation areas, natural heritage areas, places of Aboriginal heritage value, buildings, works, relics, gardens, landscapes, views, trees should be assessed. Where impacts to State or locally significant heritage items are identified, the assessment shall:*

a. *outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the NSW Heritage Manual (1996),*

b. *be undertaken by a suitable qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria),*

c. *include a statement of heritage impact for all heritage items (including a significance assessment),*

d. *consider impacts including, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment (as relevant), and*

e. *where potential archaeological impacts have been identified develop an appropriate archaeological assessment methodology, including research design, to guide physical archaeological test excavations (terrestrial and maritime as relevant) and include the results of these test excavations.*

This report is intended to fulfil the historic (non-Aboriginal) heritage requirements as listed above, where relevant.

2.2.3 NSW Heritage Act 1977

The *Heritage Act 1977* is a statutory tool designed to conserve environmental heritage in NSW. It is used to regulate development impacts on the State's historical heritage assets. The NSW Heritage Act defines a heritage item as "*a place, building, work, relic, moveable object or precinct*". To assist with the management of the State's heritage assets, the NSW Heritage Act distinguishes between items of local and State heritage significance. Items that are assessed as having State heritage significance can be listed on the NSW State Heritage Register (SHR).

Archaeological features and deposits are afforded statutory protection by the 'relics provisions' of the NSW Heritage Act. A relic is defined as "*any deposit, artefact, object or material evidence that relates to the settlement of the area that comprises NSW, not being Aboriginal settlement, and is of State or local heritage significance*". Land disturbance or excavation that will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed is prohibited under the provisions of the NSW Heritage Act, unless carried out in accordance with an Excavation Permit pursuant to section 140, or an Archaeological Exception under section 139 of the NSW Heritage Act.

Section 4.41 of the EP&A Act outlines legislation and approvals that do not apply to SSDs. Of relevance to heritage approvals, under s89J the following do not apply to SSDs:

- An approval under Part 4, or an excavation permit under s139 of the *Heritage Act 1977*.

- Division 8 of Part 6 of the *Heritage Act 1977*, which relates to controlling and restricting harm to buildings, works, relics and places not subject to interim heritage orders or SHR listing.

2.2.4 Local Planning Instruments

LEPs are developed and maintained for each LGA. The LEP identifies Aboriginal Places and historical heritage items within the LGA. These items are subject to the planning controls and provisions set out in the EP&A Act and Clause 5.10 (Heritage Conservation) of each LEP. The subject areas are situated in the LGAs of Wollongong (Wollongong LEP 2009), Wollondilly (Wollondilly LEP 2011) and Wingecarribee (Wingecarribee LEP 2010).

2.3 Heritage Register Searches

The following presents the results of Commonwealth, National, State and local heritage register searches for listed historical heritage items located within, or in close proximity to, the subject areas.

2.3.1 Commonwealth and National Heritage Registers

Under the EPBC Act, protected heritage items of significance are listed on the National Heritage List (NHL) or the Commonwealth Heritage List (CHL). The NHL provides protection to places of cultural significance to the nation of Australia, while the CHL comprises natural, Aboriginal and historic heritage places owned and controlled by the Commonwealth.

Searches of Commonwealth and National heritage registers via the Australian Heritage Database were undertaken on 27 October 2016 and 18 February 2019. The results of the searches found two Indigenous Places (Place IDs: 13706 and 3316) within the suburb of Wilton included on the non-statutory Register of the National Estate (RNE). No other location details are provided.

2.3.2 NSW State Heritage Register

The SHR lists items that have been assessed as being of State heritage significance. Items listed on the SHR are granted protection under section 57 of the *Heritage Act 1977*. A search of the SHR was completed on 27 October 2016 and 18 February 2019. The results of the searches are found in **Table 1** below.

Table 1. NSW Heritage Database Search Results.

Item Name/SHR ID Number	Item Address	Approximate distance from project location
Avon Dam / 01358	Avon Dam Road, Avon Dam, NSW	Area 6 is partially located within Item
Cordeaux Dam / 01360	Cordeaux River, Cordeaux, NSW	Area 5 is partially located within Item

The location of these two State significant heritage items in relation to the subject areas is shown in **Figure 4 and Figure 5**.

2.3.3 NSW State Heritage and Conservation (s170) Registers

Under section 170 of the *Heritage Act 1977*, NSW Government agencies are required to maintain a register of heritage assets under their control or ownership. Each government agency is responsible for ensuring that the items entered on its register under section 170 are maintained with due diligence in accordance with State Owned Heritage Management Principles. Items listed on a section 170 Heritage and Conservation Register are listed on the State Heritage Inventory (SHI).

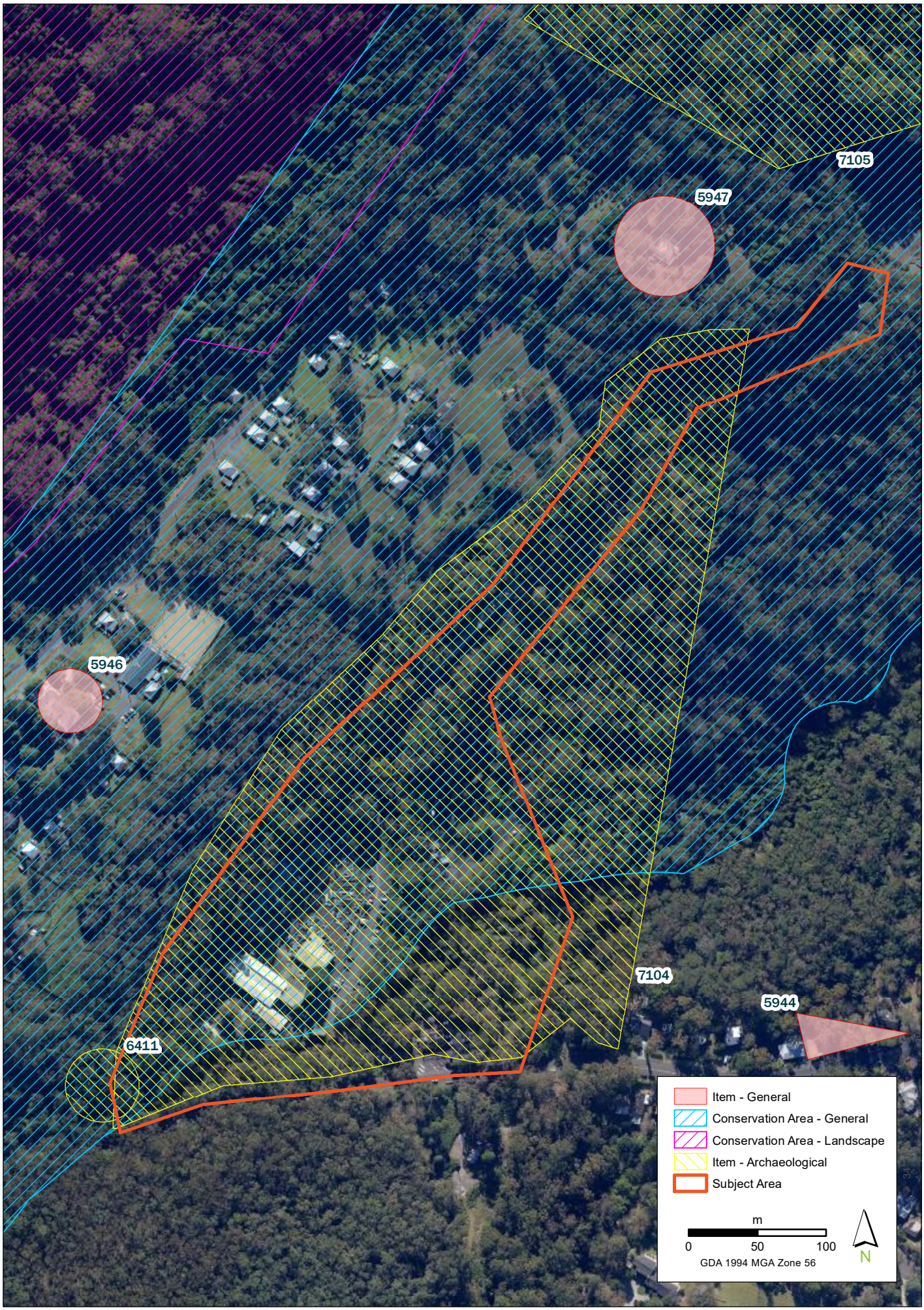
A search of the SHI was completed on 27 October 2016 and 19 February 2019. Avon Dam (SHR ID 013560) and Cordeaux Dam (SHR ID 01360) are also listed on the WaterNSW section 170 heritage register.

2.3.4 Local Environmental Plans

Heritage items are listed under Schedule 5 of each LEP. Searches of the Wollongong LEP 2009, Wollondilly LEP 2011 and Wingecarribee LEP 2010, were undertaken on 27 October 2016 and 19 February 2019. The results of the searches are found in **Table 2**, **Figure 4** and **Figure 5** below.

Table 2. LEP Heritage Search Results.

Item Name (Item number)	Item Type	Item Address	Approximate Distance from Project Area
Avon Dam (I224)	Item General	Avon Dam Road, Avon Dam, NSW	Partially located within Area 5
Cordeaux Dam (I56)	Item General	Cordeaux River, Cordeaux, NSW	Partially located within Area 6
Nebo Colliery (7104)	Archaeological Site	Lot 1, DP 1103781 and Lot 3, DP 1103666	The Dendrobium Pit Top is located within the Item
Site of Pioneer Kerosene Works (6411)	Archaeological Site	Part Lot 4, DP 751278 Between American Creek and Cordeaux Road	Approximately 120 m south-west of the Dendrobium Pit Top
Former St Clement's Roman Catholic Church (5944)	Item General	Lot 1, DP 230082 356 Cordeaux Road	Approximately 350 m east of the Dendrobium Pit Top area
Former post office (5946)	Item General	Part Lot 160, DP 751278 Harry Graham Drive	Approximately 200 m north-west of the Dendrobium Pit Top area
Mine manager's residence (5947)	Item General	Part Lot 74, DP 751278	Approximately 500 m north of the Dendrobium Pit Top area
Kembla Heights Mining Village	Heritage Conservation Area – General	–	The Dendrobium Pit Top area is partially located within the HCA
Illawarra Escarpment Landscape Area	Heritage Conservation Area – Landscape	–	Approximately 300 m west of the Dendrobium Pit Top area



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Heritage Items – Dendrobium Pit Top

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FIGURE 4

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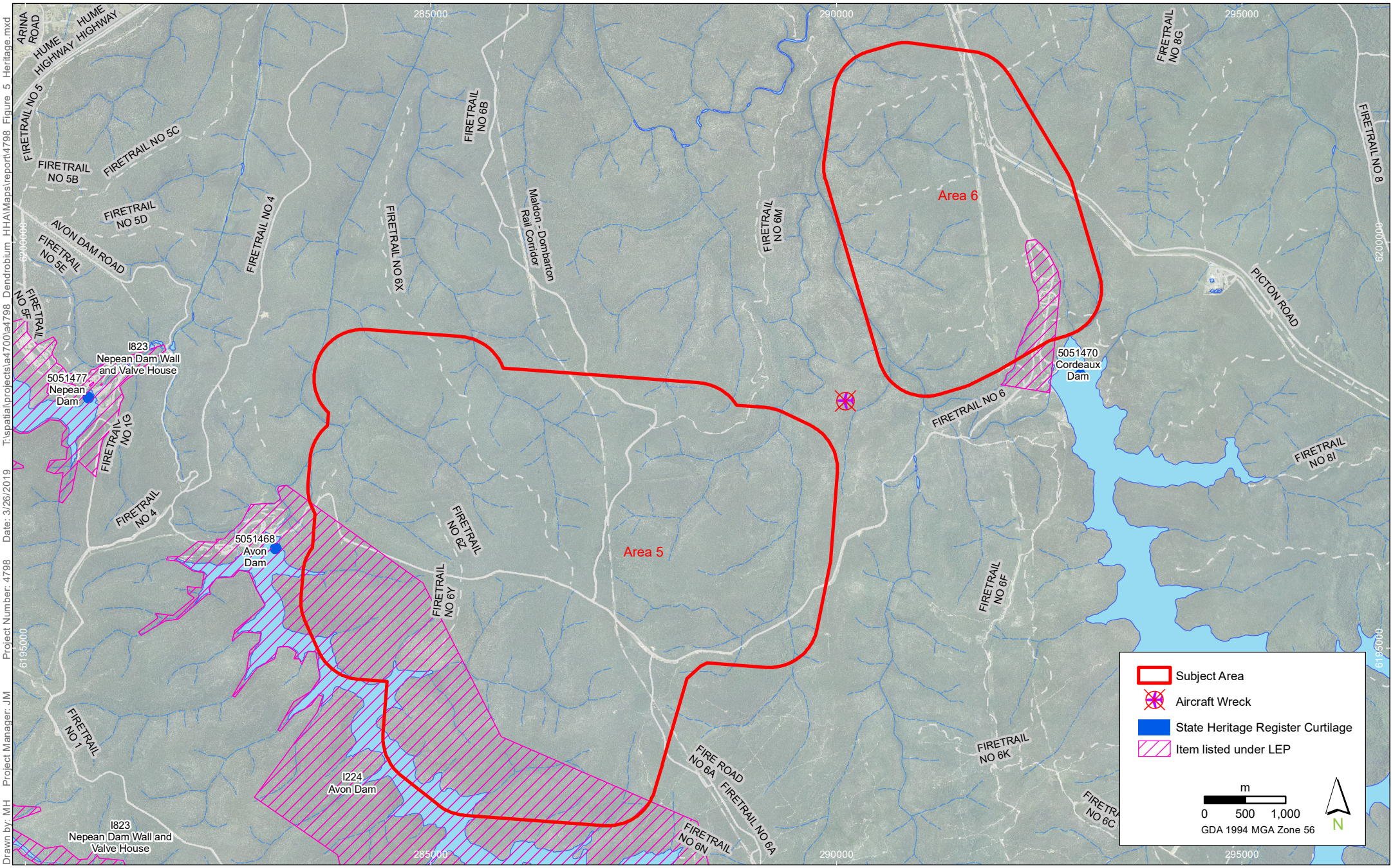

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Heritage Items – Area 5 and Area 6

Dendrobium Mine Plan for the Future: Coal for Steelmaking. Historical Heritage Assessment

FIGURE 5

Imagery: (c) S32 2009

3. Historical Summary

3.1 Preamble

This section of the report provides a summary of the relevant historical land use in the Project areas for the purpose of providing a historical context for existing and potential historical heritage items. This background has been prepared from, primarily, a review of secondary sources.

3.2 Early Historical Context

European exploration of this region of NSW commenced in the late eighteenth century, with Bass and Flinders noting the Port Kembla and Lake Illawarra area during their navigational voyages along the coast. Overland exploration into the region began in the early 1810s when cedar-getters began clearing timber in the area, exhausting supplies by the early 1840s (OHM Consultants 2006).

3.3 The Development of Wollongong (including Kembla Grange)/Mining History of Illawarra

In 1815 Dr Charles Throsby herded his cattle from his property in Liverpool to Wollongong and erected a cattle stockyard at what is now the corner of Harbour and Smith Streets, Wollongong (Kass 2010). Due to poor overland access, the first official settlement in the area commenced a couple of years later in 1817 with the first land grants made along Lake Illawarra. Settlement in the Illawarra region continued to be hampered by the poor overland access routes with the small harbour the primary transport route in and out of the fledgling Wollongong settlement. In 1826 a military garrison was established at Wollongong with the barracks completed in 1830. By 1832 the garrison had moved and the barracks were used by the mounted police (Jervis 1942).

In 1834 the town was gazetted and included the formalisation of a harbour at Belmore Basin (OHM Consultants 2006). During the 1830s the town and surrounding areas continued to grow at a slow but steady rate and boasted a number of Hotels, a courthouse and a post office. An impetus for the growth of the region was the construction of what is no Bulli Pass by a large convict labour force between 1835 and 1836 (Kass 2010) which opened the overland access to Sydney and Campbelltown. However, the depression of the 1840s hit the Wollongong region hard with many inhabitants leaving the area. The 1841 census listed a total of 659 houses in Illawarra with the population of 2,999 across Northern Illawarra, Wollongong and those areas around Dapto and Lake Illawarra (K&T Henderson 1983).

During the 1840s dairying became the most prominent industry in the region (Jervis 1942). As the number of small dairy farms in the Illawarra and surrounding regions increased the South Coast and West Camden Co-operative society was formed in 1881. The society was set up to market dairy products in the South Coast without the need for commercial agents (Kass 2010). The dairy industry continued to grow in the region with the support of numerous co-operatives including the butter co-operatives at Kiama, Unanderra and Dapto which would eventually amalgamate in 1898 under the banner the Illawarra Central Dairy Factory based out of Albion Park. In 1900 the Dairy Farmers Co-operative Milk Company was formed by the dairy farmers in and around Wollongong and Kiama (Hagan and Wells 1997). Dairying continued to be an important industry for the region well into the Twentieth Century however, after World War One the number of dairy farms decreased as dairies began to amalgamate (Kass 2010).

The town continued to grow and by the mid to late nineteenth century, Wollongong boasted a new courthouse, a School of Arts, the National School, numerous commercial banks and in 1862 a telegraph line was connected to Sydney (Jervis 1942). By 1865 the first gas supply in Wollongong was provided from the gas plant situated at what is now Corrimal Street this would facilitate the introduction of gas street lights in

1883. The growth of the new mining industry facilitated faster growth and the harbour was expanded in the late 1860s. As the mining industry grew so did the Illawarra region with other heavy industries moving to Wollongong due to the availability of coal (Kass 2010).

By 1886 the government rail line reached the Illawarra with a continuous single line between Wollongong and Sydney finished in 1888 (OHM Consultants 2006). The rail line made access to the region from Sydney easier and facilitated in further opening up of the Wollongong and Illawarra regions to regional markets. Further, the government line was utilised by various mines transporting coal from private lines on to the government line and on to the Harbour at Belmore Basin and by 1900 out of Port Kembla.

3.4 Mining History of the Illawarra

The coal seams located throughout the escarpment were first recorded in 1797 however, it wasn't until 1839 that the seams were examined by geologist Reverend W.B Clark. During the early to mid-nineteenth century the Australian Agricultural Company had a monopoly on mining coal in the colony which ended in 1848. This inhibited the mining of coal across the escarpment until 1849 when James Shoobert opened a small mine at Mount Keira in 1849 (Kass 2010; OHM Consultants 2006). Between 1849 and 1900 twelve mines had opened along the Illawarra escarpment employing some 2,300 men and boys with annual production reaching up to 1.26 million tonnes per year. One of the mines opened in this time was the Mount Kembla Colliery opened in 1883.

3.4.1 Mount Kembla Colliery

The Mount Kembla Colliery was the first mine opened in the Bulli coal stream south of Mount Keira (OHM Consultants 2006). The Mount Kembla mine was, for some time, one of the largest and most significant along the South Coast. Mount Kembla was one of the first mines in the Illawarra to longwall mine and have its own electric power generating plant (OHM Consultants 2006).

The lack of government infrastructure in the region meant that early mines were responsible for transporting mined coal from the colliery to the wider markets. In response, many mines constructed lines from mine shafts to company jetties along the Illawarra coastline. The Mount Kembla mine was one of the first colliery's to construct one of the earliest rail lines which ran to the company's jetty at what is now Port Kembla (Kass 2010; OHM Consultants 2006).

The growth of mines along the escarpment saw an increasing need to house workers and their families close to the mine shafts. As a result, a number of purpose built mining villages sprang up around mine shafts including the Kembla Heights village (OHM Consultants 2006). The current Project area is located within the Mount Kembla Mining Village Heritage Conservation Area. The Mount Kembla Colliery and the Kembla Heights village are associated with the worst mining tragedy in Australia's history which killed 96 boys and men on 31 July 1902 (OHM Consultants 2006; Kass 2010).

The Mount Kembla mine closed in 1970 however, Kembla Heights continues to be associated with the mining facilities at Dendrobium Mine. As a mining village mining has played a significant role in the history of Kembla Heights which is evidenced by the annual mining festivals and memorials held throughout the village by the Mt Kembla Mining Heritage Inc. (OHM Consultants 2006).

3.4.2 The Pioneer Kerosene Works

In 1865 small quantities of kerosene shale were being produced from a shale bed identified at the American Creek coal seam. In 1872 the kerosene shale plant was established adjacent to the current Dendrobium Pit Top Project area. The plant was eventually closed in 1878 as it was unable to compete against the low cost of kerosene produced in other areas of the state (OHM Consultants 2006).

3.5 The Development of Cordeaux and Avon / Nearby Towns

By the 1840s settlement spread with the growth of dairying in the vicinity of the Cordeaux and Avon Rivers. However, it wasn't until 1852, that Government surveyor Peter Carr, was sent to the Cordeaux River to begin surveying formal allotments in the region. Carr noted several families had already settled in the area and had already begun clearing and improving small parcels of land (McNamara 2000). The Fishlock and Moran families had reportedly taken up residence and cleared land along the banks of the river by 1857 (McNamara 2000). From the 1860s until the early twentieth century, the area around the Cordeaux River was gradually sold off in large allotments, with land use predominantly comprising of orchards, grazing and small-scale timber industries (McNamara 2000). Coal mining became a major industry in the region, with a State Coal Mine Reserve being proclaimed through the area in January 1926 (National Library of Australia 1938).

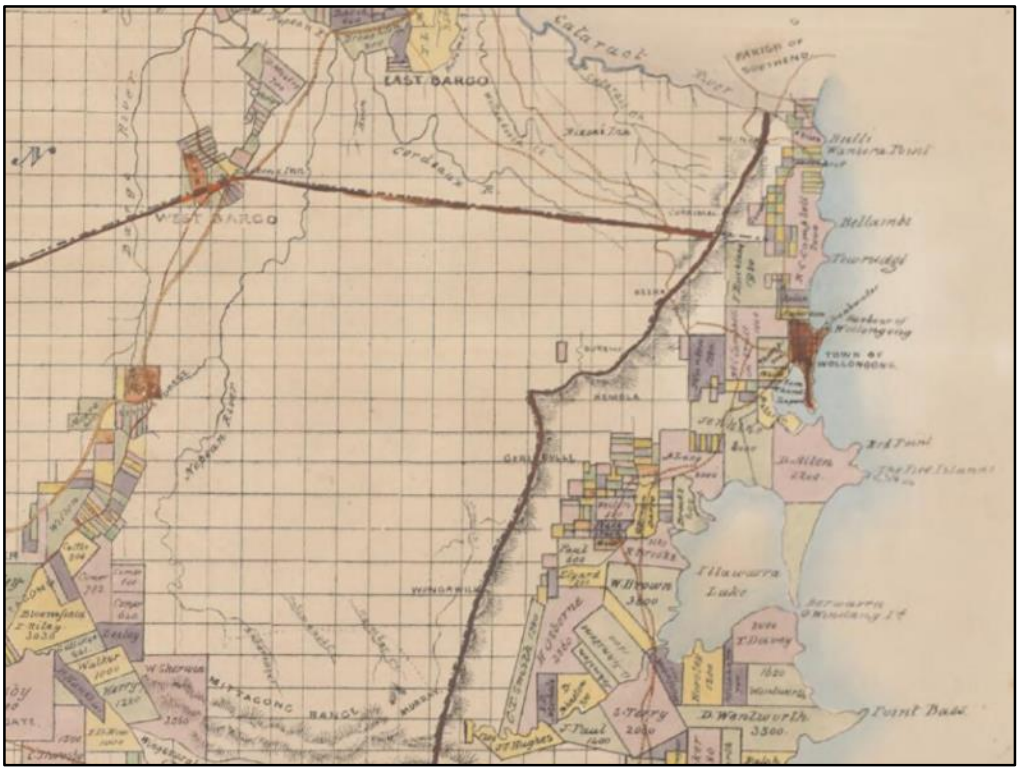


Plate 1: County of Camden in 1843 (Source: National Library of Australia 1943).

3.6 Upper Nepean Scheme

The Upper Nepean Water Supply System was built in 1880-1888 after more than a decade of investigation into schemes to provide Sydney with a fourth source of water supply (JRC Planning Services 1993:98). The system consists of an extensive system of dams, tunnels, weirs, aqueducts, canals, reservoirs and pipelines, delivering water from the catchment of the Nepean River (JRC Planning Services 1993:98). The Upper Canal forms part of the Upper Nepean Scheme and enables water diverted through the Nepean Tunnel to flow a distance of 64km to the major distribution reservoir at Prospect, supplying water to a number of localities en route (see Higginbotham 2002). The Upper Nepean Scheme continues to supply 20 to 40 per cent of Sydney's water (WaterNSW 2016).

According to Higginbotham (2002:11), one of the most outstanding features of the Upper Nepean Scheme as originally envisaged and constructed, was its potential for progressive development and improvement. Immediately after its completion in 1888, drought and population growth necessitated its further

expansion, implemented over a period of nearly 50 years with the construction of four major storage dams on the Cataract, Cordeaux, Avon and Nepean Rivers (Higginbotham 2002:11):

- Cataract Dam – completed 1907. First large cyclopean masonry dam in Australia with a height of 55.7m and total operating storage (TOS) of 94, 300 megalitres (ML).
- Cordeaux Dam – completed in 1926. Curved concrete faced cyclopean sandstone dam with a height of 58.2m and TOS of 50, 600 ML.
- Avon Dam – completed in 1927. Curved, concrete faced, cyclopean sandstone dam with a height of 72.2m and TOS of 146, 700 ML.
- Nepean Dam – completed in 1935. Curved, concrete faced cyclopean sandstone dam with a height of 81.1m and TOS of 52, 000 ML.

As a result of the Upper Nepean Scheme, special protections were afforded to the catchment areas surrounding the new dams and complete exclusion or restricted access was mandated by the Water Board. At the time of gazettal, much of the land which now makes up the Upper Nepean catchment area was unalienated Crown land where little development had occurred. In combination, this has meant a high degree of preservation of the remnant historical archaeological remains within the subject areas. In order to realise its potential for improvement the Water Board constructed public picnic grounds at scenic points within the popular catchment lands in the footprint of the dam construction infrastructure. Following the First World War and the proliferation of access to motor vehicles, more and more visitors made visits to these picnic areas (NSW OEH 2017a; 2017b).

Some parts of the Special Areas have been protected from significant further development for over 100 years. The subject areas for this Project are within one of these restricted Special Areas (WaterNSW 2017), namely the Metropolitan Special Area. This limits the potential for archaeological remains outside of the areas in the vicinity of the dams and picnic areas.

Detailed information about each of these four dams can be found within the CMP for the Sydney Catchment Authority (SCA) Metropolitan Dams prepared by Graham Brooks and Associates Pty Ltd (2003).

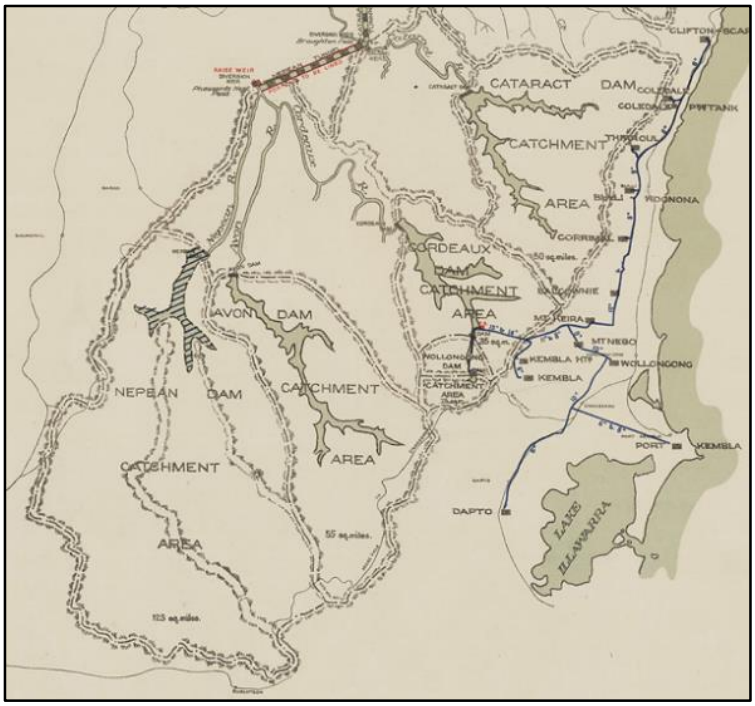


Plate 2: Map showing the Metropolitan catchment area, dams and reservoirs 1929-1940 (Source: State Library of NSW 1947).

3.7 Nebo Mine

The Nebo mine was opened by BHP in 1946 to work the Wongawilli coal seam and was the first mine to be opened fully mechanised (Rogers 2001; OHM Consultants 2006). The Nebo mine employed 'track mounted mechanical coal loaders and coal cutters, 10-tonne capacity mine cars and battery and diesel powered locomotives' (Nebo Colliery Listing Sheet).

The Nebo mine originally comprised a headquarters for non-miner staff, as well as larger and more diverse steel-framed buildings for handling equipment, maintenance and storage (Irving 2001). The Nebo Pit Top was designed to be visually pleasing as well as a functional work place (Plate 3).

During the earliest times of the mining operations, workers would emerge from the coalface and head straight home. "The colliery bath house indicates one effect of twentieth century legislation aimed to improve miners' working conditions…Here at Nebo the bath house is one of a suite of brick surface structures conceived as an architectural whole" (Irving 2001 pp 85).

In 1951 mining operations were halted as large volumes of methane gas had to be released from the strata immediately above the coal seam. By 1952 the Nebo mine became 'semi trackless' using caterpillar mounted Anderson Boyes (UK) cutters and Joy Manufacturing loaders. Coal would then be loaded into track mounted mine cars which continued to the face. In 1954 caterpillar mounted continuous miners were introduced, and in 1959 conveyor belts replaced the mine cars with coal being cut and loaded into shuttle cars at the face (Irving 2001).

At the time of opening, the Nebo mine and surface facilities were of the most modern design with the administration building at the centre of the Nebo Pit Top which also included workshop and bathhouse buildings and a training school for mine workers (Irving, 2001).

A coal handling plant, erected in the north of the main portals, could rotary dump ten ton capacity rail mounted mine cars which had been loaded at the coal face. Coal was then loaded on top the conveyor belt

and in turn into rail loading storage bins. The rail track was linked to the original Mt Kembla colliery rail line and transported to the Port Kembla Steelworks on the Company's private rail line (Nebo Colliery Listing Sheet).

In 1993 Nebo colliery ceased operations as a mine, with certain underground workings and leases, portal entries and services used to create the Elourea mine. Since 2001 the remaining surface facilities at Nebo remained to support the development of the new Dendrobium Colliery and have been altered and/or reworked to suit the needs of this new mine. (OHM Consultants 2006).

3.8 Other Archaeological Remains

Approximately 2.5 km west of Cordeaux Dam, the remains of an aircraft wreckage were located within the Metropolitan Special Area. The remains are scattered across an area approximately 20 m x 15 m within the straddles of two ridgelines (Niche 2015:1). The remains predominately consist of pieces of the aircraft's frame and fuselage. The site is of local significance because it is the remains of a Tugan L.J.W.7 Gannet (TA.52) VH-UUZ, which crashed in densely wooded country on 19 February 1936. The aircraft was designed by Australian aviation pioneer Sir Lawrence James Wackett in 1934. Only eight Tugan Gannets were completed and flown between 1935 and the closure of Tugan Aircraft in 1937 (Niche 2015:3).

The location of the wreckage remains is outside of the subject areas, away from the locations of the ventilation shafts.

Plate 3: Nebo Colliery circa 1958 (Source: National Archives of Australia).

4. Analysis of Evidence

4.1 Preamble

The following Section provides a summary of previous heritage studies and assessments relevant to the subject areas.

4.2 Dendrobium Coal Project: Cultural Heritage Assessment (Navin Officer 2000)

Navin Officer undertook the cultural heritage assessment component of the original EIS submitted to obtain the development consent for the Dendrobium Coal Project in 2000. The assessment considered both Aboriginal and non-Aboriginal (historical) heritage constraints. The assessment confirmed that the Nebo Colliery buildings, dating from 1946, are listed on the Wollongong LEP (Item ID7104).

4.3 Nebo Colliery Pit Top, Mount Kembla: An archival Record (Rogers 2001)

In order to support the Dendrobium Mine mining operations, a number of the former Nebo Mine Pit Top buildings were demolished while several required substantial alterations. In 2001 Brian Rogers, historical archaeologist, compiled an archival record of the Nebo Colliery Pit Top buildings prior to the demolition and alteration of the remnant mining facilities (see **Appendix A** for Archival Plans (2003)).

In 2003 supplementary archival documents were prepared which incorporated recordings of those buildings demolished and/or altered, and those excavations undertaken in compliance with appropriate approvals (Rogers 2003).

As part of the preparation for the Dendrobium Mine, an auxiliary water supply consisting of a 350 kilolitres tank and pump house was installed in the location of the former staff car park south of the workshop and offices. The installation of the tank and pump house included the excavation of the area to form a 'flat site'. No historical archaeological remains were recorded during these excavations.

In 2000 excavations for the Eastern Gas Pipeline identified extensive deposits of spent shale along the Kerosene Flats, associated with the early kerosene works. During excavation works in 2002 a stone and brick setting with an iron door were uncovered within the southern portion of the flat. Further archaeological excavations found evidence of two furnaces running east west across the kerosene flats. No archaeological relics were uncovered during excavations undertaken in the northern end of the kerosene flats.

The demolition of the brick and concrete fan motor house, concrete fan drift, brick Collieries Training Centre and the rail turn-in to original Nebo Mine portal resulted in a series of archaeological investigations at each building location. No archaeological relics were recorded during these excavations. However, during the removal of old Nebo Colliery structures the concrete base for the original fan was uncovered with a large concrete machine foundation exposed along the northern reaches of the Nebo Colliery Pit Top.

In 2003, a series of road works were undertaken across the Nebo Colliery Pit Top east of the offices and bath house and south of the offices and sheltered store. No archaeological relics were recorded during the road work excavations (Rogers 2003).

4.4 Sydney Catchment Authority – Metropolitan Dams: Conservation Management Plan (Graham Brooks & Associates Pty Ltd 2003)

Graham Brooks & Associates prepared a Conservation Management Plan (CMP) in 2003 for the four Metropolitan Dams controlled by the then SCA (now Water NSW). The dams – Cataract, Cordeaux, Avon and Nepean, were completed between 1907 and 1936 and were built to supply metropolitan Sydney with a secure and reliable water supply. The collective heritage value of the four Metropolitan Dams has been recognised as being of State significance and each dam has been entered onto the SHR. The CMP was prepared for the purpose of providing SCA with a plan for managing the cultural heritage value of the dams, whilst maintaining their operational efficiency.

Volume One of the CMP covers general heritage management issues that apply across the collective dam resource and establishes policies to guide management decisions which generally relate to each of the four dams. Volumes Two to Five outline specific guidelines and exemptions for day-to-day management for each of the individual dams (Volume 3 – Cordeaux Dam; Volume 4 – Avon Dam).

The CMP was endorsed by the Heritage Council of NSW on 27 June 2003 for a period of five years, and has therefore now expired (as of 27 June 2008).

4.5 Dendrobium Area 3: Archaeological and Cultural Heritage Assessment (Biosis Research 2007)

Biosis Research prepared an archaeological and cultural heritage assessment in 2007 in support of a modification to Area 3 at Dendrobium Mine. The area encompassed an area between Cordeaux and Avon Dams and is located to the west of Area 5 and south of Area 6. The purpose of the assessment was to identify, record and assess the significance of both Aboriginal and historical archaeological sites within the mining footprint.

The assessment considered impacts to Cordeaux Dam, given the proximity of Area 3 to the State heritage listed item, but found that the proposed mine would not impact on the views and vistas of the dam wall from the surrounding ridgelines or physical infrastructure associated with the dam. One new item of historical heritage was identified during the field survey in Area 3C: a small timber bridge on a tributary of the Cordeaux River, seemingly constructed ad hoc from recycled power / telegraph poles and in a very poor condition. Biosis Research found that there was a low potential for the bridge to be impacted by subsidence movements, given its construction and small size.

In conclusion, Biosis Research (2007:77) found there to be no historical heritage constraints associated with the proposed mining operations within Area 3, noting that:

> *The lack of historic heritage sites within the study area is not inconsistent with the land use history of the area. The study area was unalienated Crown land prior to declaration as a water supply reserve. This lack of sustained historic occupation is reflected in the historic archaeological record of the study area.*

4.6 Dendrobium Area 3B, Longwalls 9 to 18: Heritage Impact Assessment (Biosis Research 2012)

Biosis Research prepared a Heritage Impact Assessment for Dendrobium Area 3B, encompassing Longwalls 9-18, in 2012 in support of the Subsidence Management Plan (SMP). The SMP area assessed is located to the south of Area 5. The assessment did not identify any items of historical heritage within the SMP area and therefore no management measures in relation to historical heritage were provided.

5. Visual Inspection

5.1 Preamble

A visual inspection focusing on the heritage items located within, or in proximity to, Project Areas 5 and 6 was undertaken on 16 June 2017 by Clare Leevers (Archaeologist, Niche) and Renée Regal (Team Leader, Niche) (see **Figure 6**). A site inspection of Dendrobium Pit Top area was undertaken on 14 February 2019 by Joshua Madden (Team Leader – Historic Heritage, Niche).

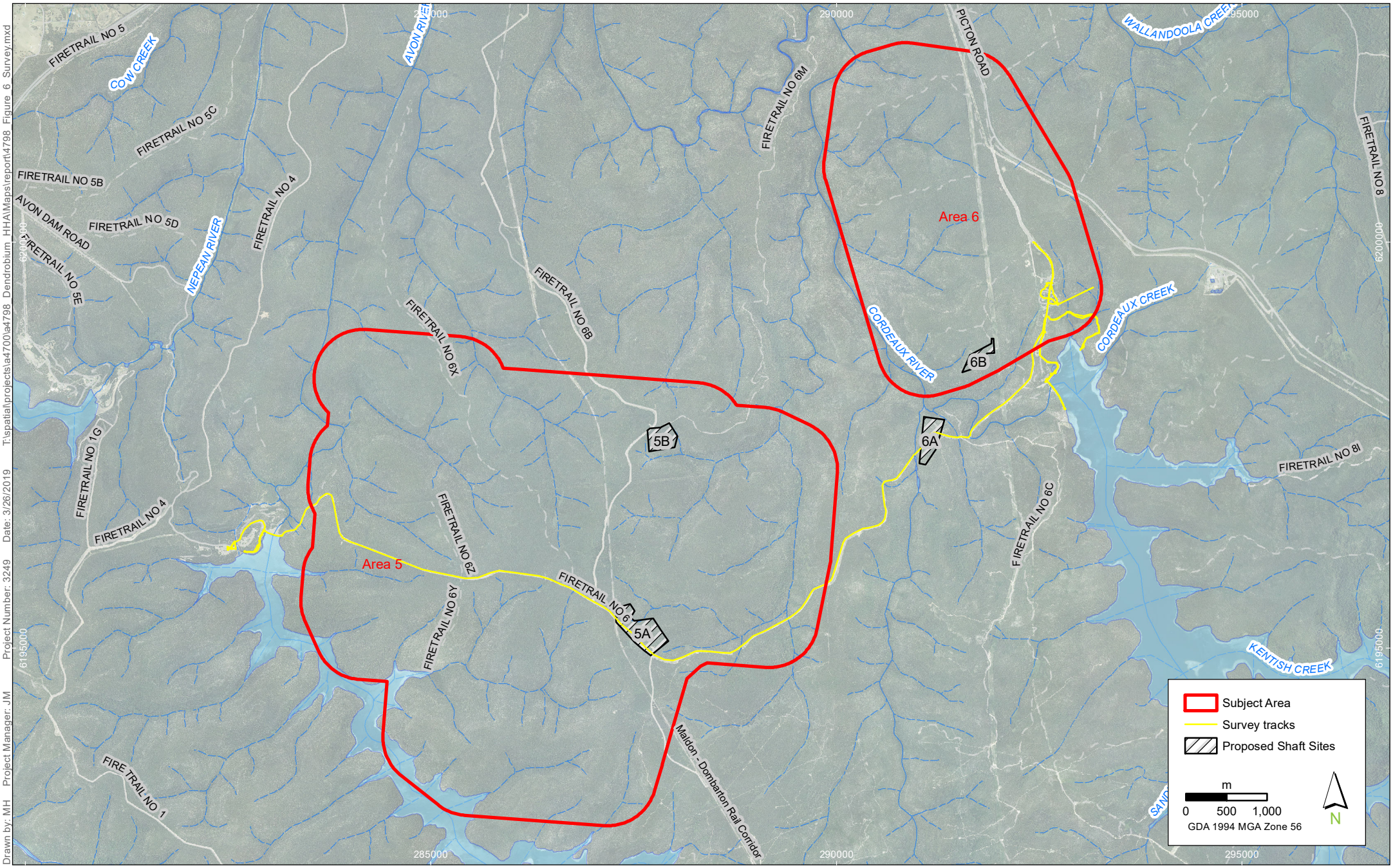
5.2 Methodology

5.2.1 Project Areas 5 & 6

The visual inspection component was intended to locate and characterise any heritage items within the subject areas. Only two heritage items were identified through historical research: the Cordeaux and Avon Dams and their associated views and vistas. These items are listed on the SHR and were photographed, and visually assessed, focusing on proposed sites of surface infrastructure associated with the Project. Sites where surface infrastructure is proposed have the potential to impact on the heritage values of the two heritage listed dams. The field survey track coverage is shown in **Figure 6**.

5.2.2 Dendrobium Pit Top Project Area

The visual inspection of Dendrobium Pit Top targeted those locations where structures and additional infrastructure would be constructed as shown in **Figure 2**.



Survey Effort Area 5 and Area 6

Dendrobium Mine Plan for the Future: Coal for Steelmaking. Historical Heritage Assessment

niche Environment and Heritage

FIGURE 6

Imagery: (c) S32 2009

5.3 Results

5.3.1 Cordeaux Dam

The Cordeaux Dam is a popular tourist attraction and is entered via public road, the end section of which is lined with an avenue of mature Monterey Pines and stands of Cypress Pine (*Callitris sp.*) (**Plate 4**).

Plate 4: The Monterey Pine (*Pinus radiata*) avenue leading into the upper picnic area (Niche 2017)

Upper Picnic Area

The upper picnic area includes picnic grounds, landscaped gardens, shelters and pathways as well as remnant landscaping from c. late 1920s – early 1930s. The picnic grounds are located on the site of the original construction township and retain a road formation, culverts and drainage lines (**Plate 5**) from that era.

Plate 5: An original broad stone flagged drain which is still in use (Niche 2017)

The easternmost section of the picnic area adjacent to the dam viewing point is encircled by the old roadway and contains a tract of Eucalyptus which were planted by Board members of the former Water Board in 1928 (**Plate 6**), and retain particular memorial associations with past identities of the Board. There were numerous tree plantings undertaken for the opening of the dam in 1927 which are still extant today,

including palms, pines, and at least one Magenta Lilly Pilly (*Szygium paniculatum*). Collectively the diversity of trees present an accurate record of past horticultural practices.

Plate 6: Tract of Eucalyptus planted by Water Board members, part of the original road alignment is in the foreground (Niche 2017)

The most immediately visible of the remnant landscaping features is a large grotto and garden present within the grounds. Filled with palms, ferns and water features, this landscape hints at the Egyptian Revival styling present across the rest of the dam landscape. Its overflow is currently managed by the drain described above (**Plate 7**).

Plate 7: The 'Egyptian Revival' grotto within the upper picnic area of Cordeaux Dam (Niche 2017)

The dam wall itself is not visible from the upper picnic area, but there are picturesque views of the reservoir created upstream from the dam, bordered by the crests of the valley sides (**Plate 8**). These can be viewed from select vantage points within the picnic area. This public vista faces away from the subject areas, including associated surface infrastructure.

Plate 8: The view of Cordeaux Dam from the upper picnic area (Niche 2017)

The past land use of the picnic site as the dam's construction township is not specifically signposted, but various plaques and small displays honour the dam's construction and engineering significance (**Plate 9**).

Plate 9: An old rail cart which has been placed on display as part of an information panel about Cordeaux Dam (Niche 2017)

This reuse and rehabilitation of land cleared and/or modified in the construction processes of Cordeaux Dam is representative of similar practices undertaken at other dams throughout NSW. Key features of this practice at the Cordeaux Dam site include utilising the former township as a picnic area, utilising former terraced construction areas as picnic areas and lookouts, and utilising the former construction roads and tramways for vehicular access to the dam wall.

Views and vistas across the reservoir towards the dam wall

Although not currently accessible to the public due to its location within the restricted Metropolitan Special Area, the survey included the view and vista from the eastern side of the reservoir looking back towards the dam wall (**Plate 10**). As this view faces away from the existing Cordeaux Colliery, it is currently unaffected by any mining infrastructure, and provides a full length vista of the upstream face of the dam wall, its entry pylons and crest houses, and the natural bushland setting beyond.

Plate 10: A front on view of Cordeaux Dam from across the reservoir looking south-west (2017)

Lower Picnic Area

The road to the lower picnic area passes a small quarry site which has been planted out and beautified as a small park (**Plate 11**) before winding down to the dam face along the old tramway track line.

Plate 11: A disused quarry face which has been converted into a small park (Niche 2017)

The visible remnants of sandstone quarrying for the construction of the dam are extensive, with a large quarry pit located next to what is now part of the car park for the dam wall. The platforms and terraces adjoining the dam mark out the past location of plant and equipment used in the dam construction (**Plate 12**, **Plate 13** and **Plate 14**).

Plate 12: A disused quarry pit next to the lower carpark

Plate 13: Past quarrying scars

Plate 14: The view of Cordeaux Dam wall from the lower car park (Niche 2017)

Close to the dam wall entrance is an example of the cyclopean masonry blocks which have been used in the construction of the Cordeaux Dam wall (**Plate 16**), which helps to illustrate the monumental scale of construction to the general public.

The lower picnic area includes a series of grassed terraces with stone retaining walls and a narrow crazy-paved stone path, where the Egyptian themed planting continues with a series of large palms (**Plate 15**).

Plate 15: Further Egyptian Revival plantings in the small park near the dam wall (Niche 2017)

Plate 16: An example block of cyclopean masonry next to Cordeaux Dam wall (Niche 2017)

Dam Wall

The entrance to the dam wall is immense, and the design and finishes of the crest houses, entry pylons and lower valve houses in Egyptian Revival style echo a romanticised view of Ancient Egypt at a time when many Australians had gained experience of the area through military service and archaeological finds reported in the popular press (SHR ID: 01360; Database No. 5051470) (**Plate 17** and **Plate 18**).

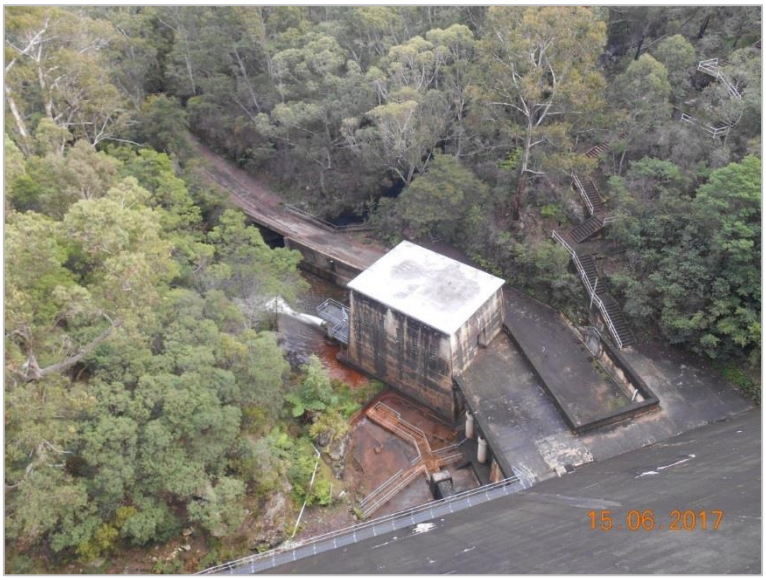


Plate 17: One of the lower valve houses, also in an Egyptian Revival style (Niche 2017)

Plate 18: The monumental entry pylons of Cordeaux Dam with its fluted lotus columns (Niche 2017)

Cordeaux Dam is a cyclopean gravity dam, a masonry construction technique which is unique to the Metropolitan Dams in Australia. The wall is in good condition with no visible cracks or degradation (**Plate 19**) and incorporates viewing galleries for the public, retaining a high level of integrity. It is also one of only two extant dams in NSW which incorporate pedestrian and vehicular entry pavilions to the crest wall.

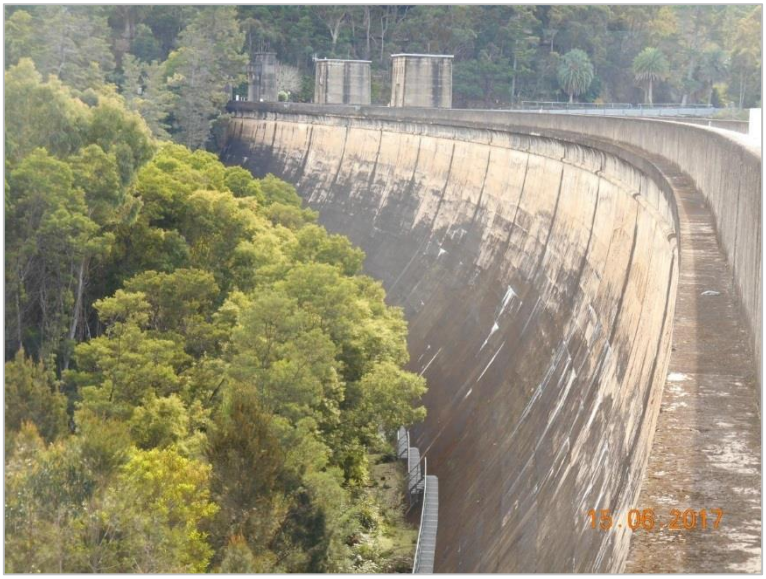


Plate 19**: The downstream face of Cordeaux Dam wall (Niche 2017)**

Cordeaux Dam includes a by-wash spillway which is an extension of the gravity wall. This spillway can be viewed both from the end of the dam wall, and through a separate viewing gallery within the end pylon of the dam wall (**Plate 20**).

Plate 20: The view of the spillway at the end of the dam through one of the designed public viewpoints (Niche 2017)

When looking northeast from the dam wall, across the reservoir, it is possible to see the previous ventilation shafts of Cordeaux Colliery on a rise in the distance (**Plate 21**).

Plate 21: A view from Cordeaux Dam wall with the existing Cordeaux Colliery ventilation shafts on the right (Niche 2017)

Given the current vegetation and past rehabilitation works, ground surface visibility was low. Despite this, no evidence of further historical archaeological relics was noted during the inspection.

5.3.2 Avon Dam

Dam Wall

Avon Dam continues the architectural character and strong Egyptian style of Cordeaux Dam (**Plate 22**), which complements the monumental nature of the structure and its natural surroundings.

Plate 22: The entry pylons of Avon Dam - unlike Cordeaux Dam the lotus columns are not fluted (Niche 2017)

The dam is in good condition, though the downstream face is now covered by an embankment of quarried sandstone blocks and compacted sandstone fill. This was added as part of upgrades completed in 1971 (along with a spill weir redesign) to relieve uplift pressure on, and leakage through, the foundations of the dam wall and to ensure the dam met modern safety requirements (SHR ID: 01358). These same requirements were not needed at Cordeaux Dam, likely due to the fact that Avon Dam is a much taller dam and therefore required greater reinforcement.

Plate 23: The downstream face of Avon Dam wall with its 1970s modifications (Niche 2017)

The dam wall itself maintains a high level of integrity, despite the sandstone embankment now present. There are, however, some maintenance issues with the entry pylons at the western end of the wall, with broken windows noted in the viewing galleries.

The dam sits within a gully with crests and low rises surrounding the dam and the upstream reservoir. Given the orientation of the dam face and the areas of current public access, there is little to no potential for proposed Project surface infrastructure to be visible.

Lower Picnic Ground

The lower picnic ground is also an interwar landscape design and is largely intact. The grounds include ornamental ponds with plantings of palms, grotto-like picnic shelters within the cliff faces, several gardens which function as individual picnic areas and a larger park area along the edge of the dam, which all incorporate various Egyptian Revival features, continuing the general themes of both construction design and landscaping at Cordeaux Dam. The SHR lists the immediate dam area as *'of distinction as a scenic landscape'* (SHR ID: 01360).

The picnic shelters (**Plate 24**) are stone with cement-rendered seating, some cement faux rockwork walling, wisteria, palms, *Cordyline sp.*, tree ferns (*Cyathea sp.*) and various other ferns.

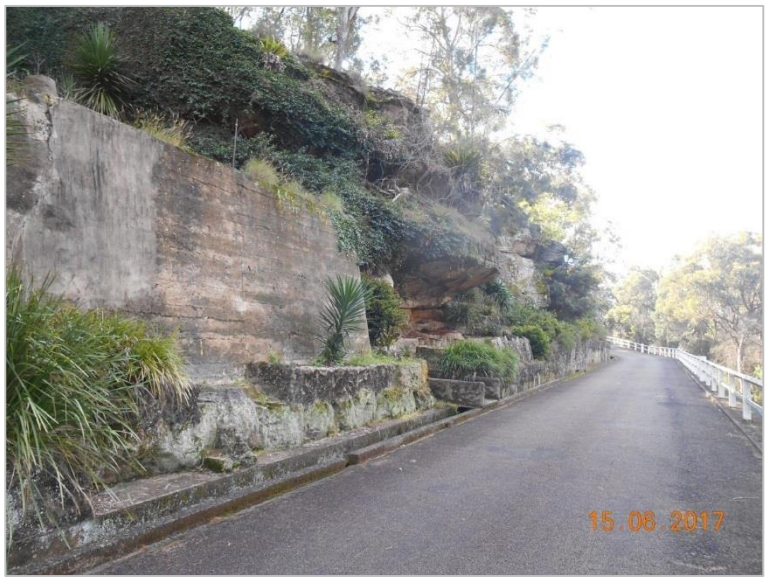


Plate 24: One of the 'grotto-like' picnic shelters within the terraced cliff faces (Niche 2017)

The ornamental pond garden contains four large circular ponds with smaller intermediate ponds between them and is made from rendered cement with planters attached to their sides (**Plate 25**). They are surrounded by an array of palms and Cordyline plantings, again following the Egyptian Revival theme to present the appearance of an oasis.

Plate 25: The four main pools of the pond garden (Niche 2017)

The stone columns at the entrance to the picnic area have the words 'AVON DAM' embedded in them with quartz pebbles (**Plate 26**), and the central path between them continues through to the end of the picnic ground.

Plate 26: The entrance to the Avon Dam picnic area which extends along the dam edge (Niche 2017)

There are a number of park benches throughout the area along with public amenities. There is also a propagating structure remaining from the post-construction regeneration process (**Plate 27**). As with Cordeaux Dam there is strong evidence of the rehabilitation process post-construction with the former terraced construction platforms used as picnic areas and lookouts, and the former construction roads converted for vehicle access to the dam site. The presence of an on-site propagation building shows the dedication to rehabilitation and beautification of the surrounds, and the picnic grounds include plantings of Swamp Cypress (*Taxodium disticum*), Hoop Pine (*Araucaria cunninghamii*), Magenta Lilly Pilly (*Szygium*), Conifer (*Podocarpus*), Japanese Maple (*Acer*), Camellia and Liquidambar.

Plate 27: The frame of the propagation structure with landscaped gardens in the foreground (Niche 2017)

Landscaping of lower picnic grounds exhibit a high level of design awareness through its planning, evolution and association with the Botanic Gardens on the original layout and selection of species.

As previously mentioned, the central pathway continues through the length of the picnic area, along the terrace which was originally the railway terrace from the spillway excavations to the dam wall (**Plate 28**).

Plate 28: The old railway terrace, now converted into parkland (Niche 2017)

The terrace provides a series of viewpoints of the upstream dam through the trees (**Plate 29**). Given the topography of the ridge crest these views are primarily orientated south to south-east, and while they face the direction of Shaft Site No. 5A proposed by the Project, the topography and intervening crests mask any potential view of the ventilation shaft site itself.

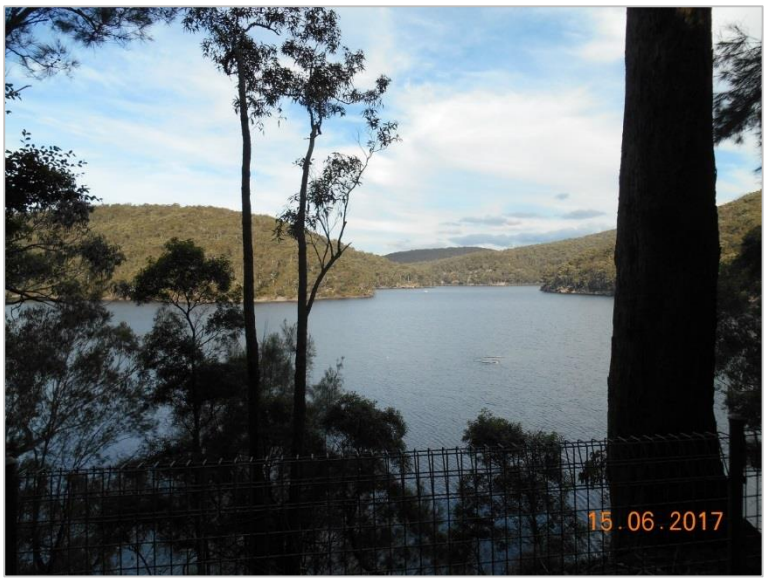


Plate 29: View from the parkland south-east across the reservoir (Niche 2017)

The stone for the construction of the Avon Dam wall came from the excavation of the spillway channel which is a deep open cut through the saddle of the hillside designed to discharge into a nearby creek and then beyond into the Avon River nearly 1 km below the dam – a design which is the earliest and largest example of its type in NSW. The spillway was originally a 1.2 m high mass concrete weir, but as part of the previously mentioned 1971 safety upgrades it was redesigned to a sawtooth or labyrinth design (**Plate 30**), which allows for a greater sill length and therefore discharge volume – in accordance with modern flood estimates (SHR ID: 01358).

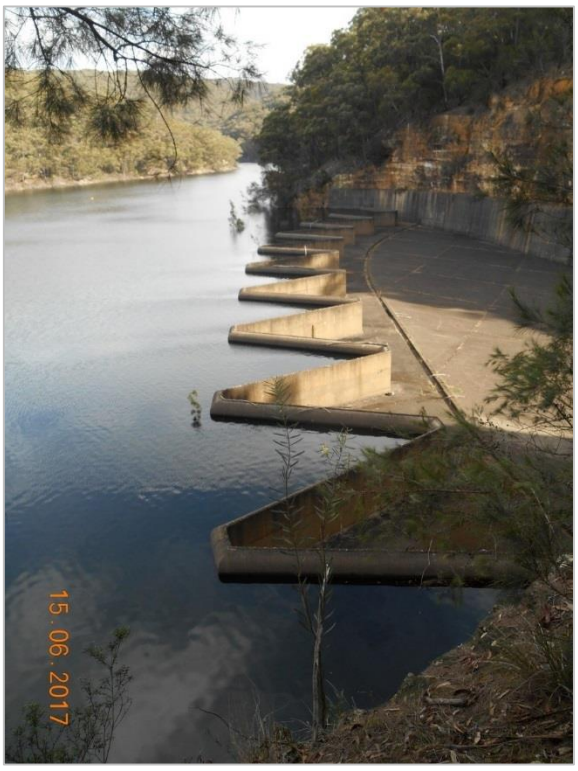


Plate 30: The redesigned sawtooth/labyrinth spillway weir (Niche 2017)

The SHR listing described several interwar cottages located above the dam wall, but these were not surveyed due to an access restriction (SHR ID: 01358). There are other indicators to their location throughout the picnic grounds, with several sets of stone and/or concrete steps leading above the terraced platform of the old railway (**Plate 31**).