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Environmental Impact Statement – Appendix I: Non-Aboriginal Heritage Assessment Report

Warragamba Dam Raising

Reference No. 30012078
Prepared for WaterNSW
10 September 2021

SMEC INTERNAL REF. 30012078

EXECUTIVE SUMMARY

WaterNSW, a New South Wales (NSW) state owned corporation, is seeking environmental planning approval for the Warragamba Dam Raising Project (the project). The Project requires approval from the NSW Minister for Planning under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

To support the project approval application, an Environmental Impact Statement (EIS) is being prepared. This report is part of the EIS and has been prepared to assess the project's impact on non-Aboriginal heritage. The Secretary's Environmental Assessment Requirements (SEARs) that this report addresses are discussed in Section 1.4.

The project is also a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and therefore requires concurrent assessment under the EPBC Act. In accordance with the Bilateral Agreement reached between the NSW and Commonwealth Governments, an EIS under the EP&A Act for SSI can also be used for an EIS under the EPBC Act for a controlled action, where directed by the Federal Minister. The direction was given for the project to be assessed under the Bilateral Agreement on 17 July 2017. The project will be assessed by relevant NSW departments in the first instance followed by assessment by the Federal Minister for final determination.

Artefact Heritage has been engaged by SMEC Australia Pty Ltd (SMEC) to undertake a Non-Aboriginal Heritage Impact Assessment (HIA) of the potential impacts associated with the proposed Warragamba Dam Raising project (the project). The raised dam would provide an airspace (called a Flood Mitigation Zone) to temporarily capture around 965 gigalitres of water during a flood event. The aim of this HIA is to identify listed heritage items and archaeological remains which may be impacted by the project, determine the level of heritage significance of each item, assess the potential impacts to those items, recommend mitigation measures to reduce the level of heritage impact and identify other management or statutory obligations.

Artefact Heritage note that impact assessment of the World and National heritage listed Greater Blue Mountains Area (GBMA), including the nominated National Heritage List item Greater Blue Mountains Area – Additional Values, has been assessed in a separate report as Appendix J in the EIS.

Overview of findings

For the purposes of this HIA, the study area has been defined into three separate zones to cover the construction and operational impacts of the project. This includes:

- Construction study area: Construction footprint of the project including Warragamba Dam elements and facilities, immediate surrounds and construction compounds
- Upstream operational study area: The upstream operational study area comprises the maximum extent of flood prone land estimated from the probable maximum precipitation. Upstream operational impacts of the project include the Lake Burragorang catchment and tributaries which flow into Lake Burragorang
- Downstream operational study area: The downstream operational impacts of the project include the maximum extent of flood prone land estimated from the probable maximum precipitation affecting the Warragamba River, the Hawkesbury-Nepean River and its floodplain and some of the tributaries of the Hawkesbury-Nepean.

The assessment of heritage places within the study area has determined that a total of **988** listed heritage items are present, which include:

- EPBC Act (11):
    - World Heritage List – 3
    - National Heritage List – 5
    - Commonwealth Heritage List – 3
- NSW Heritage Act (184):
    - State Heritage List – 68
    - NSW Historic Shipwreck Database – 40
    - Section 70 Heritage and Conservation Register– 76
- Local Environmental Plans – 793.

In some instances, a single place is represented on several statutory lists, or has its curtilage split and listed more than once. Where curtilages are split, an assessment was undertaken for the entire combined curtilage.

Construction study area Impacts

The project design is currently at the detailed concept stage. Key activities have focused on investigating the condition of the existing dam and its foundations, analysing the raised dam and defining the proposed design arrangements.

The project would result in a range of indirect (visual) impacts to the State Heritage Register listed Haviland Park, which is located within the Warragamba Supply Scheme and immediately east of the dam wall site. The proposed raising of the dam wall would result in construction of a new bridge over the auxiliary spillway within the heritage curtilage of Haviland Park. The project would result in an overall high direct (physical) impact and temporary moderate indirect (visual) impact to the Haviland Park heritage item.

The project would not involve any direct (physical) impacts to key components within the emergency scheme comprising the weir and later diversion tunnel, pumping station, Megarrity's Creek Bridge, former construction platform, balance reservoir or early dam model. Indirect physical impacts are associated with flood events, which are not considered to result in any additional impact to the current flood conditions as the volume of water discharged into Warragamba River by the dam would not change. For most events, there would be a reduction in the peak flow discharged by the dam which would lessen any risk of damage to the heritage item. The project would result in a minor physical and indirect (visual) impact to the SHR listed Warragamba Emergency Scheme.

The project would result in a range of direct (physical) and indirect (visual) impacts to the Section 170 Heritage and Conservation Register listed and State significant Warragamba Supply Scheme. The project would involve varying degrees of impact to individual components within the overall heritage item, with the main heritage impacts focused around the dam wall and its associated features including the crest crane, equipment, commemorative plaques and memorials, Valve House, landscaped areas of Haviland Park, the Terraced Garden and the 18 tonne upper tail tower located on the western bank of the dam. The project would result in a high direct impact and moderate indirect impact to the Section 170 Heritage and Conservation Register Warragamba Supply Scheme heritage item.

Upstream Impacts

The potential impacts of the project to the significance and values of the Greater Blue Mountains Area have been separately assessed (see Appendix J of the EIS).

The Joorilands Homestead (unlisted potential heritage item) would also be inundated under the existing Probable Maximum Flood (PMF) and the project has potential to extend periods of temporary inundation during flood events. The homestead site is currently uninhabited, and the structures are not being maintained. It is therefore expected that the potential impact of an extended inundation period would result in additional deterioration of the homestead structures.

Downstream Impacts

The Hawkesbury-Nepean Valley can experience extensive flooding and many heritage items located within, or near, the Hawkesbury-Nepean River or its tributaries may experience impacts from flooding. Flooding may cause direct or indirect impacts to heritage items depending on the depth of flooding, length of flooding and velocity of flood waters.

Changes in water levels due to the discharge of floodwaters from the Flood Mitigation Zone have been assessed to identify where downstream potential impacts could be expected. In summary the following number of listed heritage items would be impacted by the discharge of the Flood Mitigation Zone:

- 3 World Heritage Listed (WHL) items, including 2 declared places and 1 buffer zone
- 4 National Heritage Listed (NHL) items, including 2 listed places and 2 nominated places
- 15 State Heritage Register (SHR) listed items
- 184 Local Environmental Plan (LEP) items
- 1 State Environmental Planning Policy (SEPP) listing
- 17 Section 170 Heritage and Conservation Register listed items.

Overall, the project would result in a reduction of impact to downstream heritage items due to a reduction in peak flooding impacts for most events. The only built heritage items located in the areas impacted by the Flood Mitigation Zone discharge are designed to cope with minor flooding and include:

- Rowing Course (LEP Item No.148) – while the rowing course would be unable to be used during the Flood Mitigation Zone discharge, the course itself would not be affected by the Flood Mitigation Zone discharge
- Windsor Bridge (LEP Item No. I276) – The water level resulting from the Flood Mitigation Zone discharge would be below the deck level of the bridge and the bridge would remain open. No impacts from the Flood Mitigation Zone discharge would be expected
- Cable Ferry (Wisemans Ferry) (LEP Item No. 796) – Wisemans Ferry is expected to remain open and would not be impacted by the discharge.

It is anticipated that impacts on built heritage items resulting from discharge from the Flood Mitigation Zone would not be above minor in nature (in comparison to existing flooding conditions).

For most heritage (archaeological and built) items impacted by the discharge of the Flood Mitigation Zone, impacts would consist of minor flooding of low points (e.g. Waterways) within the curtilage of the heritage item, rather than direct flooding of the item itself. Most heritage items in close proximity to the river or its tributaries were constructed at higher elevations to avoid the impacts of flooding. As impacts would mainly involve longer inundations within existing flood events and associated flooding levels, it is anticipated that impacts would not be above minor in nature (in comparison to existing flooding conditions).

The area impacted by discharges from the Flood Mitigation Zone encompass a range of maritime heritage items, including shipwrecks, sites and remains of wharves, piers and seawalls. These items are of ranging material and construction typologies including timber, brick, stone, concrete, steel and iron. While some of these heritage items were constructed by and are associated with early European settlement, other items are more recent. The level of impact on individual items would be dependent on several factors including the construction, permeability and materiality of the item, its structural and fabric condition, nature of the wreck, and the depth and velocity of the floodwaters within the Flood Mitigation Zone discharge area. As impacts would mainly involve longer inundations within existing flood events and associated flooding levels, it is anticipated that impacts would not be above minor in nature (in comparison to existing flooding conditions).

Overall, this assessment has identified that the impact of the project downstream would generally result in a reduction of the number of heritage items that would be flooded during the nominated flooding events, or otherwise a reduction in the depth and duration of flooding for other heritage items. However, it is noted that additional impacts would occur to heritage items within the area impacted by the Flood Mitigation Zone discharge, where low level flooding would be extended in duration. This includes a range of built heritage, landscape, archaeological and maritime items. Generally, impacts downstream would be minor and temporary.

Mitigation and Management Measures

	Measure Guidelines	Would apply to
1	Where possible, consideration should be given to conserve and avoid impact to elements of primary significance and heritage items within the Construction study area. Where impact and/or removal is unavoidable, the subsequent measures would be enacted.	Haviland Park Warragamba Supply Scheme: • Directly impacted parts of the item of primary significance including buildings, machinery and equipment, plaques and memorials, and setting. The adjacent terraced garden on eastern bank
2	Photographic Archival Recording and reporting would be carried out in accordance with the NSW Heritage Office's How to Prepare Archival Records of Heritage Items (1998), and Photographic Recording of Heritage Items Using Film or Digital Capture (2006) The record would be prepared by a suitably qualified heritage consultant using archival-quality material. Records for SHR listed items would be held at the NSW Heritage Council and State Library. Records for LEP-listed items would be held by the local Council and local library. A copy of the record would be held by the owner of the asset.	Haviland Park: • The fabric of the park and its significant elements • The setting of the park including views to and from the dam wall Warragamba Supply Scheme: • Directly impacted parts of the item • The interior, exterior and setting of the dam wall itself and associated structures, including approaches • The fabric and setting of machinery and equipment to be removed or altered

	Measure Guidelines	Would apply to
		• The fabric and setting of memorials and plaques to be removed or altered • The fabric and setting of affected significant buildings • The fabric and setting of adjacent terraced garden on eastern bank
3	Appropriate heritage interpretation would be incorporated into the design for the project in accordance with the NSW Heritage Manual, the NSW Heritage Office's Interpreting Heritage Places and Items: Guidelines (August 2005), and the NSW Heritage Council's Heritage Interpretation Policy.	Warragamba Dam site: • Key locations on site including Operations and Visitor Information Centre, Haviland Park and associated lookouts • Key locations off site including Lake Burragorang lookout
4	A Heritage Interpretation Strategy for the project would be incorporated into future designs and planning. Opportunities for interpretive displays in appropriate locations would be explored	Warragamba Dam site: • Key locations on site including Operations and Visitor Information Centre, Haviland Park and associated lookouts • Key locations off site including Lake Burragorang lookout
5	An appropriately qualified and experienced heritage architect would provide independent review periodically throughout detailed design.	Construction study area in relation to all heritage items
6	The project design would be sympathetic to impacted items (including retained significant elements) and surrounding heritage items by minimising impacts to sight lines, views and setting.	Construction study area in relation to all heritage items
7	Except for heritage significant elements affected by the project, direct impact on other heritage significant items elements would be avoided.	Construction study area in relation to all heritage items
8	Where heritage significant items or elements are to be retained within the Construction study area, detailed design would consider appropriate adaptive reuse or interpretive use to be developed in consultation with a heritage architect.	Construction study area in relation to all heritage items
9	A moveable heritage item strategy (including a salvage strategy) would be prepared for the Warragamba Supply Scheme. The strategy would be prepared by a suitably qualified heritage consultant in consultation with WaterNSW and include a comprehensive record of significant elements to be impacted. This would include items, machinery and equipment, and commemorative plaques and memorials contained within curtilage of the Warragamba Dam site. The moveable heritage item strategy would form part of a broader interpretation strategy for the Warragamba Supply Scheme.	Warragamba Supply Scheme (including but not limited to impacted significant machinery, equipment, plaques and memorials)

Measure	Guidelines	Would apply to
10	Fabric of primary and contributory significance of items proposed for removal would be identified and catalogued according to the significant fabric strategy prior to design development and would be re-used or salvaged where possible. Where not re-used within the design of the project, the significant fabric strategy would indicate appropriate storage locations as well as appropriate off-site locations where the salvaged elements may be reused in the future. Where large elements are impacted a sample of fabric may be appropriate.	Warragamba Supply Scheme (including but not limited to impacted significant machinery, equipment, plaques and memorials)
11	Methodologies for the removal of existing structures and construction of new structures and infrastructure would be developed to minimise direct (physical) and indirect (visual) impacts to other elements within the curtilages of the heritage items or to heritage items located near works. These methodologies would be included within the overall Construction Environmental Management Plan (CEMP).	Construction study area in relation to all heritage items
12	Site remediation measures related to construction sites would be incorporated within the Urban Design and Landscape Plan. The objective of the remediation would be to minimise long-term impacts on the visual amenity of the items by recreating a sympathetic environment. A landscape scheme would be prepared for the SHR listed Haviland Park to re-instate planting and landscaping within and around the item's curtilage. The scheme would consider appropriate plantings. Any boundary wall treatment would be designed in consultation with a heritage architect.	Construction study area in relation to all heritage items Haviland Park
13	An archaeological research design would be prepared and implemented to identify the need for archaeological testing or monitoring. Archaeological mitigation measures recommended in the archaeological research design would be carried out in accordance with Heritage Council guidelines, and where identified in the archaeological research design, would be supervised by a suitably qualified Excavation Director. An Unexpected Finds Policy would be implemented during the project to manage and mitigate potential impacts to the potential archaeological resource.	Warragamba Supply Scheme Haviland Park
14	Ancillary works required by the project related to batch plant, laydown areas, power supply, drainage facilities and any other works would be designed and constructed to minimise impacts on heritage items and areas of archaeological potential as much as feasible within the context of the project.	Construction study area Haviland Park
15	Design and construction within the SHR curtilage of Haviland Park would consider the recommendations of the Warragamba Supply Scheme CMP 2010 and the significant fabric strategy.	Haviland Park
16	Design and construction within the Section 170 Heritage and Conservation Register curtilage of the	Warragamba Supply Scheme

Measure Guidelines	Would apply to
Warragamba Supply Scheme would consider the recommendations of the Warragamba Supply Scheme CMP 2010 and the significant fabric strategy.	

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FIGURES

TABLES

ABBREVIATIONS

The following acronyms and abbreviations may be used in this assessment:

Acronym	Definition
AEP	Annual exceedance probability
ARD	Archaeological Research Design
Artefact Heritage	Artefact Heritage Services Pty Ltd
Burra Charter	*The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013*
CBD	Central Business District
CHL	Commonwealth Heritage List
CMP	Conservation Management Plan
DA	Development application
DCP	Development Control Plan
DPC	Department of Premier and Cabinet
DPIE	Department of Planning, Infrastructure and Environment
ED	Excavation Director
EIS	Environmental Impact Statement
Element	An individual piece of fabric, or an assemblage of fabric which contributes to the place's significance
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
Fabric	The physical elements of a heritage place
GIS	Geographic information system
GBMA	Greater Blue Mountains Area
GPS	Global positioning system
Heritage Division	Now Heritage DCP, formerly the NSW Heritage Branch and Heritage Office

Acronym	Definition
HIA	Heritage Impact Assessment
ICOMOS	International Council on Monuments and Sites
LEP	Local environmental plans
LGA	Local Government Area
NHL	National Heritage List
NP&W Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
OEH	Former Office of Environment and Heritage (now DCP)
Place	Defined by the Burra Charter as *a geographically defined area. It may include elements, objects, spaces and views. Place may have tangible and intangible dimensions*.
PMF	Probable Maximum Flood
s60	Section 60 of the NSW *Heritage Act NSW 1977*
s140	Section 140 of the NSW *Heritage Act NSW 1977*
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SHI	State Heritage Inventory
SHR	State Heritage Register
SSI	State Significant Infrastructure
SoHI	Statement of Heritage Impact
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WHL	World Heritage List
World Heritage Convention	Convention Concerning the Protection of World Cultural and National Heritage

1.0 INTRODUCTION

WaterNSW, a New South Wales (NSW) state owned corporation, is seeking environmental planning approval for the Warragamba Dam Raising Project (the project). The Project requires approval from the NSW Minister for Planning under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

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Artefact Heritage has been engaged by SMEC Australia Pty Ltd (SMEC) to undertake a Non-Aboriginal Heritage Impact Assessment (HIA) of the potential impacts associated with the proposed flood mitigation works at Warragamba Dam (the project). The raised dam would provide an airspace (called a Flood Mitigation Zone) to temporarily capture around 965 gigalitres of water during a flood event. The aim of this HIA is to identify listed heritage items and archaeological remains which may be impacted by the project, determine the level of heritage significance of each item, assess the potential impacts to those items, recommend mitigation measures to reduce the level of heritage impact and identify other management or statutory obligations.

Artefact Heritage note that impact assessment of the World and National heritage listed Greater Blue Mountains Area (GBMA), including the Greater Blue Mountains Area – Additional Values, has been assessed in a separate report provided as Appendix J to the EIS.

1.1 Project background

During the 1980s and 1990s evidence emerged that floods significantly larger than any yet historically recorded could occur in the Hawkesbury-Nepean Valley. In 2013, the NSW Government initiated the Hawkesbury-Nepean Valley Flood Management Review to consider flood planning, flood mitigation and flood response in the Hawkesbury-Nepean Valley. The review found that the current flood management and planning arrangements were insufficient in mitigating the risk, and no single mitigation option could address all the flood risks present in the Hawkesbury-Nepean Valley. The raising of Warragamba Dam to capture floodwaters was concluded to be the most effective infrastructure measure that could have a major influence on flood levels during those events when most damages occur. The cost-benefit analysis modelled by INSW demonstrated that creating a Flood Mitigation Zone through raising Warragamba Dam would provide a 75 percent reduction in flood damages on average and reduce current levels of flood damages from $5 billion to $2 billion. Other non-infrastructure options were also identified to mitigate flood risks.

WaterNSW is also seeking approval for the installation and operation of environmental flow infrastructure at Warragamba Dam. Warragamba Dam does not currently have the appropriate infrastructure to allow the controlled release of environmental flows into the Warragamba River and the Hawkesbury-Nepean Rivers. Studies undertaken to investigate environmental flow releases from Warragamba Dam demonstrate that there would be substantial downstream water quality and aquatic ecological benefits from environmental flow releases.

1.2 The Project

Warragamba Dam Raising is a project to provide flood mitigation to reduce the significant existing risk to life and property in the Hawkesbury-Nepean Valley downstream of the dam. This will be achieved through raising the level of the central spillway crest by around 12 metres and the auxiliary spillway crest by around 14 metres above the existing full supply level for temporary storage of inflows. The spillway crest levels and outlets control the extent and duration of the temporary upstream inundation. There would be no change to the existing maximum volume of water stored for water supply.

The NSW Government announcement in 2016 proposed that the dam wall be raised by 14 metres. Subsequently, the NSW Department of Planning and Environment Secretary's Environmental Assessment Requirements (SEARs) required the project to be designed, constructed and operated to be resilient to the future impacts of climate change and incorporate specific adaptation actions in the design.

Peer reviewed climate change research found that by 2090 it is likely an additional three metres of spillway height would be required to provide similar flood mitigation outcomes as the current flood mitigation proposal. Raising the dam side walls and roadway by an additional three metres may not be feasible in the future, both in terms of engineering constraints and cost. The current design includes raising the dam side walls and roadway by 17 metres now to enable adaptation to projected climate change. Any consideration of raising spillway heights is unlikely before the mid to late 21st century and would be subject to a separate planning approval process.

The 17 metre raising height of the dam abutments (side walls) and roadway have been considered and accounted for in the EIS and design. The potential maximum height and duration of upstream inundation remains consistent with what was originally proposed in 2016.

The Project would include the following main activities and elements:

- demolition or removal of parts of the existing Warragamba Dam, including the existing drum and radial gates,
- thickening and raising of the dam abutments
- thickening and raising of the central spillway
- new gates or slots to control discharge of water from the FMZ
- modifications to the auxiliary spillway
- operation of the dam for flood mitigation
- environmental flow infrastructure.

Additional Project information is provided in Section 6.0.

1.3 Project location

The Project site is located approximately 65 km west of the Sydney Central Business District in the Wollondilly Local Government Area (LGA). To the west of the Project site are the Blue Mountains, various National Parks and State Conservation Areas and the Greater Blue Mountains World Heritage Area (GBMWHA) which make up part of the catchment of Lake Burragorang - the water storage formed by Warragamba Dam. To the east of the Project site is the Warragamba and Silverdale townships and surrounding rural residential areas.

The assessment areas for the Project have been described in the context of both the stage of the works (construction and operation) and geographic extent of possible effects and impacts.

1.3.1 Operational study area

The operational study area includes the areas upstream and downstream of Warragamba Dam that could be affected by the future operation of the raised dam and environmental flow releases. For the purposes of this assessment, the upstream operational study area comprises the maximum extent of flood prone land estimated from the probable maximum precipitation .

1.3.1.1 Study area zones

The study area has been separated into three zones to cover the construction and operational impacts (upstream and downstream) of the project (Figure 1.1).

This includes:

- **Construction study area:** The construction study area includes Warragamba Dam elements and facilities, immediate surrounds and construction compounds
- **Upstream** operational study area**:** The upstream operational study area comprises the maximum extent of flood prone land estimated from the probable maximum precipitation .Upstream operational impacts of the Project include the area of the Lake Burragorang catchment and tributaries that flow into Lake Burragorang.
- **Downstream** operational study area**:** The downstream operational impacts of the Project include the maximum extent of flood prone land estimated from the probable maximum precipitation affecting the Warragamba River, the Hawkesbury-Nepean River and its floodplain, and some of the tributaries of the Hawkesbury-Nepean.

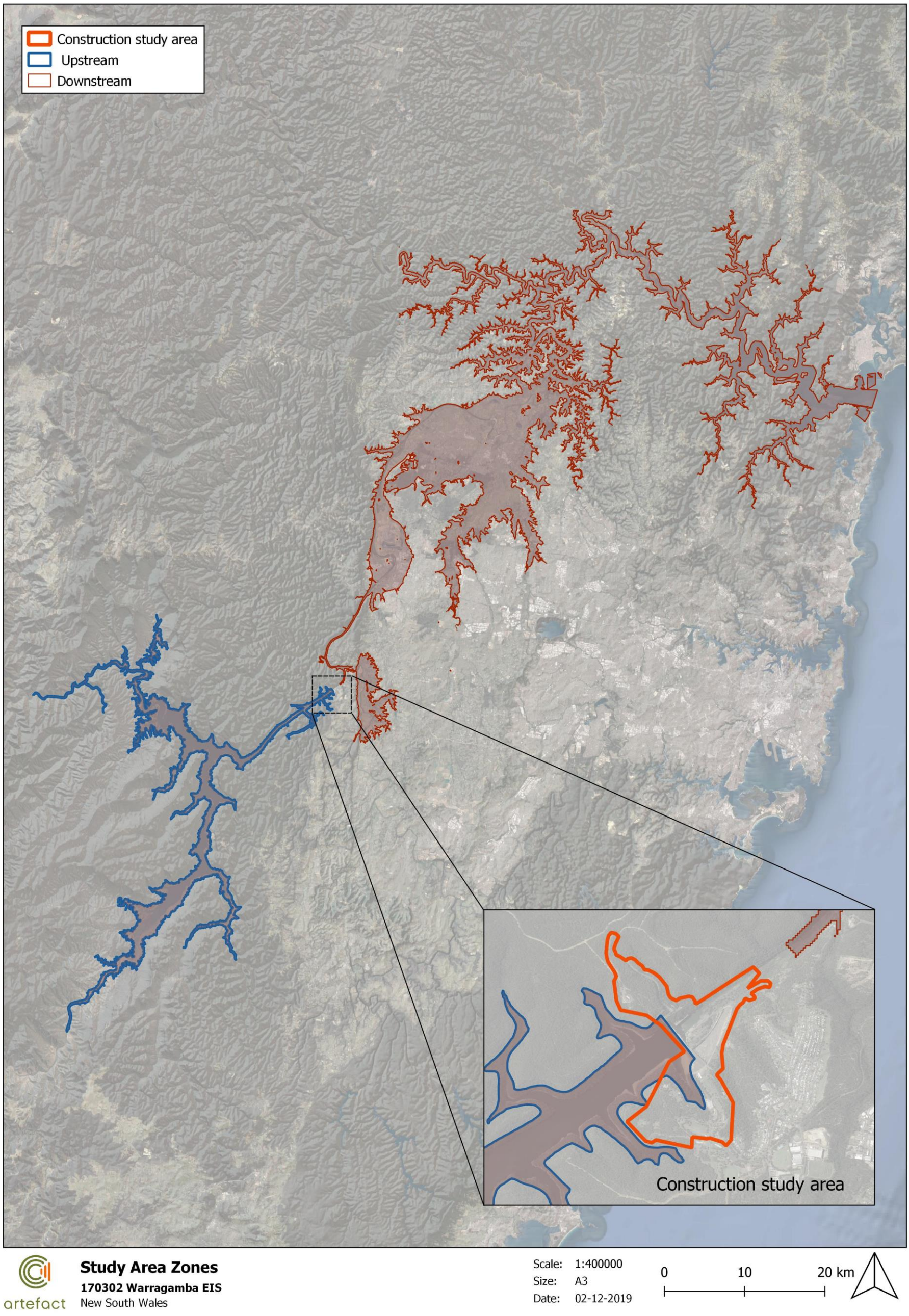


Figure 1.1: Study area zones (upstream operational study area, constructi0on study area, downstream operational study area)

1.4 Assessment approach

1.4.1 Project scope

The scope of this HIA is to prepare a non-Aboriginal heritage assessment for the project in accordance with the EPBC Act, *Heritage Act 1977* (Heritage Act) and the SEARs issued for the project as shown in Table 1.1.

Construction impacts associated with raising the dam wall to create a Flood Mitigation Zone, and impacts from the operation of the project both upstream and downstream of the dam wall will be assessed. The HIA will assess the study areas as shown in Figure 1.1.

This HIA has been informed by the NSW Heritage Manual (NSW Heritage Office and NSW Department of Urban Affairs and Planning 1996) and the Australia ICOMOS Charter for Places of Cultural Significance, The Burra Charter, 2013 (Burra Charter) and contains the following:

- Review of the relevant State and Commonwealth heritage registers and listings to identify any registered heritage sites in the study area, including:
    - World Heritage List (WHL)
    - National Heritage List (NHL)
    - Commonwealth Heritage List (CHL)
    - NSW State Heritage Register (SHR)

Due to the extent and large scale of the study area and generally minor impacts, only items listed on statutory registers are included in the assessment, with the exception of Jooriland homestead. Items of potential heritage significance listed on non-statutory registers including the Register of the National Estate, National Trust Register and the RAIA Register of Twentieth Century Buildings have not been included in the assessment. Consultation with these institutions would be undertaken once stakeholders have matched areas of impacts to items on their respective databases.

- Review of relevant legislative and policy requirements, including:
    - EPBC Act
    - State Environment Planning Policy (Infrastructure) 2007 (ISEPP)
    - EP&A Act
    - Heritage Act
- Review of the following management and reference documents:
    - Greater Blue Mountains World Heritage Area Strategic Plan 2009 (Department of Environment and Climate Change 2009)
    - The Greater Blue Mountains World Heritage Area Nomination, 1998 (New South Wales National Parks and Wildlife Service in association with Environment Australia 1998)
    - Warragamba Supply Scheme Conservation Management Plan DRAFT 7 (2010);
    - Special Areas Strategic Plan of Management (WaterNSW and Office of Environment & Heritage 2015)
    - Australian Convict Sites Strategic Management Framework (Department of the Environment Heritage Water and the Arts, 2012)
    - The Old Great North Road Cultural Landscape Dharug National Park Conservation Management Plan (Griffin NRM Pty Ltd 2004)

- Australian Convict Sites Nomination (Commonwealth of Australia 2008)

- A HIA which includes assessment under the EP&A Act as SSI and assessment under the EPBC Act as a controlled action:
  - Legislative context including EPBC Act requirements
  - Fieldwork results
  - Historical heritage impact assessment for the construction area (including discussion of CMP policies for the dam)
  - Historical heritage impact assessment for the operational area (summary table of listed places as appendix)
  - Management and mitigation measures.

Table 1.1: SEARs as they relate to non-Aboriginal cultural heritage

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirements)	Where requirement addressed in this report
10. Heritage The design, construction and operation of the project facilitates, to the greatest extent possible, the long-term protection, conservation and management of the heritage significance of places of environmental heritage and Aboriginal objects and sites. The design, construction and operation of the project avoids or minimises impacts, to the greatest extent possible, on the heritage significance of environmental heritage and Aboriginal objects and sites.	1. The Proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance of:	
	c. environmental heritage, as defined under the Heritage Act 1977; and	Sections 7.0
	d. places listed on the National and World Heritage lists. Investigations including surveys and identification of cultural heritage values should be conducted in consultation with DCP regional officers.	Sections 4.0 and 7.0, Appendix A. See Appendix J of the EIS for additional detail GBMWHA
	2. Where impacts to State or locally significant heritage places are identified, the assessment must:	
	e. include a statement of heritage impact for all heritage places (including significance assessment);	Sections 4.0 and 7.0
	f. consider impacts to the place of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant)	Sections 7.0
	a. outline measures to avoid and minimise those impacts in accordance with the current guidelines; and	Section 8.0
	b. be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed, the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria).	Section 1.7

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirements)	Where requirement addressed in this report
	5. Any objects recorded as part of the assessment must be documented and notified to OEH.	Heritage items discussed are currently listed. OEH was therefore not notified as part of this assessment. See Section 1.4.1.

1.5 Assessment structure

The following Table 1.2 provides an outline of the assessment sections and appendices.

Table 1.2: Assessment structure

Section Number	Section
1	Introduction and project background
2	Heritage management framework and legislative context
3	Historical context
4	Existing environment, results of site inspection and significance of listed heritage items
5	Archaeological potential and significance
6	Proposed works
7	Heritage impact assessment
8	Management recommendations for non-Aboriginal heritage
9	References
Appendices	
A	World, National, and Commonwealth Management Principles
B	LEP items within study area – table

1.6 Limitations and assumptions

This HIA provides an assessment of non-Aboriginal (historical) heritage values only.

Due to the extent and large scale of the study area and generally minor impacts, unlisted items of potential heritage significance that are not included on statutory registers have not been included in this assessment, with the exception of Jooriland homestead.

A detailed assessment of non-Aboriginal archaeology was undertaken within the construction zone, the only portion of the study area where subsurface impacts are proposed. Due to the extent and large scale of the study area and generally minor impacts the downstream and upstream zones have been subject to a high-level archaeological assessment and assessment of listed archaeological sites as noted in the Appendix to this report.

Overall, the following limitations apply to the assessment:

- No Aboriginal heritage values were assessed – Aboriginal heritage and archaeological values and potential impacts are assessed in the Aboriginal Cultural Heritage Assessment Report
- No sub-surface investigations were undertaken. The assessment of archaeological potential is based on knowledge of similar sites and site formation processes, the historical background and predicted robustness of potential archaeological remains
- As excavation works associated with the project are confined to the construction zone only, detailed non-Aboriginal archaeological assessment focused on this zone. It has been assumed that potential impact to archaeological sites within the downstream Flood Mitigation Zone would be associated with increased periods of inundation, which would have minimal impact on subsurface archaeological remains. A high level archaeological assessment and consideration of listed archaeological items was therefore assumed to be appropriate.
- This assessment relies on publicly available digital mapping data. No additional mapping has been carried out to map the curtilage of items that do not have publicly available digital mapping data (i.e. items on Section 170 Heritage and Conservation Registers)
- No identification or assessment of unlisted items of potential heritage significance not included on statutory registers or lists was undertaken due to the extensive potential study area created by predicted inundation data. The identification of unlisted heritage items was therefore beyond the scope of this assessment. The area downstream of the construction study area may therefore contain unlisted items with the potential to reach the local or state significance threshold
- No new archival investigations were undertaken
- No community consultation was undertaken in the production of this assessment. Social and associative significance assessments for heritage listed items and potential archaeological resources were based predominantly on existing studies and data included on the State Heritage Inventory (SHI) for individual items.

1.7 Authorship

This assessment was prepared by Matt Alexander (Project Leader, Artefact Heritage) and Charlotte Simons (Senior Heritage Consultant, Artefact Heritage). Section 5.0 was prepared by Jenny Winnett (Principal, Artefact Heritage). Dr Sandra Wallace (Managing Director, Artefact Heritage) provided management input and review.

2.0 HERITAGE MANAGEMENT FRAMEWORK

2.1 Introduction

The following legislation applies to the study area in respect to the management of cultural heritage. This section also includes a list of listed heritage items located within the study area. There is a total of **988** listed heritage items present. In some instances, a single place is represented on several statutory lists.

The tables included in the following sections, and associated figures, provide an overview of these listed heritage items. On figures showing the World, National and Commonwealth listed heritage items, full names of sites are provided. Due to the large number of sites mapped and their distribution, for SHR, Section 170 Heritage and Conservation Register, maritime, and LEP places, only the site curtilage is shown on the maps.

2.2 The World Heritage Convention

The *Convention Concerning the Protection of World Cultural and Natural Heritage 1972* (the Convention), also referred to as the World Heritage Convention, provides State Parties (i.e. Countries) with guidance on how to identify potential sites for inscription on the World Heritage List, and what is required of each State Party in the protection and preservation of such sites. Signatories of the Convention pledge to conserve World Heritage sites situated on their territory, and to take active measures to protect their national heritage. The Convention aims to promote international cooperation to protect heritage that is of such outstanding universal value that its conservation is important for current and future generations. The Convention also sets out the criteria that a site must meet to be inscribed on the World Heritage List.

Encouragement is provided to each of the State Parties to ensure that the protection of world and national heritage is integrated into relevant planning process and programs, and provide sufficient resourcing to protect, conserve, and communicate the significant values of each place.

The United Nations Educational, Scientific and Cultural Organisation (UNESCO), summarises the importance of the Convention by stating:

> *"The most significant feature of the 1972 World Heritage Convention is that it links together in a single document the concepts of nature conservation and the preservation of cultural properties. The Convention recognizes the way in which people interact with nature, and the fundamental need to preserve the balance between the two."*

2.3 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legislative framework for the protection and management of matters of national environmental significance, that is, flora, fauna, ecological communities and heritage places of national and international importance. Heritage places are protected through their inscription on the World Heritage List (WHL), Commonwealth Heritage List (CHL) or the National Heritage List (NHL).

Under Part 9 of the EPBC Act, approval under the EPBC Act is required for any action occurring within, or outside, a Heritage place that has, will have, or is likely to have a 'significant impact' on the heritage values of a World, National or Commonwealth heritage listed property (referred to as a 'controlled action' under the Act). A 'significant impact' is defined as:

> *"an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts."*

The EPBC Act stipulates that a person who has proposed an action that will, or is likely to, have a significant impact on a site that is listed on the World Heritage List, National Heritage List, or Commonwealth Heritage List, must refer the action to the relevant Minister (hereafter the Minister). The Minister will then determine if the action requires approval under the EPBC Act. If approval is required, an environmental assessment would need to be prepared. The Minister would approve or decline the action based on this assessment.

The significance of the action is based on the sensitivity, value and quality of the environment that is to be impacted, and the duration, magnitude and geographic extent of the impact. If the action is to be undertaken in accordance with an accredited management plan, approval is not needed, and the matter does not need be referred to the Minister.

Impacts to places listed on the World and National heritage lists are assessed under the guidance of the DoEE publication *Matters of National Environmental Significance Significant Impact Assessment Guidelines 1.1*.

The proposed action was referred (EPBC Act referral 201717940) to the Australian Government Department of Environment and Energy under the EPBC Act and was deemed a Controlled Action due to potentially significant impacts to World Heritage properties and National Heritage places (as well as listed threatened species and communities).

2.3.1 Bilateral agreement made under section 45 of the EPBC Act

The Project was referred to the then Commonwealth Department of the Environment and Energy (DoEE) by WaterNSW and was determined to be a controlled action under the EPBC Act.

The referral was accompanied by a preliminary consideration of relevant Matters of National Environmental Significance (MNES), principally those relating to biodiversity and heritage. This includes the areas of the Greater Blue Mountains World Heritage Area (GBMWHA) which would be impacted by temporary increased inundation during significant flood events due to the operation of the Project.

Subsequent to the referral, the NSW *Biodiversity Conservation Act 2016* (BC Act) came into effect on 25 August 2017, repealing the *Threatened Species Conservation Act 1995* (TSC Act). One effect of this was to remove the legislative basis for the bilateral assessment agreement between the Commonwealth and NSW governments which provided for an EIS prepared under the EP&A Act for SSI to be also used for an EIS under the EPBC Act for a controlled action, where directed by the Commonwealth Minister for the Environment.

However, under Part 7 of the Biodiversity Conservation (Savings and Transitional) Regulation 2017, the Project is regarded as a 'pending Part 5 assessment', and therefore the TSC Act and the bilateral assessment agreement are still in place for the Project. The matters specified in clause 6 of the former bilateral assessment agreement have been addressed in preparing the EIS. Appropriate consideration has also been given to relevant Commonwealth guidelines for the EIS information requirements.

Revised SEARs were issued on 13 March 2018 which contained the EPBC Act assessment requirements provided by DoEE.

2.3.2 Matters of National Environmental Significance Significant Impact Assessment Guidelines 1.1.

The *Matters of National Environmental Significance Significant Impact Assessment Guidelines 1.1* (Impact Guidelines) guides the process for the assessment of various matters under the EPBC Act, including the assessment of impacts to such matters as:

- Listed threatened species and ecological communities
- Listed migratory species
- World heritage properties
- National heritage places.

The Impact Guidelines state that:

> *"Approval under the EPBC Act is required for any action occurring within or outside a declared World Heritage property that has, will have, or is likely to have a significant impact on the World Heritage values of the World Heritage property.*
>
> *An action is likely to have a significant impact on the World Heritage values of a declared World Heritage property if there is a real chance or possibility that it will cause:*
>
> - *one or more of the World Heritage values to be lost*
> - *one or more of the World Heritage values to be degraded or damaged, or*
> - *one or more of the World Heritage values to be notably altered, modified, obscured or diminished."*[1]

The approach above is also used in assessing impacts to places of National heritage significance.

2.3.3 World, National, and Commonwealth Heritage Principles

Under the EPBC Act, actions that have, will have, or are likely to have a significant impact on the values of a World, National, or Commonwealth heritage property must be in line with the Heritage Principles, as presented in Schedules 5, 5B, and 7B of the EPBC Act Regulations respectively. These principles are reproduced in Appendix 2.

The three sets of principles guiding statement is to *"…to identify, protect, conserve, present and transmit, to all generations…"*[2] the values of the places on each list, and in the case of the WHL, to "…*if appropriate, rehabilitate the World Heritage values of the property*."[3]

[1] Commonwealth Department of the Environment, 2013. *Matters of National Environmental Significance Significant Impact Assessment Guidelines 1.1.* pp.15-16
[2] National Heritage Management Principles. Accessed at http://www.austlii.edu.au/cgi-bin/viewdoc/au/legis/cth/consol_reg/epabcr2000697/sch5b.html on 23/10/2017
[3] Australian World Heritage Management Principles. Accessed at http://www.austlii.edu.au/cgi-bin/viewdoc/au/legis/cth/consol_reg/epabcr2000697/sch5.html on 23/10/2017

2.3.4 World Heritage List

The Convention sets out the criteria that a site must meet to be inscribed on the World Heritage List (WHL) and the role of State Parties in the protection and preservation of world and their own national heritage. Places on the World Heritage List are protected in Australia through the EPBC Act.

The study area is located partially within the curtilage of **three** places listed on the WHL, as summarised in Table 2.1 and illustrated on Figure 2.1 and Figure 2.2.

Table 2.1: World heritage places within the study area

Name	Place ID	Status	Natural Criteria	Cultural Criteria	Address	Relationship to the study area
The Greater Blue Mountains Area	105127	Declared property	ii, iv	-	Great Western Hwy, Katoomba NSW	Upstream & Downstream
Australian Convict Sites (Old Great North Road)	106209	Declared property	-	iv, vi	The Old Great Northern Rd, Wisemans Ferry NSW	Downstream
Australian Convict Sites (Old Great North Road Buffer Zone)	106209	Buffer zone	-	iv, vi	The Old Great Northern Rd, Wisemans Ferry NSW	Downstream

Figure 2.1: World heritage places in the upstream of the study area

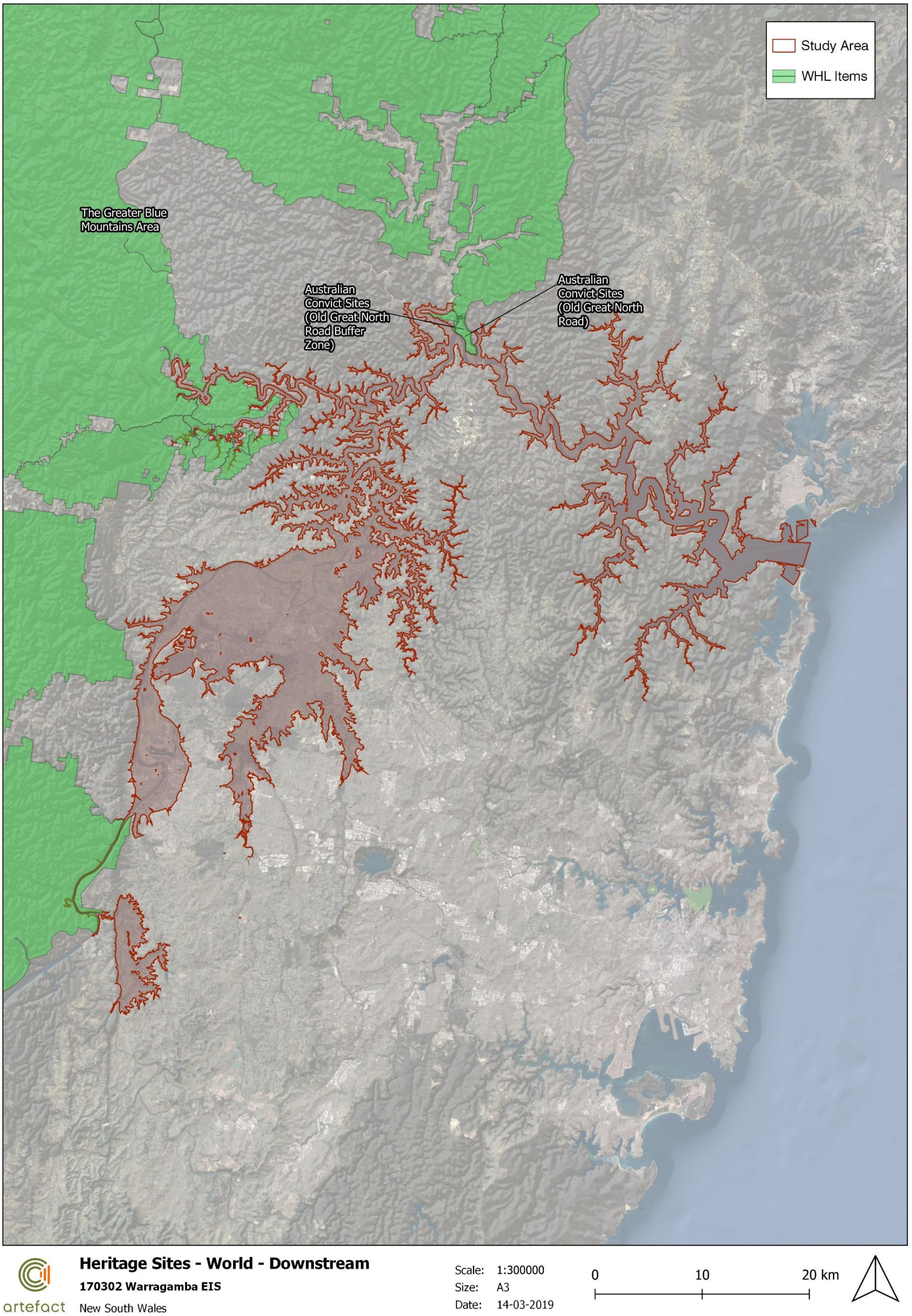


Figure 2.2: World heritage places in the downstream of the study area

2.3.5 National Heritage List

The National Heritage List (NHL), established under the EPBC Act, provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places.

There are **five** places within the study area on the NHL.

This includes three listed places and two nominated places on the NHL. Although the nominated places have not yet been accessioned to the NHL, they should be managed in accordance with the values set out in their nomination until a decision on whether to list the places or not has been made.

These items have been summarised in Table 2.2, and are shown in Figure 2.3 and Figure 2.4.

Table 2.2: National heritage places within the study area

Name	Place ID	Class	Status	Address	Relationship to the study area
The Greater Blue Mountains Area	105999	Natural	Listed place	Greater Western Hwy, Katoomba NSW	Upstream and Downstream
Old Great North Road	105961	Historic	Listed place	Old Great North Road, between Wiseman's Ferry and Mount Manning	Downstream
Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves	105817	Natural	Listed place	Ku-ring-gai Chase National Park	Downstream
The Greater Blue Mountains Area - Additional Values	105696	Natural	Nominated place	Katoomba, NSW	Upstream and Downstream
Great North Road, Wisemans Ferry to Bucketty	106318	Historic	Nominated place	Wisemans Ferry to Bucketty, NSW	Downstream

Figure 2.3: National heritage places in the upstream of the study area

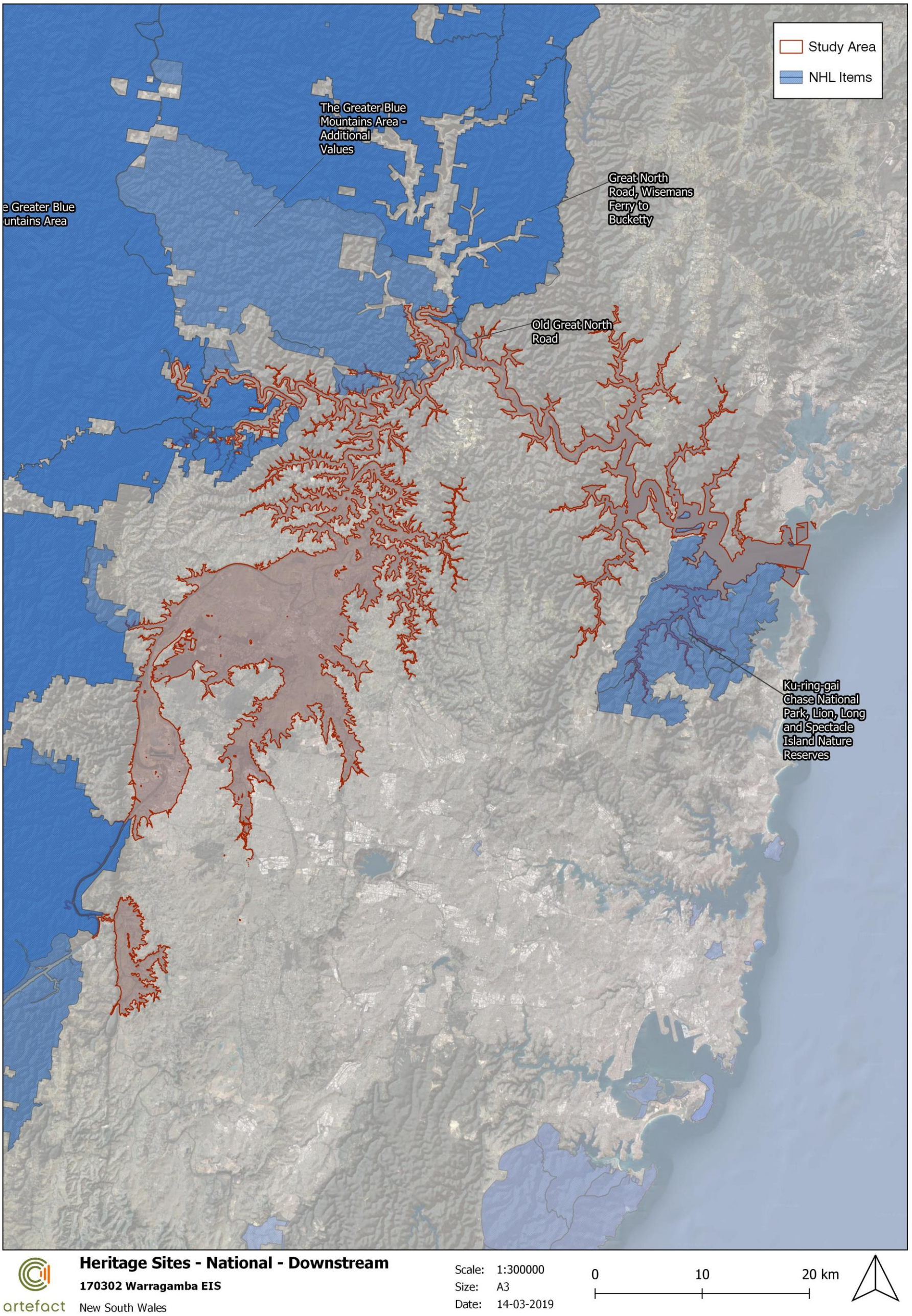


Figure 2.4: National heritage places in the downstream of the study area

2.3.6 Commonwealth Heritage List

The Commonwealth Heritage List (CHL) was established under the EPBC Act, which provides a legal framework to protect and manage heritage places owned by the Commonwealth and managed by its various Departments and other organisations. Under the EPBC Act, significant heritage places owned by the Australian Government are protected through listing on the Commonwealth Heritage List.

There are **three** places listed on the CHL located within the study area. These places are identified in Table 2.3, and are shown in (Figure 2.5).

Table 2.3: Commonwealth heritage places within the study area

Name	Place ID	Class	Status	Address	Relationship to the study area
North Base Trig Station	105240	Historic	Listed place	Dight St, Richmond RAAF Base NSW	Downstream
Shale Woodland Llandilo	105534	Natural	Listed place	Stony Creek Rd, Shanes Park NSW	Downstream
RAAF Base Richmond	105653	Historic	Listed place	McNamarra Av, Richmond NSW	Downstream

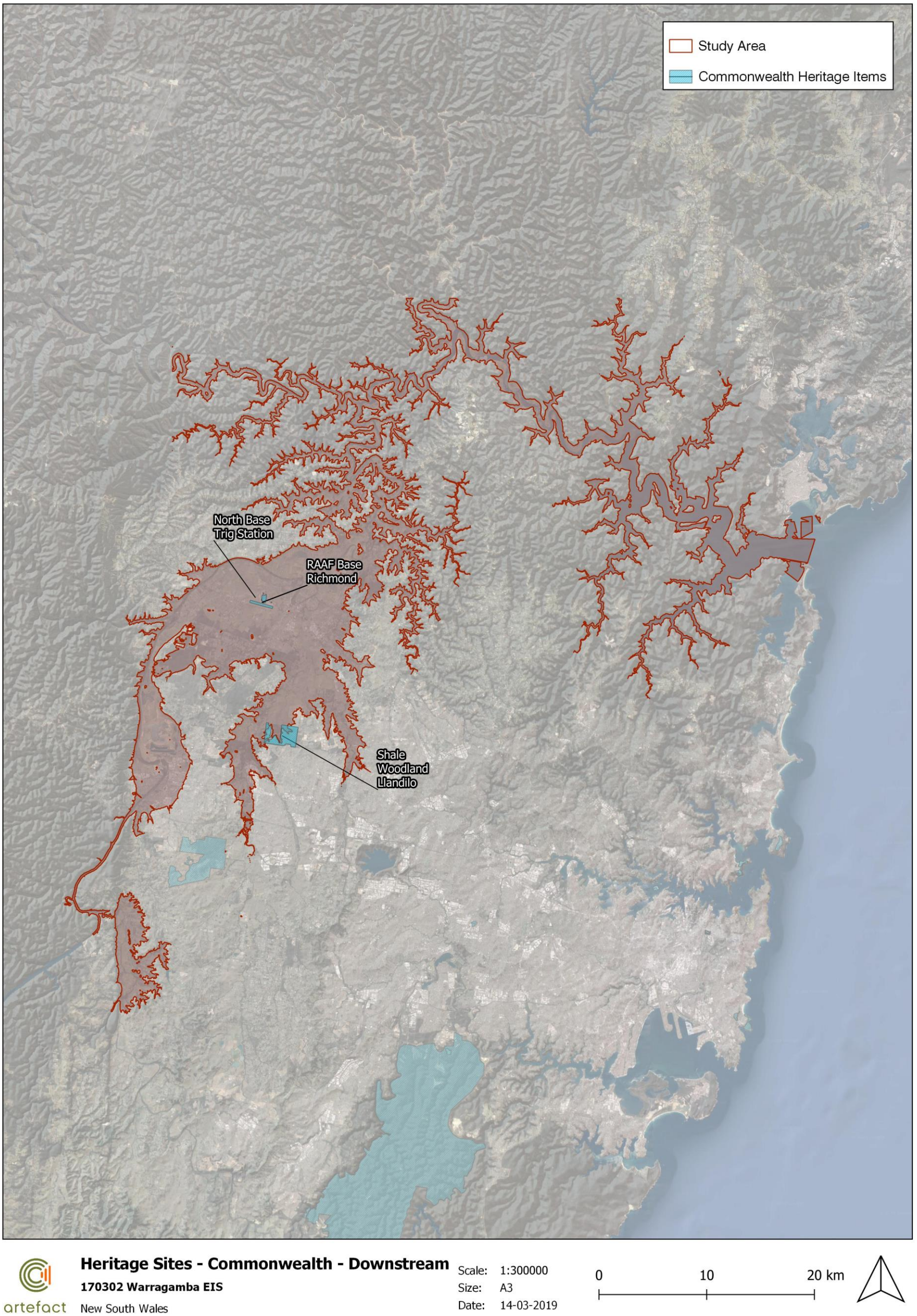


Figure 2.5: Commonwealth heritage places in the downstream study area (pale shaded CHL items indicate items outside study area)

2.4 NSW Heritage Act 1977

The NSW *Heritage Act 1977* (Heritage Act) provides protection for items of 'environmental heritage' in NSW. 'Environmental heritage' includes places, buildings, works, relics, movable objects or precincts considered significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. Items considered to be significant to the State are listed on the State Heritage Register (SHR) and cannot be demolished, altered, moved or damaged, or their significance altered without approval from the Heritage Council of NSW.

2.4.1 The 2009 'Relics provisions'

The Heritage Act also provides protection for 'relics', which includes archaeological material or deposits. According to Section 139 (Division 9: Section 139, 140-146) of the *Heritage Act 1977*:

(1) A person must not disturb or excavate any land knowingly or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, damaged or destroyed unless the disturbance is carried out in accordance with an excavation permit.

(2) A person must not disturb or excavate any land on which the person has discovered or exposed a relic except in accordance with an excavation permit.

(3) This section does not apply to a relic that is subject to an interim heritage order made by the Minister or a listing on the State Heritage Register.

(4) The Heritage Council may by order published in the Gazette create exceptions to this section, either unconditionally or subject to conditions, in respect of any of the following:

a. Any relic of a specified kind or description,
b. Any disturbance of excavation of a specified kind or description,
c. Any disturbance or excavation of land in a specified location or having specified features or attributes,
d. Any disturbance or excavation of land in respect of which an archaeological assessment approved by the Heritage Council indicates that there is little likelihood of there being any relics in the land.

Section 4 (1) of the Heritage Act (as amended in 2009) defines a relic as:

> *...any deposit, artefact, object or material evidence that:*
>
> *relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and is of State or local heritage significance*

A relic has been further defined as:

> *Relevant case law and the general principles of statutory interpretation strongly indicate that a 'relic' is properly regarded as an object or chattel. A relic can, in some circumstances, become part of the land be regarded as a fixture (a chattel that becomes permanently affixed to land).*[4]

[4] *Assessing Significance for Archaeological Sites and 'Relics'*, Heritage Branch, Department of Planning, 2009:7.

Excavation permits are issued by the Heritage Council of NSW, or its Delegate, under Section 140 of the Heritage Act for relics not listed on the SHR or under Section 60 for relics listed on the SHR. An application for an excavation permit must be supported by an Archaeological Research Design and Archaeological Assessment prepared in accordance with the NSW Heritage Division archaeological guidelines. Minor works that will have a minimal impact on archaeological relics may be granted an exception under Section 139 (4) or an exemption under Section 57 (2) of the Heritage Act.

2.4.1.1 Works

'Works' refer to past evidence of infrastructure. 'Works' may be buried, and therefore archaeological in nature; however, exposure of a 'work' does not trigger reporting obligations under the Heritage Act. 'Works', as places of environmental heritage, have the potential to provide information that contributes to our knowledge of past practices, and good environmental practice recognises this. Roads and Maritime, for example, uses its *Standard Management Procedure: Unexpected Heritage Places* to manage the discovery of such works[5].

2.4.2 State Heritage Register

The SHR was established under Section 22 of the Heritage Act and is a list of places and objects of importance to the people of NSW, including archaeological sites. The SHR is administered by the Heritage Division of the DCP and includes a diverse range of over 1,500 items, in both private and public ownership. To be listed, an item must be deemed to be of heritage significance for the whole of NSW.

There are **68** places listed on the SHR located within the study area. These places are identified in Table 2.4, and are shown in Figure 2.6 and Figure 2.7.

There is one SHR item located within the Construction study area, comprising Haviland Park (SHR No. 01375). The rest of the SHR items are located downstream.

There are no places within the study area that are subject to an Interim Heritage Order (IHO) as of 15 March 2019.

Table 2.4: SHR heritage places within the study area

Name	SHR No.	Address	Relationship to the study area
Hobartville, including outbuildings	00035	Kurrajong Road, Richmond	Downstream
Cattai Estate	00982	Wisemans Ferry Road, Cattai	Downstream
House	00108	28 North Street Windsor	Downstream
Clydesdale - Grand House, Barn & Cottage	00674	1270 Richmond Road, Marsden Park	Downstream
Penrith Railway Station group	01222	Great Western Railway, Penrith	Downstream
McQuade Park	01851	George Street, Windsor	Downstream
Government Cottage Archaeological Site	01843	41 George Street Windsor	Downstream

[5] Roads and Maritime, 2015

Name	SHR No.	Address	Relationship to the study area
Emu Plains (Nepean River) Underbridge	01830	Great Western Highway, Emu Plains	Downstream
Riverstone Railway Station and yard group	01237	Riverstone Parade, Riverstone	Downstream
HMAS Parramatta shipwreck and memorials	01676	Historic Shipwreck: Cascade Gully Memorials Parramatta and Sydney Parramatta	Downstream
House	00045	126 Windsor Street Richmond	Downstream
Torin Building	01796	26 Coombes Drive Penrith	Downstream
Hawkesbury River Rail Bridge and Long Island Group	01040	Main Northern railway, Brooklyn	Downstream
Cottage	00107	29 North Street Windsor	Downstream
Richmond Park	01808	Bounded by East Market, Windsor and March Streets Richmond	Downstream
Richmond Railway Station and yard group	01236	Blacktown-Richmond railway, Richmond	Downstream
Windsor Railway Station Group and Former Goods Yard	01287	Blacktown-Richmond railway, Windsor	Downstream
Emu Plains Railway Station group	01136	Main Western railway, Emu Plains	Downstream
Hawkesbury River Railway Station group	01166	Main Northern railway, Brooklyn	Downstream
Mackenzie House	00735	29 Fitzgerald Street Windsor	Downstream
Macquarie Arms Inn (former)	00282	104-106 Bathurst Street Pitt Town	Downstream
Stables at rear of Police Station	01018	32-34 Bridge Street Windsor	Downstream
Peninsula House, Tebbutt's Observatory	00028	Palmer Street, Windsor	Downstream
Building, outbuildings, grounds, trees	00753	49 - 51 Bosworth Street Richmond	Downstream
Glenmore	00074	754-760 Mulgoa Road Mulgoa	Downstream
Natural Area	00649	Rickards Avenue, Agnes Banks	Downstream
Richmond Post Office	01410	286 Windsor Street Richmond	Downstream
Wilberforce Park	01868	47 George Road Wilberforce	Downstream

Name	SHR No.	Address	Relationship to the study area
Seymours House	00681	24 Bosworth Street Richmond	Downstream
Yobarnie Keyline Farm	01826	Grose Vale Road, Grose Vale	Downstream
Scheyville National Park	01817	Scheyville Road, Scheyville	Downstream
Australiana Pioneer Village	01683	Rose Street, Wilberforce	Downstream
Terrace Building	00075	23-27 Johnston Street Windsor	Downstream
Victoria Bridge	01950	Great Western Highway Penrith	Downstream
Uniting Church and Hall	00735	29 Fitzgerald Street, Windsor	Downstream
Megarritys Bridge	01367	Warragamba Dam, Warragamba	Downstream
Clear Oaks Moxey's Farm House	00058	135 Francis Street Richmond	Downstream
Rev. Peter Turner Cottage and Well	00202	350 George Street Windsor	Downstream
Simmons Hardware Store	00667	226 George Street Windsor	Downstream
House	00142	31-33 North Street Windsor	Downstream
Methodist Parsonage (former)	00735	49 Macquarie Street Windsor	Downstream
Claremont Cottage	00738	Claremont Crescent, Windsor	Downstream
House & Outbuildings	00005	5 Thompson Square Windsor	Downstream
Craithes House	00378	34-40 Borec Road Penrith	Downstream
St. Matthew's Anglican Church, Rectory, Stables & Cemetery	00015	Moses Street, Windsor	Downstream
Toxana	00014	157 Windsor Street Richmond	Downstream
Macquarie Arms Hotel	00041	Thompson Square, Windsor	Downstream
Windsor Court House	00804	Court and Pitt Streets, Windsor	Downstream
Bowman House	00468	368-370 Windsor Street Richmond	Downstream
Glenleigh Estate	00346	427 Mulgoa Road Regentville	Downstream
Mountain View	00044	22 Inalls Lane Richmond	Downstream

Name	SHR No.	Address	Relationship to the study area
Stannix Park House, cattle tanks and site	00598	Stannix Park Road, Wilberforce	Downstream
Ebenezer Church (Uniting), Old Schoolhouse, Cemetery & Tree	00138	Coromandel Road, Ebenezer	Downstream
Building	00610	257-259 Windsor Street Richmond	Downstream
House	00109	35 North Street Windsor	Downstream
Lower Hawkesbury Wesleyan Chapel and site	00576	Wisemans Ferry Road, Gunderman	Downstream
Upper Castlereagh Public School and residence	00339	Castlereagh Road, Castlereagh	Downstream
Loder House	00003	126 George Street Windsor	Downstream
Rose Cottage	00358	Rose Street, Wilberforce	Downstream
Great Drain and two house sites	01402	Wisemans Ferry Road, Maroota South	Downstream
Rose Cottage and Early Slab Hut	01392	Water Street, Werrington	Downstream
Houses	00110	37-39 North Street Windsor	Downstream
Thompson Square Conservation Area	00126	Thompson Square, Windsor	Downstream
Mamre	00264	Mamre Road, St. Marys	Downstream
House	00150	25 North Street Windsor	Downstream
Bird In The Hand Inn (former)	00373	87 Eldon Street Pitt Town	Downstream
Warragamba Emergency Scheme	01376	Warragamba Dam, Warragamba	Downstream
Warragamba Dam - Haviland Park	01375	Warragamba Dam, Warragamba	Construction study area

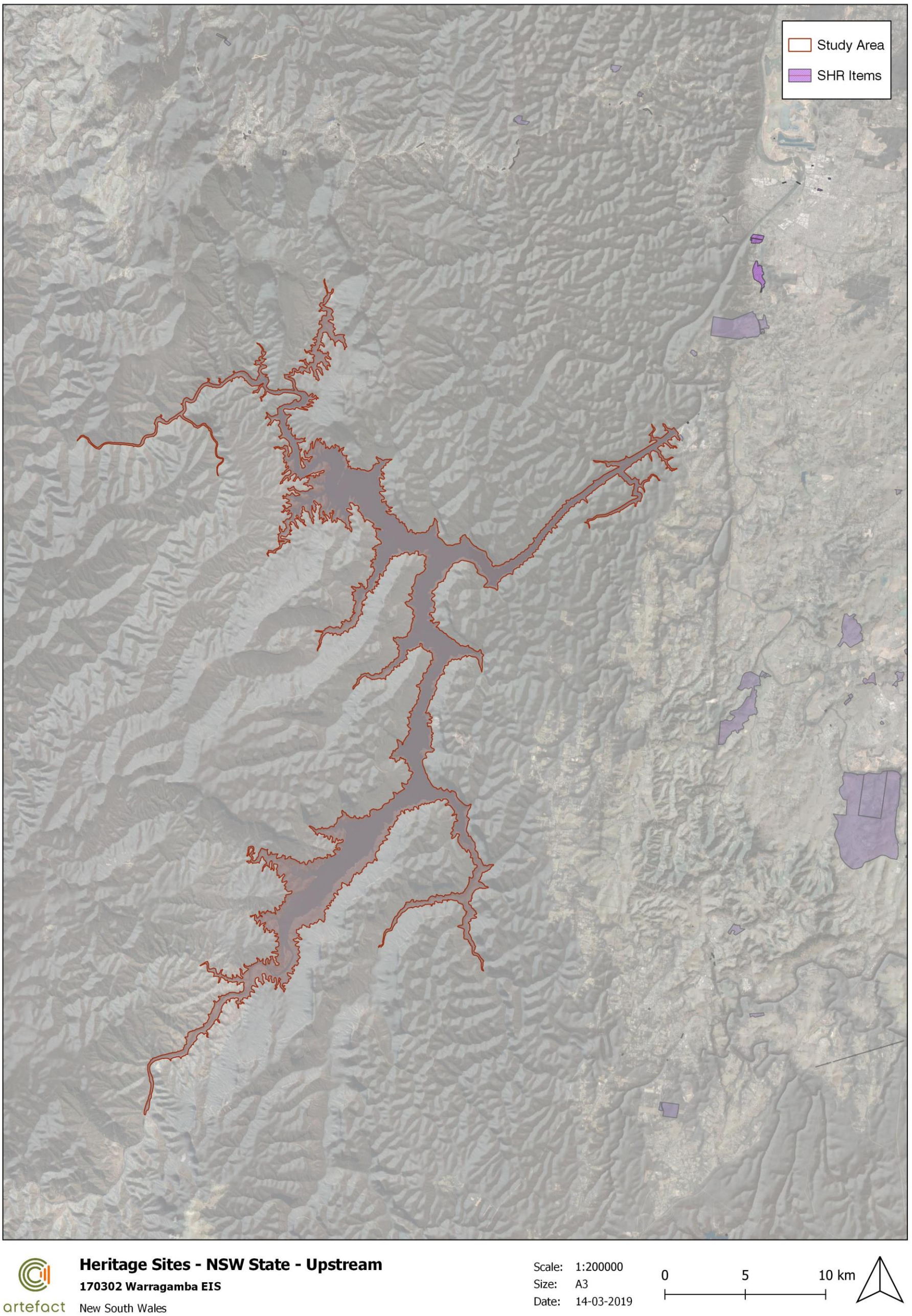


Figure 2.6: State heritage places in the upstream of the study area (pale shaded SHR items indicate items outside study area)

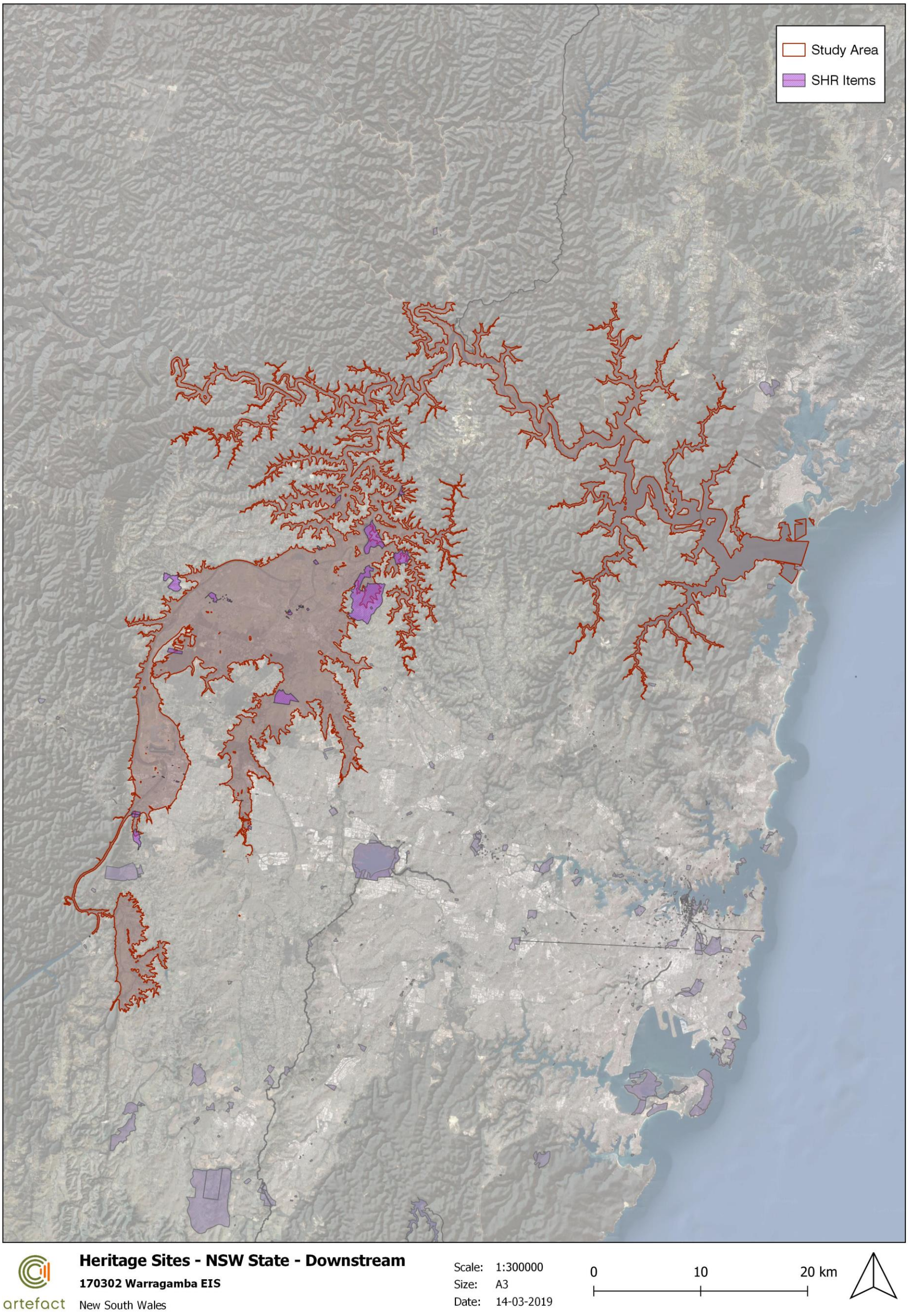


Figure 2.7: State heritage places downstream of the study area (pale shaded SHR items indicate items outside study area)

2.4.3 Section 170 Heritage and Conservation Registers

The Heritage Act requires all government agencies to identify and manage heritage assets under their ownership and control. Under Section 170(3) of the Heritage Act, government instrumentalities must establish and keep a register which includes all places of environmental heritage listed on the SHR, environmental planning instruments, or which may be subject to an interim heritage order that are owned, occupied, or managed by that government body. Government agencies must also ensure that all places entered on its register are maintained with due diligence in accordance with State Owned Heritage Management Principles approved by the Minister on advice of the NSW Heritage Council. These principles serve to protect and conserve the heritage significance of identified sites, places and objects and are based on relevant NSW heritage legislation and statutory guidelines.

There are **76** places listed on State Agency Section 170 Heritage and Conservation Registers located within the study area, from 14 separate registers, as identified in Table 2.5. As mapped Section 170 Heritage and Conservation Registers curtilages are not available for many items on the State Heritage Inventory (SHI) database and the large number of items within the study area, items on Section 170 Heritage and Conservation Registers have not been mapped in this HIA.

There is a single Section 170 Heritage and Conservation Register listed place within the construction study area: the Warragamba Supply Scheme (WaterNSW No. 4580161).

Table 2.5: Section 170 Heritage and Conservation Register listings within the study area

Heritage Item	Section 170 Heritage and Conservation Registers No.	Suburb	Relationship to the study area
Eastern Creek Bridge	Roads and Maritime Services 4309513	Blacktown	Downstream
Northern Suburbs Ocean Outfall Sewer (NSOOS)	Sydney Water 001303	The Hills, Blacktown	Downstream
Old Windsor Road and Windsor Road Heritage Precincts	Roads and Maritime Services 4301011	Multiple	Downstream
Riverstone Police Station	NSW Police Service 4180152	Riverstone	Downstream
Riverstone Railway Station Group and Residence	RailCorp 4801009	Riverstone	Downstream
Administration Building/Quadrangle Buildings and Garden	University of Western Sydney 4730008	Richmond	Downstream
Blacksmith's Shop	University of Western Sydney 4730004	Richmond	Downstream
Grandstand, Scoreboard and Oval	University of Western Sydney 4730002	Richmond	Downstream
Great North Road (retaining walls, culverts, road cutting)	Roads and Maritime Services 4309678	1 km south of Wisemans Ferry	Downstream
Great North Road, The	Office of Environment and Heritage 3902005	Wisemans Ferry	Downstream
Hawkesbury River Bridge	Roads and Maritime Services 4309511	North Richmond	Downstream

Heritage Item	Section 170 Heritage and Conservation Registers No.	Suburb	Relationship to the study area
Hawkesbury River Bridge, Windsor	Roads and Maritime Services 4309589	Windsor	Downstream
Loder House	Department of Planning and Infrastructure 3490027	Windsor	Downstream
Mulgrave Railway Residence	RailCorp 4801027	Mulgrave	Downstream
Owen Carter Memorial Chapel	University of Western Sydney 4730007	Richmond	Downstream
Pitt Town Water Pumping Station (WP0064)	Sydney Water 4574706	McGraths Hill	Downstream
Richmond Courthouse and Police Station	Attorney General's Department 3080112	Richmond	Downstream
Richmond Police Station and Court House	NSW Police Service 4180148	Richmond	Downstream
Richmond Railway Station Group	RailCorp 4801005	Richmond	Downstream
River Farm	University of Western Sydney 4730011	Richmond Lowlands	Downstream
Sackville Ferry Crossing, Sackville	Roads and Maritime Services 4311606	Sackville	Downstream
Stable Square, Surrounding Lawns and Palm Trees	University of Western Sydney 4730003	Richmond	Downstream
UWS Campus Planned Landscape	University of Western Sydney 4730013	Richmond	Downstream
UWS Campus, Nature Reserve and Castlereagh Jewel Beetle Habitat And Movement	University of Western Sydney 4730010	Richmond	Downstream
Windsor (Elevated) Reservoir (WS 0140)	Sydney Water 4575812	Windsor	Downstream
Windsor Courthouse	Attorney General's Department 3080018	Windsor	Downstream
Windsor Fire Station	NSW Fire Brigades 4690108	Windsor	Downstream
Windsor Police Station	NSW Police Service 4180149	Windsor	Downstream
Windsor Railway Station Group and Former Goods Yard	RailCorp 4801003	Windsor	Downstream
Windsor Water Pumping Station (WP00062)	Sydney Water 4574708	Windsor	Downstream
Wool Classing Building	University of Western Sydney 4730005	Richmond	Downstream
Yarramundi House and Cottages	University of Western Sydney 4730009	Richmond	Downstream

Heritage Item	Section 170 Heritage and Conservation Registers No.	Suburb	Relationship to the study area
Brooklyn (Long Island) Archaeological Site	4803221	Brooklyn	Downstream
Brooklyn Former Railway Platform (Long Island)	RailCorp 4803221	Long Island	Downstream
Hawkesbury River Rail Bridge and Long Island Group	RailCorp 4800130	Long Island	Downstream
Hawkesbury River Railway Station Group	RailCorp 4801021	Brooklyn	Downstream
Peats Ferry Road Bridge over Hawkesbury River	Roads and Maritime Services 4309666	Brooklyn	Downstream
1841 Tilley 5 inch Manual Fire Engine	NSW Fire Brigades 4690173	Penrith	Downstream
869 Shand Mason 7" Manual Fire Engine	NSW Fire Brigades 4690169	Penrith	Downstream
1891 Shand Mason Steamer Fire Engine	NSW Fire Brigades 4690165	Penrith	Downstream
1898 Shand Mason Curricle Ladders - Fire Engine	NSW Fire Brigades 4690168	Penrith	Downstream
1916 Garford Type 64 Chain Drive Fire Engine	NSW Fire Brigades 4690171	Penrith	Downstream
1929 Ahrens Fox PS2 Fire Engine	NSW Fire Brigades 4690166	Penrith	Downstream
1939 Dennis Big 6 Fire Engine	NSW Fire Brigades 4690167	Penrith	Downstream
1942 Ford 21W Fire Brigade Mobile Canteen	NSW Fire Brigades 4690172	Penrith	Downstream
1949 Dennis F1 Fire Engine (Scout Car)	NSW Fire Brigades 4690176	Penrith	Downstream
Commissioner's Uniform (NSWFire Brigades) - Ian Mac Dougall	NSW Fire Brigades 4690174	Penrith	Downstream
Cottage	Department of Planning and Infrastructure 3490019	Llandilo	Downstream
Edward Smith Headquarters Switchboard - 1909	NSW Fire Brigades 4690170	Penrith	Downstream
Emu Plains (Nepean River) Underbridge	RailCorp 4801576	Penrith	Downstream
Emu Plains Correctional Centre	Corrective Services NSW 3360092	Emu Plains	Downstream
Emu Plains Correctional Centre - Manager of Industries Office	Corrective Services NSW 3360093	Emu Plains	Downstream
Emu Plains Railway Culvert	RailCorp 4804417	Emu Plains	Downstream

Heritage Item	Section 170 Heritage and Conservation Registers No.	Suburb	Relationship to the study area
Emu Plains Railway Station Group	RailCorp 4801017	Emu Plains	Downstream
Four Winds	Department of Planning and Infrastructure 3490036	Werrington	Downstream
Mamre	Department of Planning and Infrastructure 3490022	St Marys	Downstream
Margaret Farm & Barn	Department of Planning and Infrastructure 3490031	St Marys	Downstream
NSW Fire Brigades Heritage Fleet	RailCorp 4690177	Emu Plains	Downstream
NSWFB 'No. 10' Vehicle Number Plates	RailCorp 4690110	Emu Plains	Downstream
Old Police Station	Department of Planning and Infrastructure 3490018	Emu Plains	Downstream
Original building (Nepean Cottage Hospital)	NSW Department of Health 3540104	Penrith	Downstream
Peach Tree Creek Bridge	Roads and Maritime Services 4309507	Penrith	Downstream
Penrith Railway Station Group and Residence	RailCorp 4801032	Penrith	Downstream
Penrith Weir	State Waters 4550169	Penrith	Downstream
Rose Cottage and Early Slab Hut	Department of Planning and Infrastructure 3490017	Werrington	Downstream
South Creek Bridge (Eastbound)	Roads and Maritime Services 4309584	St Marys	Downstream
St Marys Railway Station Group	RailCorp 4801036	St Marys	Downstream
State Records Movable Heritage – Furniture	Department of Commerce 4270005	Penrith	Downstream
State Records Movable Heritage - Memorials	Department of Commerce 4270006	Penrith	Downstream
Torquay	Department of Planning and Infrastructure 3490016	Werrington	Downstream
Victoria Bridge over Nepean River	Roads and Maritime Services 4301653	Penrith	Downstream
Wool Pack Inn (Ruin)	Department of Planning and Infrastructure 3490032	St Marys	Downstream
Wisemans Ferry Police Station and Official Residence	NSW Police Service 4180150	Wisemans Ferry	Downstream
Warragamba Sewage Treatment Plant	Sydney Water 4576020	Warragamba	Downstream
Emu Plains (Lapstone Ck) Underbridge	RailCorp 4803210	Emu Plains	Downstream

Heritage Item	Section 170 Heritage and Conservation Registers No.	Suburb	Relationship to the study area
Warragamba Supply Scheme	WaterNSW 4580161	Warragamba	Construction study area

2.4.4 NSW Register of Shipwrecks

The Heritage Act provides protection to NSW maritime heritage. The Heritage Act was amended in 2001, to incorporate the protection of historic shipwrecks if over 75 years of age. The changes to the Heritage Act in 2001 also introduced the statutory 'Register of Shipwrecks' for NSW state protected historic wrecks.

The follow entries were extracted from the NSW Register of Shipwrecks on 13 March 2019. At the time of this register search, the interactive map feature on the DCP website for historic shipwrecks was not available. As such, identified maritime items that are potentially within the study area are based on an approximate manual search of the Nepean and Hawkesbury Rivers and tributaries, and the associated descriptions of items.

There are **40** items listed on the NSW Register of Shipwrecks that are potentially located within the study area. Relics associated with each wreck are protected under the NSW Heritage Act if they are more than 75 years old. This will be the case for all these wrecks by 2020. All the wrecks are located downstream of the dam wall.

These places are shown in Table 2.6.

Table 2.6: NSW Register of Shipwrecks places within the study area

Name	ID	Location	Wrecked /Refloated	Protected	Relationship to Project
Aero Club Aircraft	2671	Nepean River (Hawkesbury) - Agnes Banks area	Unknown	Unknown	Downstream
RAAF Aircraft	2662	Hawkesbury River - Windsor area	Salvaged	Unknown	Downstream
RAAF Wapiti	2661	Hawkesbury River - Windsor area	Salvaged	Unknown	Downstream
Windsor wharf	2585	The Terrace, Windsor	N/A	NSW Heritage Act 1977	Downstream
Government Wharf - Windsor	2580	The Terrace, Windsor	N/A	NSW Heritage Act 1977	Downstream
Narara	2674	Hawkesbury River - Sackville area	Re-floated	NSW Heritage Act 1977	Downstream
Isabel	2659	Hawkesbury - Leet's Vale area	Unknown	NSW Heritage Act 1977	Downstream
Gipsy Moth	2668	Hawkesbury River - Wiseman's Ferry area	Unknown	NSW Heritage Act 1977	Downstream
Adelaide	24	Broken Bay, off Hawkesbury River	Wrecked	Historic Shipwrecks Act 1976	Downstream

Name	ID	Location	Wrecked /Refloated	Protected	Relationship to Project
Bella Coulter	1805	Hawkesbury River mouth, Flint & Steel Point	Wrecked	NSW Heritage Act 1977	Downstream
Charlotte Fenwick	1953	Hawkesbury River	Wrecked	NSW Heritage Act 1977	Downstream
Elizabeth	1482	Hawkesbury River	Wrecked	NSW Heritage Act 1977	Downstream
Endeavour	1536	Hawkesbury River	Wrecked	NSW Heritage Act 1977	Downstream
General Gordon	136	Hawkesbury River, Cowan Water, Waratah Bay	Wrecked	NSW Heritage Act 1977	Downstream
Happy Days	1247	Hawkesbury River, Brooklyn, 'The Gunya'	Wrecked	NSW Heritage Act 1977	Downstream
Hawkesbury	1258	Hawkesbury River	Wrecked	NSW Heritage Act 1977	Downstream
Hawkesbury	1259	Hawkesbury River, Sackville Reach	Re-floated	NSW Heritage Act 1977	Downstream
Kellermont	1085	Hawkesbury River, Flint & Steel Bay	Grounded	Historic Shipwrecks Act 1976	Downstream
LHE	1112	Hawkesbury River, Jerusalem Bay	Wrecked	Not protected	Downstream
Marian	913	Hawkesbury River, Croppy Point	Wrecked	NSW Heritage Act 1977	Downstream
Minmi	846	Hawkesbury Bridge	Sank at mooring	NSW Heritage Act 1977	Downstream
Parramatta (1) Ex HMAS	798	Hawkesbury River	Foundered	NSW Heritage Act 1977	Downstream
Peggy	2684	Hawkesbury River - Brooklyn	Wrecked	NSW Heritage Act 1977	Downstream
Phoenix	676	Hawkesbury River	Wrecked	NSW Heritage Act 1977	Downstream
Sally	503	Hawkesbury and Sydney	Wrecked	Historic Shipwrecks Act 1976	Downstream
Speedwell	584	Ashore near Hawkesbury River,	Wrecked	Historic Shipwrecks Act 1976	Downstream
Surprise	2622	Hawkesbury River near Brooklyn	Abandoned	Navigation Act 2012	Downstream
Swan (1) Ex HMAS	474	Little Wobby, Hawkesbury River	Foundered	NSW Heritage Act 1977	Downstream

Name	ID	Location	Wrecked /Refloated	Protected	Relationship to Project
Unidentified - Hawkesbury River, Long Island	2701	Long Island, Hawkesbury River	Wrecked	Unknown	Downstream
Unidentified - Hawkesbury River, Mullet Creek, Wondabyne area - Boat	2696	Hawkesbury River, Mullet Creek	Wrecked	Unknown	Downstream
Unidentified Hawkesbury River - Spectacle Island Nature Reserve, near Mooney Mooney 1	2481	Hawkesbury River, Spectacle Island, near Mooney Mooney	Wrecked	Unknown	Downstream
Unidentified Hawkesbury River - Spectacle Island Nature Reserve, near Mooney Mooney 2	3902	Hawkesbury River, Spectacle Island, near Mooney Mooney	Wrecked	Unknown	Downstream
Unidentified Hawkesbury River - Spectacle Island Nature Reserve, near Mooney Mooney 3	3903	Hawkesbury River, Spectacle Island, near Mooney Mooney	Wrecked	Unknown	Downstream
Unidentified Hawkesbury River Windsor 1	3952	Hawkesbury River north side of Windsor	Unknown	Not protected	Downstream
William and Mary	223	On beach at mouth of Hawkesbury River	Refloated	Historic Shipwrecks Act 1976 and NSW Heritage Act 1977	Downstream
Willirie	2621	Hawkesbury River	Unknown	NSW Heritage Act 1977	Downstream
Z Special Unit Camp X - Refuge Bay, Broken Bay	2777	Hawkesbury River, Broken Bay, Refuge Bay	Unknown	Unknown	Downstream
Unknown Wharf Waratah Bay Cowan Creek Hawkesbury	2584	Waratah Bay, Cowan Creek, Hawkesbury River	N/A	NSW Heritage Act 1977	Downstream
Argument	1752	Broken Bay, East & West Reef	Wrecked	Historic Shipwrecks Act 1976	Downstream
Unidentified	426	Broken Bay, ~3 mls from north head	Wrecked	Historic Shipwrecks Act 1976 and Heritage Act 1977	Downstream

2.5 Environmental Planning and Assessment Act 1979 (NSW)

The EP&A Act establishes the framework for cultural heritage values to be formally assessed in the land use planning and development consent process. The EP&A Act requires that environmental impacts are considered prior to land development. This includes impacts on cultural heritage places and places as well as archaeological sites and deposits. The project is subject to assessment pursuant to Division 5.2 (s5.12) (State Significant Infrastructure) of the EP&A Act.

The EP&A Act also requires that local governments prepare planning instruments, such as Local Environmental Plans (LEPs) and Development Control Plans (DCPs) in accordance with the EP&A Act, to provide guidance on the level of environmental assessment required.

Each LEP controls actions that may impact places within each instrument's Schedule 5 Registers, and each of these lists, and the places listed on them within the study area are detailed below.

2.5.1 State Environmental Planning Policy (Infrastructure) [ISEPP] 2007

In 2007, the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) was introduced to streamline the development of infrastructure projects undertaken by state agencies, including WaterNSW. Generally, where there is conflict between the provisions of the ISEPP and other environmental planning instruments, the ISEPP prevails.

Under the clause 50 of the ISEPP, development for the purpose of flood mitigation may be carried out by a public authority without consent on any land. The ISEPP overrides the controls included in the LEPs an DCPs, and WaterNSW would be required to consult with the council only when development "*is likely to have an impact that is not minor or inconsequential on a local heritage place (other than a local heritage place that is also a State heritage place) or a heritage conservation area*". When this is the case, WaterNSW must not carry out such development until it has:

- Had an assessment of the impact prepared
- Given written notice of the intention to carry out the development, with a copy of the assessment, to the council for the area in which the heritage place or heritage conservation area (or the relevant part of such an area) is located
- Taken into consideration any response to the notice that is received from the council within 21 days after the notice is given (ISEPP clause 14).

2.5.2 Local Environment Plans

The study area falls within the boundaries of the Blacktown, Central Coast, Hawkesbury, Hornsby, Pittwater, Gosford, Liverpool, Penrith, The Hills, and Wollondilly LEP's, all of which pre-date the recent council mergers. The study area also falls within the boundaries of the SEPP Sydney Region Growth Centres (SRGC) 2006. Schedule 5 Registers of each LEP and the SEPP SRGC includes a list of places/sites of heritage significance within the relevant LGA.

There are **793** places listed on the LEPs and SEPP SRGC located within the study area, from 11 separate schedules, as summarised in Table 2.7. Due to the number of places on the LEP schedules listed above within the study area, the full list is provided as on Appendix B. The curtilages of listed heritage items listed on the LEP's are shown in Figure 2.9 and Figure 2.10. All items listed on LEP's are located around the dam wall or downstream of the dam.

There is one LEP heritage item within the Construction study area, comprising the Warragamba Supply Scheme and Warragamba Emergency Scheme (LEP No. I270).

Table 2.7: Place counts for LEP Schedules

LEP	Places listed
Blacktown Local Environmental Plan 2015	28
Hawkesbury Local Environmental Plan 2012	469
Hornsby Local Environmental Plan 2013	54
Liverpool Local Environmental Plan 2008	6
Penrith Local Environmental Plan 2010	154
State Environmental Planning Policy (Sydney Region Growth Centres) 2006	7
The Hills Local Environmental Plan 2012	43
Wollondilly Local Environmental Plan 2011	5
Gosford Local Environmental Plan 2014	25
Pittwater Local Environmental Plan 2014	2

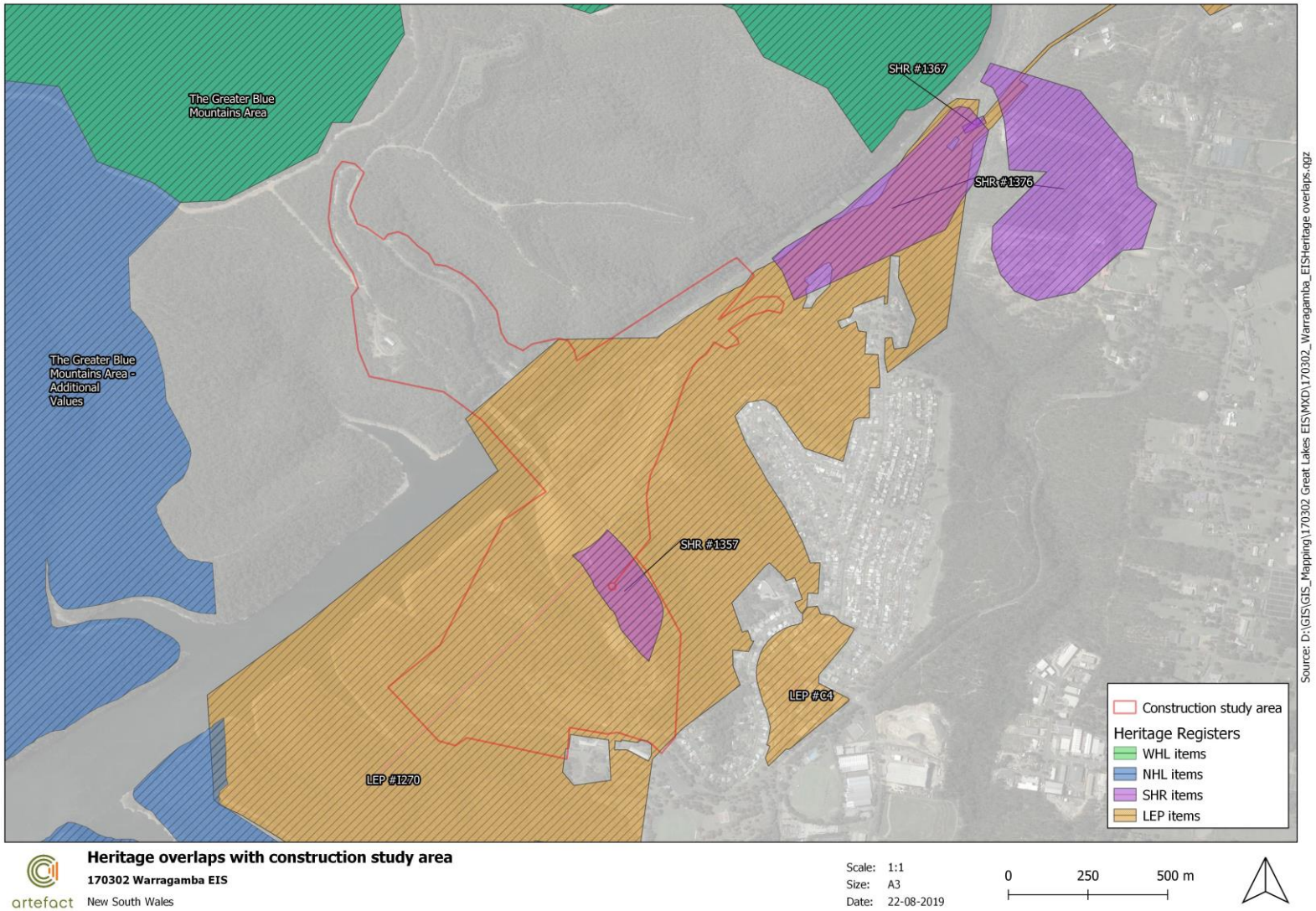


Figure 2.8: Heritage items within and around the Construction study area study area

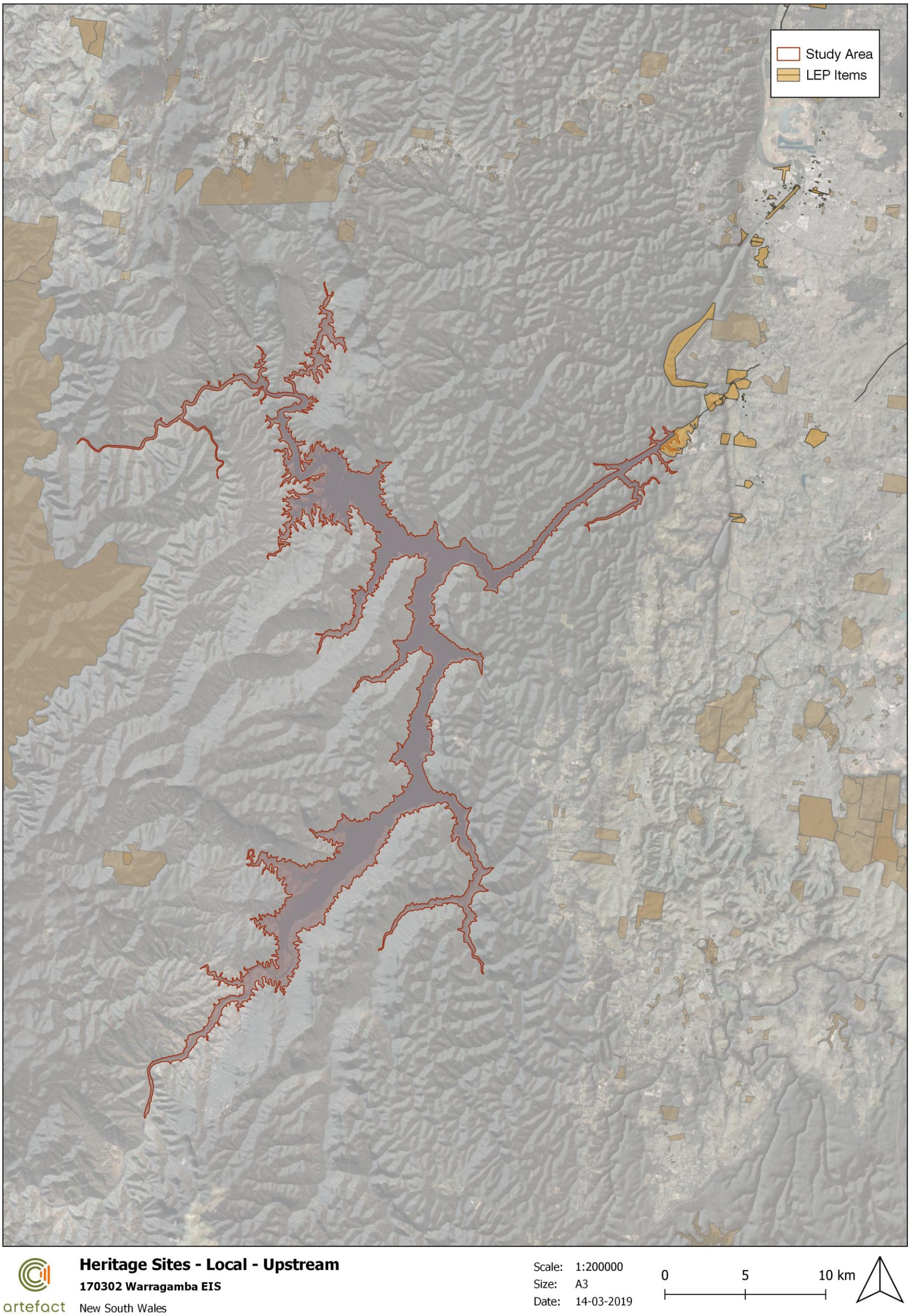


Figure 2.9: LEP Schedule 5 Registers heritage places in the upstream of the study area (pale shaded LEP items indicate items outside study area)

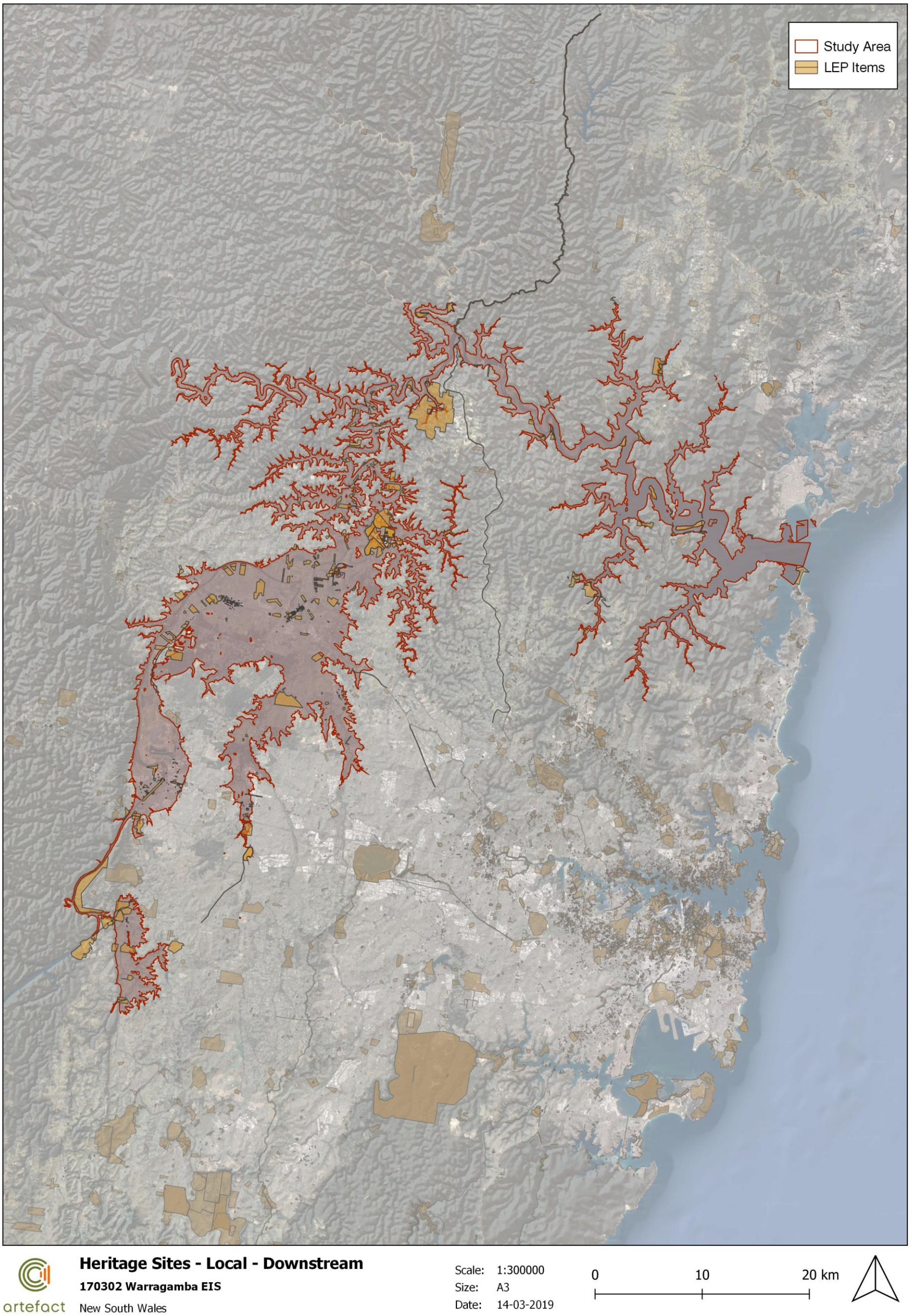


Figure 2.10: LEP Schedule 5 Registers heritage places downstream of the study area (pale shaded LEP items indicate items outside study area)

3.0 HISTORICAL CONTEXT

This chapter provides an overview of the Non-Aboriginal history of the study area. Aboriginal history and context are discussed in the separate Aboriginal heritage report for the project (Appendix K of the EIS). This encompasses the history of Western Sydney and the Hawkesbury, an overview of Sydney's water supplies, development of Warragamba Dam and history of the conservation of the World and National heritage items within the study area.

3.1 Non-Aboriginal history

3.1.1 Early colonial history

Following European settlement in 1788, the most pressing need for the colony was a stable food source to alleviate potential famine and reduce the reliance on ships bringing supplies from England. Exploration to the west of Sydney Cove had begun soon after initial colonisation, as it was found that the sandstone soils of coastal Sydney were unsuited for intensive farming.[6] Exploration up the river in 1788 located better land at an area originally named Rose Hill and later Parramatta, and settlement soon commenced in the locality during the 1790s. Shortly after, a third settlement was established at Toongabbie in 1792. These settlements were at the centre of the agricultural occupation of the surrounding land.

Further north, the first Europeans visited the Hawkesbury River in 1788 a few months after arriving in the colony with the First Fleet. Governor Arthur Phillip and his party travelled to Prospect Hill, via Broken Bay. It was in Broken Bay that Phillip first saw the mouth of the Hawkesbury River.[7] In 1789, Phillip successfully travelled the length of the River, naming it after Lord Hawkesbury, the First Earl of Liverpool. Shortly after Phillip's exploration, surveyors began marking out the land along the Hawkesbury with land grants and roads, and several Crown Grants were also included. The early settlers of the lower Hawkesbury were remote from major settlements, and access remained difficult. This meant that the area did not become heavily occupied until the late 19th century when rail and ferry infrastructure was developed in the area.[8]

The Cumberland Plain, with its gently undulating landscape and rich alluvial soils, offered better conditions for farming and land was cleared in the Cumberland Plain as early as the 1790s.[9] Settlement around the Cumberland Plains initially focused on the well-watered areas around the Hawkesbury and Georges Rivers, but soon began to spread further west and south. The heavily dissected sandstone plateau and deep valleys characteristic of the Blue Mountains, which provided a physical barrier to the inland, meant that for 25 years between 1788 and 1813, the European colony's expansion was restricted to the coastal strip around Sydney.

Convict labour was largely responsible for the development of Western Sydney into productive land. During the early years of settlement in the late 18th century and early 19th century, the absence of machinery and the shortage of bullocks meant that convicts cleared land, erected public buildings, private buildings, and provided labour for jobs small and large.[10] The County of Cumberland and the County of Camden, are largely associated with convict era development. A range of assets constructed by convicts survive within the study area including the Great North Road. In 1840, transportation of convicts to the colony ceased.[11]

[6] FORM 2006 in Austral 2011.
[7] Nichols, M. 2004. Pictorial History Hawkesbury Shire, Kingsclear Books Pty Ltd, Hawkesbury, NSW, p. 8.
[8] Rowland, J. 2008. Brooklyn, Dictionary of Sydney.
[9] FORM 2006 in Austral 2011.
[10] Kass, T. 'Western Sydney Thematic History'. 2005:9.
[11] Kass, T. 2005:11.

Figure 3.1: Historical painting depicting a view of the Nepean River at the Cow Pastures, 1825 (Source: State Library Victoria)

Figure 3.2: Historical painting depicting a view of the Hawkesbury River, 1788 (Source: Mitchell Library, State Library NSW)

3.1.2 Rural development

Rural development and settlement within much of the study area was driven by the availability of fertile soil and accessible water sources such as creeks and riverbeds. By end of the 18th century, fertile alluvial soils along the Nepean River, Hawkesbury River and South Creek, and the area of Prospect Hill, comprised early land grants and were being farmed for wheat and maize.[12] The floodplains of the Nepean River provided the most fertile soil in the region and occupation and farming took place along its banks and alluvial soils from 1789 onwards.

Following exploration of the area during the late 18th century, the colonial gentry soon regarded it as rich, fertile and suitable land for livestock grazing and pastoral pursuits, and the acquisition of land in the district was being sought by private colonists. The newly appointed Governor Lachlan Macquarie soon had the land surveyed and began granting land allotments to the colonial elite. The establishment of key towns including Campbelltown, Camden, Windsor and Richmond resulted in continued development and consolidated agricultural pursuits in the area.

Figure 3.3: Historical painting by George William Evans depicting a view along the Nepean River at connection with Grose River, 1809
(Source: State Library NSW, call no. SV/123)

In May 1813, an exploratory expedition led by immigrants Gregory Blaxland, William Charles Wentworth and William Lawson set out from Emu Plains to find a way to cross the Blue Mountains, to secure a passage west.[13] After 21 days navigating an established Aboriginal trading route,[14] the party reached the summit of what is now Mount Blaxland. Although Blaxland, Wentworth and Lawson did not complete a crossing of the Great Dividing Range, a trail across the Blue Mountains by white settlers had been blazed, enabling access to the western pastoral lands beyond.

During the early to mid-19th century, areas surrounding the Blue Mountains, encompassing Burragorang Valley and the Cumberland Plains beyond, were expropriated from local Aboriginal groups and used for the mining of coal, lead and silver, for farming and for recreational activities.

[12] NSW Department of Commerce, State Records 2007:1.
[13] State Library NSW, op. cit. 2014
[14] Jakelin Troy, 'King plates: a history of Aboriginal gorgets.' 1993:42.

Established in 1827 as a mining town, Burragorang developed into a small township that comprised houses, farms, churches, cemeteries and several guesthouses.

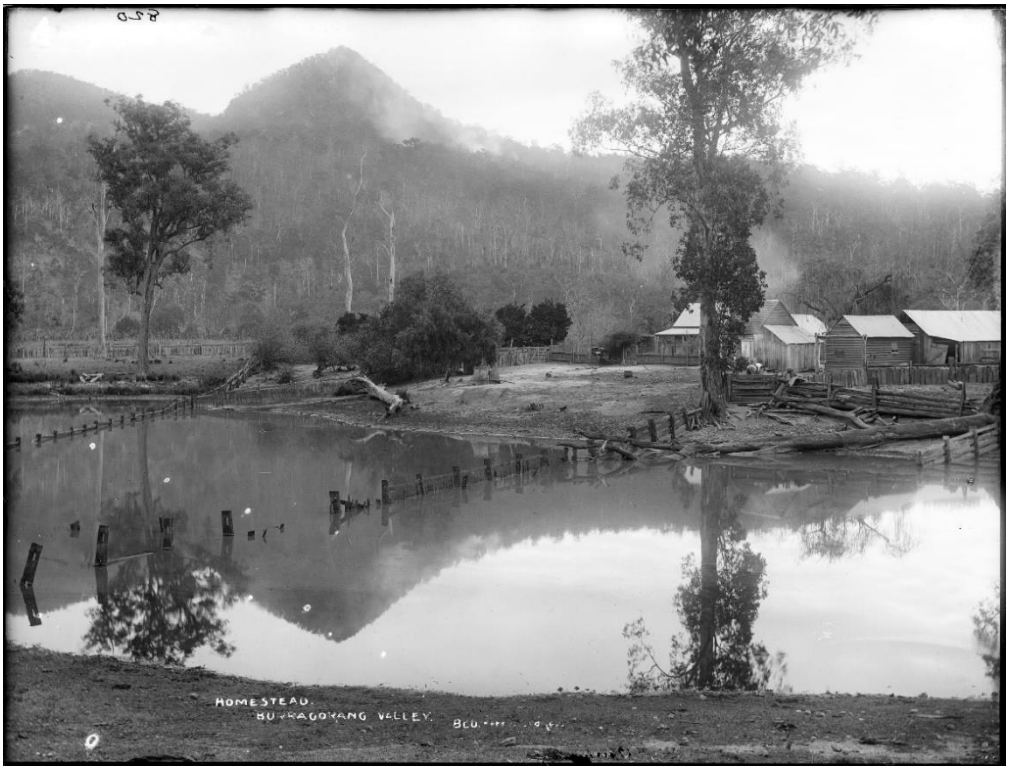


Figure 3.4: A homestead in the Burragorang Valley prior to flooding of the township to establish Warragamba Dam, c1884-1917
(Source: Museum of Applied Arts & Sciences. Object No. 85/1284-435)

3.1.3 Consolidated settlement and development

With the development of links with Bathurst following completion of a road between Sydney and Bathurst in 1815, and the opening of agricultural land further west following the crossing of the Blue Mountains, the importance of the Western Sydney agricultural region diminished. The character of the area also shifted as the new road to Parramatta was constructed, making the area more attractive to settlers. Drought followed by wheat leaf rust in the 1870s necessitated a change in crop types and by the 1890s the area was a major producer of citrus and dairying. During the last decades of the nineteenth century and throughout the twentieth century, portions of the Cumberland Plain region were used for quarrying, gravel and sand extraction.

3.2 Overview of Sydney's water supplies

The following section provides a context of Sydney's water supplies over time and the background to the development of Warragamba Dam. It is noted the Warragamba Supply Scheme CMP prepared by Graham Brooks & Associates in 2010 (Warragamba Supply Scheme CMP 2010) provides a detailed history of Warragamba Dam and the evolution of Sydney's water supplies.

3.2.1 Early water sources, the Upper Nepean Scheme & additional catchment areas

In January 1788, the European colony was founded on the first water supply system, a 'spring of water' that flowed into Sydney Cove, which became known as the Tank Stream. Although it was never satisfactory for the requirements of the colony and subject to variations of the weather, the Tank

Stream continued to serve the fledgling colony until the mid-1820s.[15] From 1827, Sydney's second water supply was developed as a series of reservoirs on the Lachlan Swamps, which are now part of the Centennial Park lakes system. The Lachlan Swamps continued to supply Sydney with water until 1860, when it was replaced by the development of the Botany Swamps located to the south.[16]

Residential and industrial growth in Sydney resulted in increasing water consumption. By 1867, the Botany Swamps supply was considered to be over-taxed, and a Special Commission was appointed by the Governor of NSW to recommend a scheme that could provide a reliable and plentiful water supply to meet the city's future growth, harvesting water on river catchment areas far removed from the city and transferred by means of canals and pipelines.[17] The Upper Nepean Scheme was proposed, based on the provision of water from the Nepean River and its tributaries of the Avon, Cataract, and Cordeaux Rivers.

Figure 3.5: Historic photograph of Prospect Reservoir at the time of completion, 1888 (Source: Reproduced in Besley, M. 'The Sweat of their Brows' Water Board, 1988)

The Upper Nepean Scheme was envisaged as a 'run of the river scheme' involving the diversion of the natural flow of waters without regulation in storage reservoirs by the construction of weirs, tunnels and reservoirs.[18] The scheme was built between 1879 and 1887, and was commissioned in 1888. The Prospect Reservoir, which was constructed as part of the scheme, was completed in 1888 as the first earth-fill embankment dam in Australia.[19]

During the remaining portion of the nineteenth century, Sydney's water supplies were obtained by amplifying the existing supplies and progressively developing the Botany water reserve, Prospect Reservoir, and by the construction of Cataract Dam by 1907, which was developed to increase the potential of the Upper Nepean Scheme. However, to provide adequate water supply for the growing population in the metropolitan area, the Public Works Department continued investigations to determine other feasible water supply schemes.

[15] Graham Brooks & Associates. 'Conservation Management Plan: Warragamba Supply Scheme'. 2010:16.
[16] Graham Brooks & Associates. 2010:16.
[17] Graham Brooks & Associates. 2010:19.
[18] Graham Brooks & Associates. 2010:19.
[19] Sydney Catchment Authority, 2013. Prospect Reservoir. Site accessed on 26/03/2015 at: http://www.sca.nsw.gov.au/water/supply/dams/prospect-dam

The Public Works Department, through engineers such as Ernest M. de Burgh and Leslie A.B. Wade, proposed the damming of the Warragamba River. In 1908, E.M. de Burgh, Chief Engineer of the Water Supply and Sewerage Branch, recommended to the Minister that an investigation be made into the proposal for a dam on the Warragamba River for irrigation and water supply purposes. E.M. de Burgh's report outlined the improvements to engineering that would make the construction of a high masonry dam, using 'waste weirs' to safely manage the escape for flood waters, possible.

During the drought of 1915/1916, planning was undertaken by the Public Works Department to increase Sydney's water supply by the construction of a dam on the Warragamba River,[20] although the financial stringency brought about by the First World War delayed any action.

Separate to investigations surrounding Warragamba, an additional report prepared by E.M. de Burgh outlined the need to extend the storage in the Upper Nepean and additional catchment areas. In November 1918, upon cessation of the First World War, a Special Board of Experts was appointed to examine the findings of E.M. de Burgh's report. The Special Board recommended the immediate construction of Avon Dam and construction of the Nepean Dam to supply about two years' worth of water to metropolitan Sydney and raising the height of the recently commenced Cordeaux Dam. Although the decision to construct the Nepean Dam was made in 1923, the Nepean Dam was constructed between 1925 and 1935.[21]

3.3 Development of Warragamba Dam

3.3.1 Early consideration

In 1810, Macquarie visited the area, and noted the immense body of water that poured into a circular basin connecting with the Nepean to form a large river.[22] The name "Warragamba" is derived from Macquarie, based on the "real and proper Native name" of the river "Warragombie". The first use of the word "Warragamba" appears to have been used in 1825 by Surveyor General Oxley. The native words "warra" meaning swamp and "gamba" meaning ti-tree.[23]

3.3.2 Exploration

In 1845, explorer Count PE de Strzelecki suggested the use of the Warragamba River, among other rivers, for agricultural irrigation.[24] In a Special Commission in 1867-1869, a member of the Commission Lieut. Thomas Woore strongly urged the construction of a dam in the gorge of the Warragamba, and for works to convey water through Mulgoa and Prospect for the supply of Sydney. Woore outlined the advantages of locating a water supply at Warragamba, the collecting area of which would be within reach of the city and could be tapped at its lowest point to feed the water by gravity to Sydney.[25]

3.3.3 Woore's proposed design

To enable the construction, Woore proposed the use of a coffer dam and shifting of sluice-gates fitted on the inner face of the wall. The work would be gradually raised by alternate shifts and gradually proceed in horizontal layers until complete. Woore's proposed conveyance of water into Sydney was

[20] Graham Brooks & Associates. 2010:32.
[21] Office of Environment and Heritage, 'Nepean Dam'. Accessed at: https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5051477 (15/12/2020).
[22] Graham Brooks & Associates. 2010:35.
[23] Aird, WV. 'The Water Supply, Sewerage and Drainage of Sydney'. 1961:108, as in Graham Brooks & Associates. 2010:35.
[24] Graham Brooks & Associates. 2010:35.
[25] Graham Brooks & Associates. 2010:35.

by a tunnel and inverted syphon cut into the rock to take the water through adjacent gorges. An aqueduct would then transport the water along the ridges to a reservoir located at Petersham, then considered the highest land near Sydney. Due to perceived engineering difficulties associated with construction of a dam in a flood-prone river, Woore's colleagues instead recommended the construction of what is now known as the Upper Nepean Scheme.[26]

3.3.4 Change in governance

In 1925, the provision of future water supplies for Sydney was transferred to the Metropolitan Water Sewerage and Drainage Board (MWS&DB). Despite the vital role of the Upper Nepean Scheme, the pressing need to supply adequate water supplies to the metropolitan area persisted. In June 1925, the Board appointed an expert committee to report on the utilisation of Warragamba or other catchment area as the next to be developed following completion of the dams on the Cordeaux, Avon and Nepean Rivers. In September 1925, the committee recommended that a dam 91.5 metres high with top water level of 94.5 metres above sea level be constructed on the Warragamba with a capacity of 181,000 million gallons.[27]

In 1929, the Metropolitan Water Sewerage and Drainage Board took over from the Department of Public Works to complete the Nepean Dam, which had just been commenced, to be followed by the construction of the Woronora Dam. While these two dams increased quantity of water for Sydney's growing population, the effects of the severe drought from 1934 to1942 drought necessitated the commencement of the Warragamba project by the construction, as an emergency, of the Warragamba Emergency Scheme to pump river flow to Prospect. In July 1938, the project to obtain water from Warragamba River was formally approved by the Sydney Water Board, with work to proceed in four stages.[28]

3.3.5 Warragamba Emergency Supply Scheme

Stage one of the Warragamba development involved construction of the Warragamba Emergency Supply Scheme, just downstream of the current dam. A 50ft high overshot weir was constructed, along with a pumping station and pipeline to deliver 40 million gallons per day to Prospect Reservoir. Twin 72 inch diameter steel pipes were laid through the weir, to service pumps supplying the 25 kilometre-long, 48 inch diameter cement lined steel pipeline to Prospect Reservoir. The pipeline also included a concrete arch bridge over Megarrity's Creek, a dam of 9 million gallons capacity to act as a balance reservoir on the line and to provide emergency supply, and a chlorination and alum plant for water treatment.[29]

Construction of the Warragamba Emergency Supply Scheme commenced in April 1937, involving establishment of the office and work camps. The office site was located on the east bank of the Warragamba River, with access along what is now known as Weir Road. Construction elements included a 10-tonne cableway, shed, batching plants, electrical substations, staff facilities and accommodation. The project was completed within three years and played a key part in avoiding the failure of Sydney's water supply.[30] Upon completion of the Warragamba Emergency Supply Scheme, efforts were diverted to completing the major dam and pipelines of the Warragamba development.

[26] Graham Brooks & Associates. 2010:36.
[27] Graham Brooks & Associates. 2010:39.
[28] Graham Brooks & Associates. 2010:40.
[29] Graham Brooks & Associates. 2010:41.
[30] Graham Brooks & Associates. 2010:41.

3.3.6 Warragamba to Prospect Reservoir pipeline

In 1937, a temporary 48 inch pipeline had been constructed to take water from the weir associated with the Warragamba Emergency Supply Scheme to Prospect Reservoir. The second stage of the Warragamba development was the replacement of this pipeline with a larger 84 inch pipeline to provide more water to Prospect Reservoir.

It was originally planned to construct three pipelines, each 84 inches in diameter and 23 kilometres in length from the connection on the eastern side of the Nepean River to Prospect Reservoir.[31] These would connect to the two pipes in tunnel and concrete extending between the dam and the northern bank of the Nepean River. To minimise costs, however, a second pipeline was eventually constructed between 1965 and 1969 as a single 106-inch diameter pipeline, equivalent to two 84-inch pipelines.[32]

3.3.7 Construction of Warragamba Dam

In 1943, the Metropolitan Water, Sewerage and Drainage Board engaged geologist William Browne to investigate a proposed site for the Warragamba Dam. Upon finding a weakness in this initial site, comprising a bed of shale at a critical level of the foundation area, the present site further upstream was deemed most suitable, and was formally accepted by the Metropolitan Water, Sewerage and Drainage Board on 2 October 1946.

The topography and geological features of the site influenced the adoption of a straight gravity wall with central spillway design for the dam.[33] The dam's planning, design and construction was directed by three distinguished Engineers-in-Chief to the Board including Mr S.T. Farnsworth, Sir William Hudson and Mr T.B. Nicol.

In 1948, construction works commenced. To provide a dry area for excavation of the site and initial concreting work, coffer dams were constructed across the river upstream and downstream of the site. Diversion of the river around the construction site between the two coffer dams was achieved by way of establishing a 5.5 metre x 4.3 metre concrete lined diversion tunnel approximately 550 metres long under the eastern riverbank. Other initial works comprised the construction of 47 workers' cottages and employee barracks, reconstruction of access roads, and excavation (and levelling of areas) for equipment including the 10-tonne cableway tower.[34] In 1953, concreting works commenced.

All civil engineering work was carried out by the Sydney Water Board's own day labour work force. The work force totalled between 1,600 to 1,700 men for most of the project's duration. The Warragamba township that was established during construction comprised approximately 500 cottages, barracks, shops, town hall, schools, churches, sports facilities and a medical centre. Upon completion of the dam in 1960, the township area was transferred to the local Shire Council.[35]

[31] Graham Brooks & Associates. 2010:43.
[32] Graham Brooks & Associates. 2010:43.
[33] Graham Brooks & Associates. 2010:45.
[34] Graham Brooks & Associates. 2010:46.
[35] Graham Brooks & Associates. 2010:48.

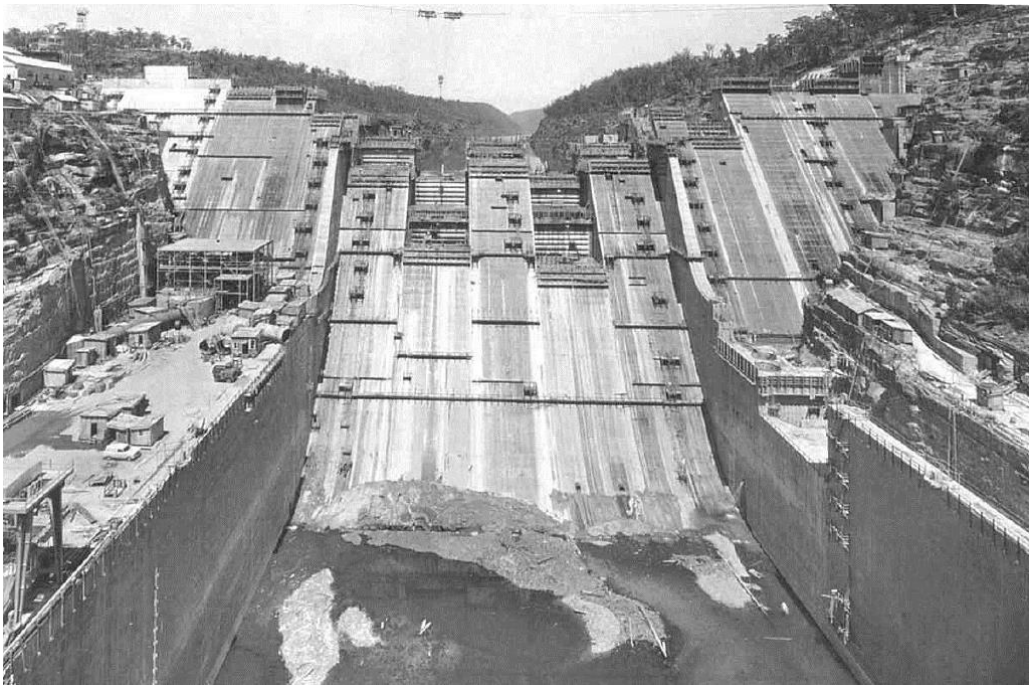


Figure 3.6: Historical photograph of works progress at the dam, 1958 (Source: KW 581107 – 1, SWC/SCAHR&AF)

During construction of the dam, frequent complications and challenges led to many innovations and advancements in construction and engineering methods. Model studies and investigations were undertaken to increase the efficiency of the scheme.[36] The general spillway dimensions were determined by studying the history of floods on the Warragamba and passing flood waters over the dam, while the length of the concrete apron and height of the containing walls were determined by information gained from model studies combined with observations from precedent spillway systems. Water from the dam, surplus to supply requirements, was used for electricity generation via the Hydroelectric station constructed on the eastern side of the spillway.[37]

By 1960, the main body of the dam had been completed, with a total of 43,372 cubic yards of concrete in place, and the crest roadway, bridge spans, crest gates, crest crane and roadway approaches nearing completion.[38] On 14 October 1960, the dam, which had been completed at a cost of £35,500,000, was officially opened by the then Premier of NSW, the Hon. R.J. Heffron. About 4,000 people attended the opening ceremony, including the workers and their families and government representatives.[39]

[36] Graham Brooks & Associates. 2010:51-52.
[37] Graham Brooks & Associates. 2010:57.
[38] Graham Brooks & Associates. 2010:53.
[39] Graham Brooks & Associates. 2010:53.

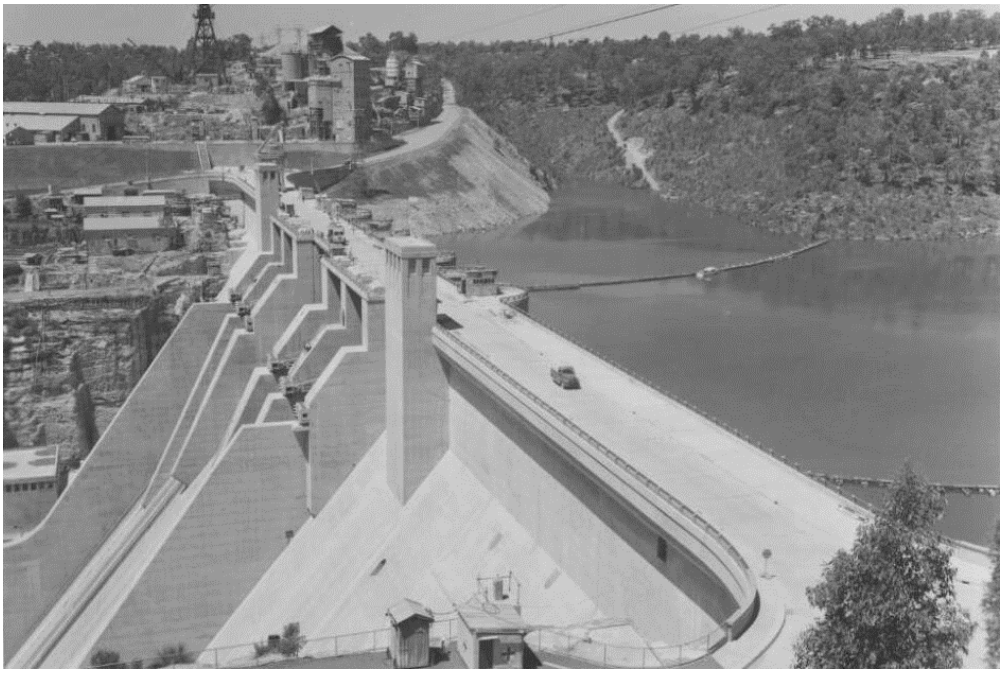


Figure 3.7: Historical photograph of the newly completed Warragamba Dam, 1960 (Source: National Library of Australia)

Figure 3.8: Historical photograph of the opening ceremony of Warragamba Dam, 1960 (Source: Reproduced in Beasley, M. 'The Sweat of their Brows' Water Board, 1988)

Figure 3.9: Overhead view of Warragamba Dam during the opening ceremony, 1960 (Source: Sydney Water Board Journal, Special Edition, October 1960)

3.3.8 Modifications and development at Warragamba Dam

In November 1961, heavy flood flows resulted in damage to the dam and particularly the rock abutments downstream of the dam that necessitated a series of repairs. Upon completion of works and selling of surplus equipment, the works area, which comprised several bare, excavated platforms and open areas, required rehabilitation. During the 1960s, works were focused around the beautification programme, and completion of park and picnic areas and former works areas associated with the dam. These landscaped areas comprised two picnic areas and a terraced garden immediately above the eastern bank, to accommodate visitors and organised conducted tour groups of the dam.[40]

[40] Graham Brooks & Associates. 2010:57.

Figure 3.10: Photograph of Mrs Boucher in the newly completed Haviland Park, c1960s. (Source: RS/17 – 4M, SWC/SCAHR&AF)

Developments in rainfall and flood estimation during the early 1980s indicated that Warragamba Dam could experience floods much larger than previously estimated. In December 1985, the Warragamba Dam flood protection program was announced by the Government.[41]

With several model studies demonstrating the dam would fail after a 1 in 750-year flood event, a two-stage program was formulated. Between 1987 and 1990, the first stage involved the crest of the dam being raised by five metres to cater for a 1 in 1,500-year flood, and the dam wall itself was strengthened using post tensioned steel cables. The second stage involved the construction of an auxiliary spillway located on the eastern bank of the dam to divert excess flood waters around the dam and reduce the pressure on the wall. [42]

Further investigations into flooding and flood mitigation were undertaken and culminated in 1995 in a proposal to raise Warragamba Dam by 23 metres primarily for dam safety but also to provide for flood mitigation. The 1995 proposal did not proceed.

[41] Graham Brooks & Associates. 2010:58-59.
[42] Graham Brooks & Associates. 2010:59-60.

Figure 3.11: Photograph showing the raising of the crest wall using the 18-tonne cableway that remained at this time, November 1988.
(Source: R95B – 2, SWC/SCAHR&AF)

In the late 1990s, major upgrades of Warragamba Dam were undertaken to prevent dam failure during extreme flooding events, to protect Sydney's water supply, and to prevent catastrophic downstream floods from dam failure. This resulted in the construction of the auxiliary spillway. However, these works only dealt with dam safety issues and did not address the major flood risks to the people and businesses in the Hawkesbury-Nepean Valley and the NSW economy.

Preliminary site works for the auxiliary spillway commenced in 1998, and in 1999 construction of the large structure began (Figure 3.12 and Figure 3.13). Works involved modification to the existing structure of the dam and surrounding area. Large amounts of rock and soil were removed from the site (effectively the western end of Haviland Park) and were relocated to the western bank to create the rehabilitated Left Bank Spoil embankment. Concurrently, a public platform and lookout overlooking the dam and spillway works site with access from Eighteenth Street, was constructed.[43] The construction of the auxiliary spillway resulted in the removal of a significant part of the Haviland Park's original area and exotic plantings, along with the loss of other features including a children's playground and picnic shelter located at the western end of the park.

Bushfires in December 2001 caused considerable damage to the area surrounding the dam and spillway construction site. Growth and planting on the Left Bank Spoil embankment were affected, while archaeological sites and remains of elements relating to the Emergency Scheme, the former Community Relations building and works depot area and sheds, were lost. The fire also caused further damage to the deteriorating timber suspension bridge crossing the gorge.[44] Elements of Haviland Park were also impacted.

In 2008-2009, the Sydney Catchment Authority (SCA) constructed a new Warragamba Visitor and Operations Centre at the western end of Haviland Park, with views over the dam and auxiliary spillway. A new maintenance shed and other auxiliary structures have also been built adjacent to the

[43] Graham Brooks & Associates. 2010:60.
[44] Graham Brooks & Associates. 2010:60.

picnic areas. The former SCA Operations office, now the only extant building dating to the initial construction phase of the dam, has been adaptively reused as a Moveable Heritage store.[45]

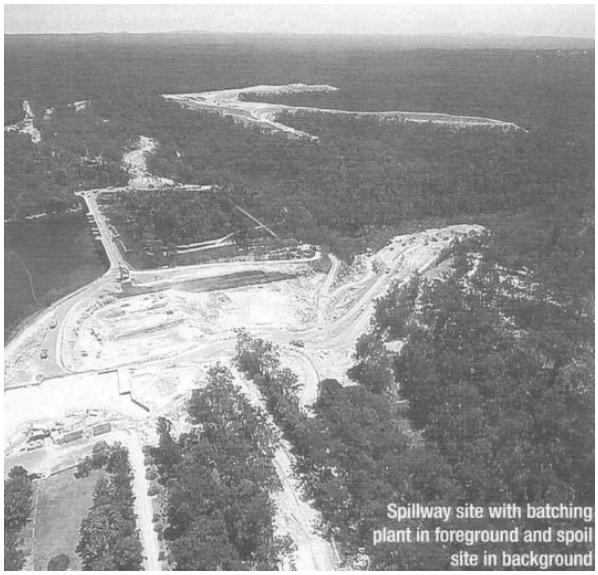


Figure 3.12: Photograph of the spillway under construction, c2000, showing impact to north-western end of Haviland Park (Source: RS/17 – 5, SWC/SCAHR&AF)

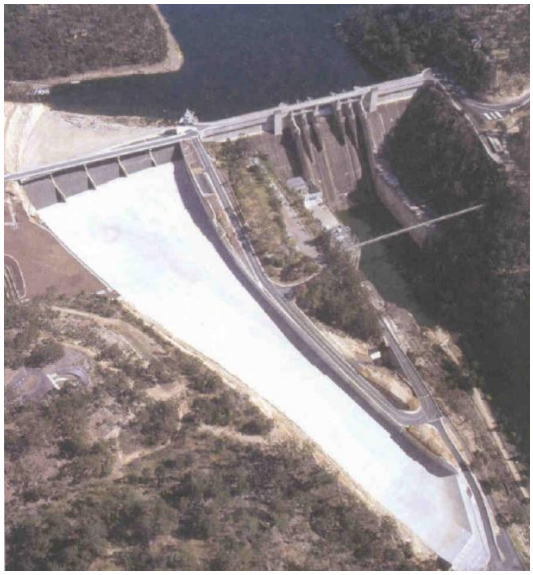


Figure 3.13: Overhead view of the newly completed auxiliary spillway, 2002 (Source: SCA)

3.4 Development of World and National heritage places in the study area

The following provides a brief overview history of the development of the World and National heritage places located within the study area. The development of the Greater Blue Mountains World Heritage property has been adapted from 'The Greater Blue Mountains Area: World Heritage Nomination' prepared by the Australian Government in 1998.

3.4.1 Development of the Greater Blue Mountains World heritage property (WHL 105127, NHL 105999, 105696)

In 1932, the genesis of a Greater Blue Mountains National Park was proposed by early conservationist Myles Dunphy. Dunphy's proposal for the national park comprised large areas of what are today the Blue Mountains National Park along with the Wollemi, Kanangra-Boyd, Nattai, Gardens of Stone and Thirlmere Lakes National Parks and other smaller reserves (Figure 3.14). The Dunphy Park proposal was submitted to the Surveyor General and the Blue Mountains Shire Council. The Blue Mountains National Park Committee was formed to promote the park, and in 1933 the committee evolved into the National Parks and Primitive Areas Council.[46]

In 1937, the gazettal of a reserve in the Kanangra-Boyd area represented the beginning of a lengthy process of establishing the Greater Blue Mountains National Park. In 1959, the Blue Mountains National Park was gazetted, covering an area of approximately 63,000 hectares.[47] The construction of the Warragamba Dam between 1948 and 1960 greatly affected southern portions of the Blue Mountains National Park, with the flooding of the Burragorang Valley. In 1969, the Kanangra-Boyd

[45] Graham Brooks & Associates. 2010:60.
[46] New South Wales National Parks and Wildlife Service in association with Environment Australia, 'The Greater Blue Mountains Area: World Heritage Nomination'. 1998:176.
[47] New South Wales National Parks and Wildlife Service in association with Environment Australia. 1998:176.

National Park was established, and a decade later an area to the north was included in the Wollemi National Park. [48]

Following the sustained efforts of conservation groups against competing interests during the 1990s, the Nattai National Park and Gardens of Stone National Park were established. By 1998, the area in the gazetted parks in relation to the 1932 scheme was almost double the size of the original Dunphy proposal for the Blue Mountains National Park.[49]

The protection of specific areas of wilderness proceeded slowly, but by the 1990s wilderness areas were gazetted at Nattai (1991), Kanangra-Boyd (1997), and Wollemi (1998).[50] In 1999, 37 walking tracks within the Blue Mountains National Park were added on the SHR. In 2000, the Greater Blue Mountains Area was inscribed on the UNESCO WHL, with the listing comprising 1.03 million hectares representative of the evolutionary adaptation and diversification of the eucalypts in post-Gondwana isolation on the Australian Continent.

[48] New South Wales National Parks and Wildlife Service in association with Environment Australia. 1998:178.
[49] New South Wales National Parks and Wildlife Service in association with Environment Australia. 1998:178.
[50] New South Wales National Parks and Wildlife Service in association with Environment Australia. 1998:178

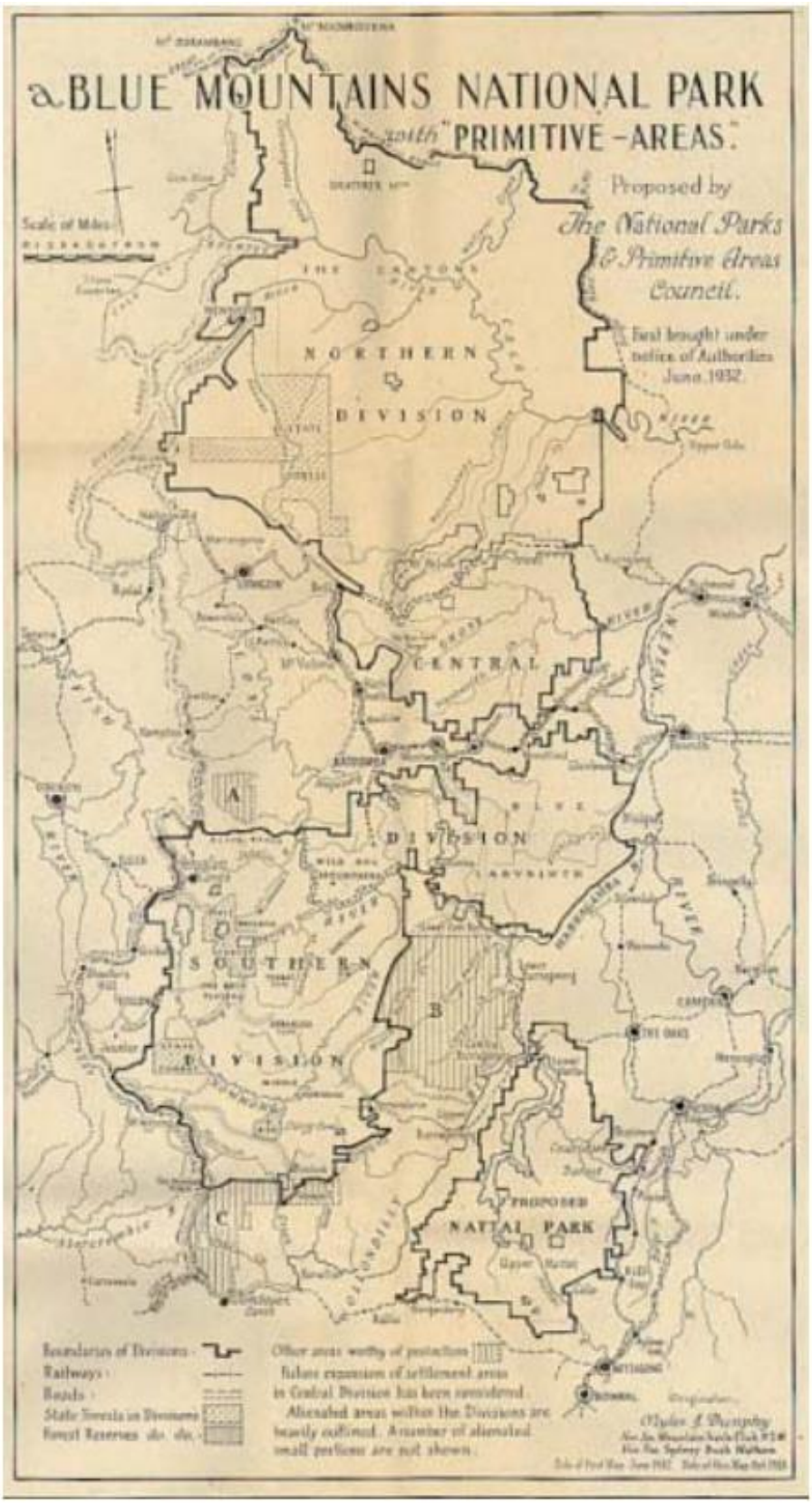


Figure 3.14: Plan of the proposed Blue Mountains National Park, 1932. (Source: Blue Mountains Gazette)

3.4.2 Development of the Australian Convict Sites World heritage property (Old Great North Road) (WHL 106209, NHL 105961, 106318)

The Great North Road is over 240km long and was constructed between 1826 and 1834 using convict labour and remains one of the major engineering feats of the convict era. The road runs from the Windsor Road in Baulkham Hills to Wiseman's Ferry, where it continues to Maitland and Singleton. During the time of the road's construction, the engineering involved was at the cutting edge of road building technology and incorporated the latest design ideas from Europe.[51]

Sections of the road remain in use today. In 2007, the Old Great North Road was recognised as a place of National significance on the NHL and was recommended for nomination on the WHL. In 2010, at the 34th session of the UNESCO World Heritage Committee, the Old Great North Road, along with ten other Australian sites with significant associations with convict transportation and labour, were inscribed as a group on the WHL as the Australian Convict Sites. The WHL listing for the Australian Convict Sites includes a Buffer Zone around the Old Great North Road.

Figure 3.15: 1833 watercolour, 'Convicts building road over the Blue Mountains, NSW 1833' (Source: National Library Australia, Call No. PIC Drawer 3842 #T2083 NK9673)

3.4.3 Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves (NHL 105817)

In the early years of European colonisation, the Ku-ring-gai area was primarily used for timber extraction and boat building, and soda ash, salt and shell lime were also collected and manufactured in the region. In 1855, a navigation light was established on Barrenjoey Head which was replaced in 1868, and a customs house also operated at Barrenjoey Head from 1843 to 1904. During the late 1870s, construction began on the railway to the Hawkesbury River. The Main Northern Line was constructed in two stages. The line between Strathfield and Hawkesbury River, known as The Short North, was opened in April 1887. At the northern end, it terminated at Brooklyn, and the station was named Hawkesbury River Station. The opening of the railway line and construction of the Hawkesbury River Station at Brooklyn led to consolidated settlement and development in the area.

[51] Convict Trail Project 1997 as in OEH 1997 'Old Great North Road, Between Devine's Hill and Mount Manning'

From the 1880s onwards, concerns were increasing around the loss of native vegetation and the degradation of bushland in and around Sydney. Around this time, Frederic Du Faur successfully lobbied the NSW Government to establish a park near Turramurra to protect native flowers from the surrounding expanding neighbourhood. In 1894, the conservation area “Ku-ring-gai Chase” was established, covering 13,500 hectares. The Ku-ring-gai Chase conservation area was administered by the Ku-ring-gai Chase Trust with Du Faur as managing trustee.

In 1967, after 73 years of management by the Trust, the Ku-ring-gai Chase was declared a National Park under the NPWS Act 1967. In 1919, Spectacle Island was dedicated as a reserve for public recreation, and as a nature reserve in 1972. In 1891 Long Island was reserved for public recreation and in 1972 became a nature reserve except for railway uses. In 1956, Lion Island was dedicated as a fauna reserve and was also dedicated as a nature reserve under the NPWS Act 1967. The Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves became a listed place on the NHL in December 2006.

Figure 3.16: Long Island and Dangar Island, Hawkesbury River 1910 (Source: State Library NSW)

4.0 EXISTING ENVIRONMENT

4.1 Site inspection

Site inspections were undertaken on 17 November 2017 and 8 March 2018. Due to the considerable number of listed heritage items within the study area, site inspections were limited to those places upstream and in the Construction study area. This included the Warragamba Dam site itself and Greater Blue Mountains Area. A site inspection was also undertaken for any WHL or NHL items within the operation zone.

The Project would reduce the extent of the existing downstream Probable Maximum Flood (PMF) and potential impacts to non-Aboriginal heritage items are expected to be minor. On this basis listed heritage items located downstream of the Project were not inspected.

Results of the site inspection are included under the heading for each listed item.

4.2 Australian Convict Sites (Old Great North Road) (WHL Place ID 106209, NHL Place ID 106318)

4.2.1 Description

The WHL entry for the Australian Convict Sites provides the following description of the item:

> *The property includes a selection of eleven penal sites, among the thousands established by the British Empire on Australian soil in the 18th and 19th centuries. The sites are spread across Australia, from Fremantle in Western Australia to Kingston and Arthur's Vale on Norfolk Island in the east; and from areas around Sydney in New South Wales in the north, to sites located in Tasmania in the south. Around 166,000 men, women and children were sent to Australia over 80 years between 1787 and 1868, condemned by British justice to transportation to the convict colonies. Each of the sites had a specific purpose, in terms both of punitive imprisonment and of rehabilitation through forced labour to help build the colony. The Australian Convict Sites presents the best surviving examples of large-scale convict transportation and the colonial expansion of European powers through the presence and labour of convicts.*

The NHL entry for the Old Great North Road provides the following description of the item:

> *The convict built Great North Road runs in a generally northward direction from Sydney for some 250 kilometres to Jerry's Plains in the Hunter Valley. North of Dural the road runs through farmland to the Hawkesbury River at Wiseman's Ferry. On the northern side of the Hawkesbury River the terrain rises steeply to a heavily dissected sandstone plateau cut by rivers, creeks and ravines. The road rises from the Hawkesbury via the Devine's Hill ascent to the plateau and then follows the narrow ridge-top of the Judge Dowling Range before descending at its northern end to the rich lands of the Hunter River Valley. Devine's Hill precinct is located within a 43 kilometre portion of the Great North Road that the National Parks and Wildlife Service (NPWS) terms the Old Great North Road (OGNR) to distinguish it from other portions of the route which have been modernised.*

The nominated place is the 7.5 kilometre portion of the Old Great North Road incorporating the 1.8 kilometre Devine's Hill section of road (built 1829-32) and the abandoned 5.2 kilometre Finch's Line (built 1828) which provide ascents from the Hawkesbury River on its northern side, opposite the town of Wisemans Ferry, to the sandstone plateau in an open forest setting plus the link road (0.5 km) joining them. The precinct lies within the Dharug National Park and the natural setting retains the qualities of the physical environment in which the convict road builders would have laboured. The scale and extensive nature of the road structures along this portion of the Old Great North Road represent the most advanced aspects of road engineering in the colony in the 1820s.

The Devine's Hill precinct of the Old Great North Road is part of a large complex of bushland that surrounds Sydney to the north and west, and is contiguous with the north-eastern extremity of the Greater Blue Mountains World Heritage Area. The environment of the Old Great North Road landscape reflects the ecology and ecosystems of this greater whole. While the plant biodiversity of the study area is a small part of an extensive whole, a number of threatened species grow in close proximity to the road.

The sandstone landforms make an important contribution to the character of the Old Great North Road due to the effect of differential weathering and contribute significantly to the aesthetic appeal of the landscape. The geology of the area is predominantly Hawkesbury Sandstone containing shale lenses but the ascents from the Hawkesbury River and the descent to the MacDonald River also pass through a narrow band of Narrabeen Series rocks (Bryan 1996). Both sandstone and shale have been extensively used in the construction of the Old Great North Road (NPWS 1999:15).The combination of monumental stone construction, rugged landscape, distinctive vegetation, spectacular views or aspects and intriguing sandstone formations has inspired a range of aesthetic responses to the Old Great North Road and its landscape, both historically and in the present community.

Where the Old Great North Road traverses the plateau it is through natural bushland and for much of the route, no signs of development can be seen in any direction. The setting of the Old Great North Road is important as it provides a sense of what nineteenth century travel was like. The scenic quality of the Old Great North Road landscape derives from the contrast between monumental stone remains and the seemingly undisturbed nature of the bush around them. Important views across undisturbed bushland are gained from the ridge top locations of the road, while the Finch's Line provides spectacular views over the Hawkesbury River and Wisemans Ferry.

4.2.2 Significance

The WHL entry for the Australian Convict Sites provides the following statement of Outstanding Universal Value:

The property consists of 11 complementary sites. It constitutes an outstanding and large-scale example of the forced migration of convicts, who were condemned to transportation to distant colonies of the British Empire; the same method was also used by other colonial states.

The sites illustrate the different types of convict settlement organised to serve the colonial development project by means of buildings, ports, infrastructure, the extraction of resources, etc. They illustrate the living conditions of the convicts, who were condemned to transportation far from their homes, deprived of freedom, and subjected to forced labour.

This transportation and associated forced labour was implemented on a large scale, both for criminals and for people convicted for relatively minor offences, as well as for expressing certain opinions or being political opponents. The penalty of transportation to Australia also applied to women and children from the age of nine. The convict stations are testimony to a legal form of punishment that dominated in the 18th and 19th centuries in the large European colonial states, at the same time as and after the abolition of slavery.

The property shows the various forms that the convict settlements took, closely reflecting the discussions and beliefs about the punishment of crime in 18th and 19th century Europe, both in terms of its exemplarity and the harshness of the punishment used as a deterrent, and of the aim of social rehabilitation through labour and discipline. They influenced the emergence of a penal model in Europe and America.

Within the colonial system established in Australia, the convict settlements simultaneously led to the Aboriginal population being forced back into the less fertile hinterland, and to the creation of a significant source of population of European origin.

***Criterion (iv):** The Australian convict sites constitute an outstanding example of the way in which conventional forced labour and national prison systems were transformed, in major European nations in the 18th and 19th centuries, into a system of deportation and forced labour forming part of the British Empire's vast colonial project. They illustrate the variety of the creation of penal colonies to serve the many material needs created by the development of a new territory. They bear witness to a penitentiary system which had many objectives, ranging from severe punishment used as a deterrent to forced labour for men, women and children, and the rehabilitation of the convicts through labour and discipline.*

***Criterion (vi):** The transportation of criminals, delinquents, and political prisoners to colonial lands by the great nation states between the 18th and 20th centuries is an important aspect of human history, especially with regard to its penal, political and colonial dimensions. The Australian convict settlements provide a particularly complete example of this history and the associated symbolic values derived from discussions in modern and contemporary European society. They illustrate an active phase in the occupation of colonial lands to the detriment of the Aboriginal peoples, and the process of creating a colonial population of European origin through the dialectic of punishment and transportation followed by forced labour and social rehabilitation to the eventual social integration of convicts as settlers.* [52]

The NHL entry for the Old Great North Road provides the following statement of significance:

[52] Commonwealth Department of the Environment: Accessed at http://www.environment.gov.au/heritage/places/world/convict-sites/values on 21/12/2017.

Finch's Line and the Devine's Hill ascent are important as a particularly challenging segment of the 250km long Great North Road. The road, built with convict labour, was commenced in 1826 and completed in 1836. This segment of the Great North Road contains a rich array of features associated with convict road building, including traces of the first road, known as Finch's Line constructed in 1828, the later road re-alignment ascending Devine's Hill built between 1829-32, the archaeological remains of a convict stockade which housed convicts during the building of the road, the landscape setting of the roads including the massive retaining walls and buttresses on Devine's Hill, culverts and the landscape along the roads and between the routes.

Governor Darling promoted the building of roads to assist in the development of the colony. Built as one of the Governor's three 'Great Roads', it linked Castle Hill just west of Sydney to the fertile and recently settled Hunter Valley. Road access via a permanent land route would provide the means of moving people, goods and large numbers of stock to the expanding district. Expansion and exploration were key aims of Governor Darling's administration and were sanctioned by the British Government which saw the economic opportunities they would bring. Road building was a civilising improvement and it played an important role in the transition of the colony from penal outpost to colonial settlement.

The Old Great North Road is also important for its role in the story of convict punishment. The system of using convicts in road gangs was a form of additional punishment, for offences committed in the colony and was known as secondary punishment. It was a particularly harsh form of punishment deliberately designed to deter criminal activity in Britain and in the Australian colonies. The very worst convicts were placed in iron collars and leg irons. The road gangs worked in isolated and harsh conditions for months on end with limited shelter from the elements and reduced rations. Despite these drawbacks the construction of the Great North Road was a significant achievement.

The monumental buttressed retaining walls and associated drainage system on Devine's Hill are an impressive example of the ambitious and exacting nature of work that involved surveying, engineering, blasting, quarrying and masonry carried out by the convict gangs under the direction of assistant surveyors. These structural features as well as the associated quarrying sites are still intact today and are undisturbed by development on or in the vicinity of the road.

Without such development, the Old Great North Road can provide information about colonial road construction and about how convicts lived and worked in this place. Evidence of convicts personalising their work can be found in convict graffiti rock carvings and the '25 R. Party' engraving indicating the road gang responsible for building this part of the road.

The Old Great North Road is regarded as outstanding for its social value with the local community, including through its association with the Convict Trail Project which draws together all parties with an interest in the Great North Road.

The Old Great North Road is valued as a public resource, a public thoroughfare and for its educational potential for present and future generations. [53]

4.2.3 Site survey

For the purposes of this assessment, a field survey of a localised section of the Australian Convict Sites/Old Great North Road was undertaken on 7 June 2018. This survey encompassed accessible areas of the Old Great North Road that are within or near the study area.

Figure 4.1: View north to entrance of Australian Convict Sites (Old Great North Road) from Settlers Road.

Figure 4.2: View north east along Settlers Road to Buffer Zone area around the Australian Convict Sites (Old Great North Road).

4.3 Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves (NHL Place ID 105817)

4.3.1 Description

The NHL entry for the Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves provides the following description of the item:

Ku-ring-gai Chase National Park has been a conservation area since 1894. It is located within the Sydney metropolitan area, approximately 20 kilometres north of the centre of Sydney and receives over 2 million visitors a year. The National Park includes Barrenjoey Head, the site of an early customs house and a lighthouse complex with two cottages. Lion Island (8 hectares) is situated just inside the entrance to Broken Bay and is entirely included in the nature reserve. Long Island is situated near the town of Brooklyn. Most of the island (73 hectares) is included in the nature reserve while a small area at the eastern end of the island is managed by the State Rail Authority and includes a railway tunnel and several buildings. Spectacle Island (36 hectares) is situated near the junction of the Hawkesbury River and Mooney Mooney Creek and is entirely included in the nature reserve (NSW NPWS 2002).

Covering an area of 14,882 hectares, Ku-ring-gai Chase National Park is located on the dissected Hornsby Plateau near the centre of the sedimentary Sydney basin

[53] Commonwealth Department of the Environment: Accessed at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105961 on 21/12/2017.

and demonstrates a range of landscapes, including drowned river valley estuaries, steep sandstone cliffs and plateaus (Thomas & Benson 1985). Lion Island, Long Island and Spectacle Island Nature Reserves are all located in the lower Hawkesbury River close to Ku-ring-gai Chase National Park.

Three major sedimentary formations dominate the geology within the area namely, Wianamatta shale, Hawkesbury sandstone and Narrabeen Group sandstones and shales. These formations were created during the early Jurassic and late Triassic (approximately 190 to 225 million years ago). The last major rise in sea level occurred during the Holocene and drowned the valleys of Cowan, Coal and Candle and Smiths Creeks to form the current foreshore. This rise in sea level also resulted in several peaks becoming islands, including Lion, Long and Spectacle Islands.

The place is within the Hawkesbury-Nepean catchment, an area with a very rich and distinctive assemblage of species that thrive on poor soils (Benson et al 1996, NSW NPWS 1996). The non-tree component is especially rich and contributes the major part of the plant biodiversity (Benson et al 1996). The place includes a complex pattern of vegetation communities such as heathland, woodland, open forest, swamps and warm temperate rainforest. The attributes and distribution of the vegetation communities within the National Park are strongly related to geology, soil, drainage and aspect. Species from the Proteaceae family are common in the understorey of the Hawkesbury sandstone (Howell and Benson 2000). Wet heathland occurs over Wianamatta shale platforms that remain on some ridge tops. The Narrabeen shales found in gullies and sheltered valleys support open forest communities of taller trees including some rainforest species.

The vegetation communities of most conservation significance in the place are those that are poorly reserved elsewhere (Thomas and Benson 1985). These tend to be associated with uncommon or remnant geological features or specific habitats and therefore tend to be small in area. Of special interest is the vegetation found on Wianamatta Shale that is generally open forest with dominant species being common name silvertop ash (Eucalyptus sieberi), myrtle wattle (Acacia myrtifolia) and spiny bossiaea (Bossiaea obcordata). The diatreme vegetation communities at Campbells Crater and Smiths Crater along with the vegetation growing on volcanic dykes at West Head are other products of unusual underlying geology. Three ecological communities listed on the New South Wales Threatened Species Conservation Act 1995 are also present, namely Duffys Forest, Pittwater Spotted Gum Forest, and Sydney Coastal River-flat Forest.

There are over 1,000 plant species recorded from the place (NSW NPWS 2002), including several species protected under the NSW Threatened Species and Conservation Act 1995: Caley's grevillea (Grevillea caleyi), Bynoe's wattle (Acacia bynoeana), a shrub (Haloragodendron lucasii), a shrub (Persoonia hirsuta), a shrub (Persoonia mollis spp. maxima) and a shrub (Asterolasia elegans). Additionally the following species have been listed as vulnerable: a shrub (Kunzea rupestris), a shrub (Darwiniabiflora), Camfield's eucalypt (Eucalyptus camfieldii), an orchid (Cryptostylis hunteriana) and a shrub (Tetratheca glandulosa) (NSW NPWS 2006a).

The place is recognised as containing a rich vertebrate fauna, a reflection of the diversity of vegetation communities and habitats in the area and the Park's location

in one of the most diverse parts of Australia, the Sydney basin. There are over 160 species of avifauna recorded. There are 28 mammals recorded in the park and reserves of which 11 are bats. The herpetofauna (reptiles and frogs) is diverse with about 62 species record, including about 20 species of frogs. There is also a rich though poorly recorded invertebrate fauna, including over 100 species of butterfly and moths (NSW NPWS 2002; DEH 2006b; Ku-ring-gai Council 2005).

There are 13 animals found in the place listed under the NSW Threatened Species and Conservation Act 1995. Regionally significant populations of several fauna species occur within the National Park including the spotted-tailed quoll (Dasyurus maculatus), the southern brown bandicoot (Isoodon obesulus obesulus), the koala (Phascolarctos cinereus), and the eastern bent-wing bat (Miniopteus schreibersii) (NSW NPWS 2002).

Lion Island, at the entrance to Broken Bay, provides breeding habitat for several Environment Protection and Biodiversity Conservation Act 1999 (EPBC) listed Marine and Migratory bird species; including the wedge-tailed shearwater (Puffinus pacificus), the sooty shearwater (Puffinus griseus) and the little penguin (Eudyptula minor) (DEH 2006a). The breeding colony of little penguins on Lion Island has been the subject of long term research (Rogers et al 1995; Knight and Rogers 2004). Almost all breeding little penguins in the Sydney region are to be found on Lion Island, and long term studies have shown the reproductive success to be higher and more stable than populations at other locations.

The place is an important scientific and educational resource used by many universities and research institutions in the Sydney Region. Pollen and charcoal analysis from South Salvation Creek Swamp provide an indication of the change in species composition over the last 6,000 years and records from moist scrublands and swamps within the place indicate that they may be representative of a cycle of swamps built up, scoured and destroyed and reformed over thousands of years.

Extensive evidence of Aboriginal use and occupation occurs in the place, with over 800 sites or locations with physical evidence of Aboriginal use recorded (NSW NPWS 2002, NSW NPWS 2006b). Shell middens along the foreshore are the most common type of evidence recorded. Other evidence includes rock engravings and paintings, grinding grooves, stone arrangements, burials and occupation sites. No systematic survey has been undertaken across the park, and it is likely that additional sites occur within the park.

The Great Mackeral rock shelter has been excavated within the park. Dates for the site range from 3,670 ± 150 to 220 ± 120 Before Present (McDonald 1992a). McDonald suggests that the art in this shelter was made from 600 years ago until just prior to contact. Attenbrow also states that temporal changes in the proportions of the dominant shellfish were documented at Great Mackerel Beach, near the estuary mouth, where radiocarbon determinations indicate the shell-bearing layer extends from about 560 to 220 years ago (Attenbrow 2002:68).

Rock art within the place has been investigated by McDonald (1994) as part of a broader analysis of rock art in Sydney Basin. Specific features of the Sydney Basin rock art include: pecked intaglio motifs, interpreted as being a 'residual Panaramittee' assemblage (predating the majority of art and occupation in the Sydney region); shelter art sites present in large numbers across the entire

sandstone landscape, while engraving sites are more geographically confined, with a dense core of engraving sites in the central coastal area; and a small number of engravings found on vertical boulders in close proximity to major waterways. There are striking similarities in the motif preferences of both art forms, as well as several major differences (e.g. marine depictions in engravings but not in the shelter art). Stylistic differences in both engravings and paintings across the region may demonstrate the nature of contacts between language groups. There was generally less stylistic homogeneity in pigment art than engravings; however the Ku-ring-gai area was a sharp contrast, as it had a core and highly homogenous engraving assemblage while the pigment art was highly heterogenous. There is no evidence for a change in motif forms over time, with the exception of change from early to later style engravings.

The mainland areas of the park include wharves associated with recreational use as well as walking tracks, such as that built to Perry's Lookout on Pittwater, and roads. The two main roads are from North Turramurra to Bobbin Head (1901) and from Mount Colah railway station to the Bobbin Head road via a causeway (1903). There are also roads to Illawong and Apple Tree Bay.

The park was originally established under management by the Ku-ring-gai Chase Trust. Properties originally purchased or managed by the Trust include 'The Basin' on Pittwater (purchased 1915), 'Beechwood Cottage' (erected in 1882), 'Bobbin Inn' as well as jetties, boatsheds and a swimming enclosure.

A number of observation posts and other defence emplacements were constructed at West Head. Between 1924/1925, a small replica of the Great Sphinx was carved out of sandstone near Turramurra. The monument is flanked by two small pyramids inscribed in memory of AIF comrades who died during World War I.[54]

4.3.2 Significance

The NHL entry for the Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves provides the following summary statement of significance:

Ku-ring-gai Chase National Park and Long Island, Lion Island and Spectacle Island Nature Reserves contain an exceptional representation of the Sydney region biota, a region which is recognised as a nationally outstanding centre of biodiversity. The place contains a complex pattern of 24 plant communities, including heathland, woodland, open forest, swamps and warm temperate rainforest, with a high native plant species richness of over 1000 species and an outstanding diversity of bird and other animal species. This diversity includes an outstanding representation of the species that are unique to the Sydney region, particularly those restricted to the Hawkesbury Sandstone landform. The place is an outstanding example of a centre of biodiversity.

[54] Commonwealth Department of the Environment: Accessed at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105817 on 1/3/19

4.3.3 Site survey

For the purposes of this assessment, a field survey of a localised section of the Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves was undertaken on 6 June 2019. This survey encompassed accessible areas within or near the study area.

Figure 4.3: View south east from Flat Rock Point across the Hawkesbury River towards a portion of the Ku-ring-gai Chase National Park within the study area.

Figure 4.4: View north east across Cowan Creek at Bobbin Head, within a portion of the Ku-ring-gai Chase National Park within the study area.

4.4 Warragamba Dam - Haviland Park (SHR No. 01375)

4.4.1 Description

The SHR listing for the Warragamba Dam – Haviland Park heritage item provides the following description of the item:

Warragamba Dam is located in a narrow gorge within the Warragamba River, approximately 65 km west of Sydney and 15km south of Penrith. The south-eastern corner of the site connects to the Warragamba township established as part of the Warragamba Supply Scheme. The northern side of the dam is adjacent to the Blue Mountains National Park. East if the dam is a large Entry Precinct and Picnic Grounds, and Haviland Park is between this Precinct and the dam itself and spillways.

Haviland Park is to the dam's east and covers 10 acres contains plantings and built features which are substantially intact from the time of establishment in the 1960s. There is remnant evidence of the construction apparatus, including rail tracks, building footings, concrete anchors, former aggregate conveyor tunnel, existing terraced road alignments, 19 ton cableway and associated machinery. The existing timber and fibro systems office (former engineers office) and information centre (former staff mess) which constitute the only two remaining buildings from the original construction site.

Haviland Park now comprises two open, relatively level grassed areas bounded by native and introduced trees and shrubs. The most prominent are two rows of sweet gums (Liquidambar styraciflua) planted during the 1960s. The areas are bounded by access roads with newly formed car parking areas and kerbs also provided. The precinct is the major open space recreation area of the dam but has been closed

since 1997 due to construction works at the site. (Sydney Catchment Authority, 2007, 1).

Haviland Park covers an area of 10 acres contains plantings and built features which are substantially intact from the time of establishment. There is remnant evidence of the construction apparatus, including rail tracks, building footings, concrete anchors, former aggregate conveyor tunnel, existing terraced road alignments, 19 ton cableway and associated machinery.

The tree lined avenue of exotic and indigenous plantings includes; coastal redwood (Sequoia sempervirens), Chinese tallow tree (Sapium sabiferum), brush box (Lophostemon confertus), sweet gum (Liquidambar styraciflua), paperbark (Melaleuca sp.), Jacaranda, camphor laurel (Cinnamomum camphora), plus major species of Monterey pine (Pinus radiata), Eucalypt, and she-oak (Casuarina sp.). The site is surrounded by a dry packed stone retaining wall. A landscaped exotic garden and steps adjacent to the existing picnic shelter to the north. This garden comprises significant plantings, in this instance of Cacti, Agave, succulents, and Yuccas. Access is provided to the Folly Creek area.

The facilities available for public use include, parking areas, viewing points, picnic areas with tables and seats, barbeque fireplaces, with wood provided, boiling water installations, children's playgrounds, shelter sheds, public toilets, and drinking fountains. The existing timber and fibro systems office (former engineers office) and information centre (former staff mess) which constitute the only two remaining buildings from the original construction site.[55]

Note: the SHR listing description has not been updated and some information may be inaccurate. For example, the 'information centre' (former staff mess) was destroyed by fires in 2001.

4.4.2 Significance

The SHR listing for the Warragamba Dam – Haviland Park heritage item provides the following statement of significance:

Haviland Park has a high level of state heritage significance for several reasons. It represents the pinnacle of quality visitor facilities provided by the Board at Dam sites. It contains numerous archaeological, architectural and engineering remnants from the dam's construction. The Park displays a high degree of formality and planning and is rich in both exotic and native botanical species which contribute to the landscape significance of the park. It commemorates the role of Haviland, without whom the numerous landscaped parks and reserves of the Dams would not have been established, nor executed with such high regard for design and formalism. It is highly valued by the community of New South Wales as a place for passive recreation, leisure activities and sightseeing pursuits. Sydney Water continues the role of maintaining Haviland Park and providing visitor facilities.[56]

[55] Office of Environment & Heritage, State Heritage Inventory: 'Warragamba Dam – Haviland Park' http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5051483. Accessed 12 June 2018

[56] Office of Environment and Heritage, 'Warragamba Dam – Haviland Park'. Accessed at: http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5051483 on 03/05/2018.

4.4.3 Site survey

For the purposes of this assessment, a field survey of Haviland Park was undertaken on 8 March 2018. This survey encompassed accessible areas of the park, which has been assessed as being affected by greater levels of anticipated impact from the project.

It is noted that at the time of the survey, many of the significant elements listed on the SHR are no longer extant, having been damaged or destroyed by the December 2001 bushfires (refer to Section 3.3.8). The only remaining significant elements comprise a remnant fountain base, several mature plantings at the southern end of the site and sections of dry packed stone retaining wall. A former aggregate conveyor tunnel also remains within the site.

Figure 4.5: View south-east across Haviland Park towards remnant fountain base.

Figure 4.6: View east to remnant fountain base within Haviland Park.

Figure 4.7: View north across Haviland Park within the construction footprint.

Figure 4.8: View to entry gate at Haviland Park.

4.5 Warragamba Emergency Scheme (SHR No. 01376, LEP No. I270)

4.5.1 Description

The SHR listing for the Warragamba Emergency Scheme heritage item provides the following description of the item:

> *Construction site for the Warragamba Emergency Scheme was located on the east bank of the Warragamba River. Access to the site was along the road currently known as Weir Road. Major elements of the construction works still extant include the weir, a 10-cable cableway, shads, batching plants, roads, electrical substation,*

chlorination plant, maintenance staff accommodation, balance reservoir, Megarrity's bridge, water pumping station, tunnels, and associated pipelines.[57]

4.5.2 Significance

The SHR listing for the Warragamba Emergency Scheme provides the following statement of significance:

The Emergency Scheme is representative of the collective engineering response to Sydney's critical water shortage during the Second World War period. It was the first stage in the storage and extraction of water from the Warragamba River, and was preliminary to the Warragamba Dam. All of the components are excellent examples of the civil engineering skills of the times; the Balance Reservoir is particularly significant because it provides a stilling pool downstream of Warragamba Dam for the purpose of flood discharge; the group of five cottages associated with the construction of the dam are considered to be of high significance because they housed the operations staff between 1940 and 1959. These have since been incorporated into the Warragamba township, one of the largest townships in the Shire of Wollondilly.[58]

4.5.3 Site survey

For the purposes of this assessment, a field survey of key elements of the Warragamba Emergency Scheme was undertaken on 8 March 2018. This survey encompassed accessible areas assessed as being affected by greater levels of anticipated impact from the project.

Figure 4.9: View north-east from Weir Road towards Megarritys Bridge.

Figure 4.10: View south-west along Weir Road towards pumping station.

[57] Office of Environment & Heritage, State Heritage Inventory: 'Warragamba Dam – Haviland Park' http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5051483. Accessed 12 June 2018

[58] Office of Environment and Heritage, 'Warragamba Emergency Scheme'. Accessed at: http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5051484 on 03/05/2018.

Figure 4.11: View down from Weir Road to weir structure.

4.6 Warragamba Supply Scheme (WaterNSW Section 170 Heritage and Conservation Register No. 4580161, LEP No. I270)

4.6.1 Description

The SHI database listing card for the Warragamba Supply Scheme does not provide a physical description of the item. The Warragamba Supply Scheme CMP 2010 identifies the item as comprising of three major components including the Warragamba Dam, the Warragamba Emergency Scheme and Warragamba-Prospect Pipelines 1 & 2.[59]

The Warragamba Dam includes the main dam wall. This component has a crest extending to a length of 351 metres, and a total height of 142 metres. The dam is a straight gravity wall and contains the following sub-components:

- Crest gantry crane
- Crest gates
- Dam outlets
- Internal inspection galleries, lift shafts, and access tunnels
- 18 ton Cableway (upper tail tower)
- Haviland Park
- Hydro-electric power station
- Suspension bridge
- Valve house
- Picnic grounds
- Dam models and existing visitor centre
- Production office and other buildings within Haviland Park
- Conference Centre
- Former construction township.

The Warragamba Emergency Scheme includes the following sub-components:

- Warragamba Emergency Pumping Station No.9

[59] Graham Brooks & Associates. 2010:8.

- Warragamba Weir
- Balance Reservoir
- Former construction township
- Megaritty's Bridge.

4.6.2 Significance

The SHI database listing card for the Warragamba Supply Scheme heritage item provides the following statement of significance:

> *The Warragamba Supply Scheme is the largest and most important of the water supply systems to provide a secure water supply to satisfy the demands of industrial, commercial and residential development of metropolitan Sydney. The dam, associated infrastructure and pipelines is one of the largest (possibly largest) of any type of dam in the world constructed specifically for an urban water supply.*
>
> *The Warragamba Dam foundation and wall drainage systems, and the post-war architectural expression of the crest, lift towers and Valve House collectively continue to be integral elements of an outstanding example of a high, straight concrete gravity wall, which at the time of construction was the highest concrete gravity dam in the world constructed on stone foundations.*
>
> *The scale of the use of mass concrete in the in the dam wall is unique in New South Wales. The design of the spillway incorporated in the wall and crest gates demonstrate a notable technological advancement and are possibly the only extant examples of their type in Australia.*
>
> *The means of construction and infrastructure established for the construction of the dam, involved innovative techniques that were used for the first time in Australia, such as the pre-stressed concrete frame of the ice making plant and the use of circulated chilled water to cool the concrete being placed. The techniques also incorporated equipment and fabric from previous Board works and brought together experience gained from these earlier works and overseas models.*
>
> *The Dam contains in-situ items of post-war era water delivery technologies developed by the Water Board, such as lengths of pipes, emergency roller gate, trash racks and penstocks which in consideration of their scale and integrity are rare examples of their types. The welded mild steel delivery pipeline similarly represents a notable advance in construction technology for the period.*
>
> *It contains items of machinery and structures which are significant due to their relationship and role they played during the construction period, and which continue to demonstrate the means of construction and operations such as the Upper Tail Tower and remains of the Warragamba Suspension Bridge.*
> *The dam is a regional landmark that has engendered beautification works undertaken from early in the construction phase to post completion of the dam for the use of local and general visiting public.*
>
> *The picnic areas in particular have strong associations with past management practices of the Water Board and Haviland Park in particular demonstrates the Board's recognition of the scale and importance of the dam and adoption of a more sophisticated approach to picnic area and park design and layout under the influence of specialist consultants such as Professor Spooner. The grounds of the dam are associated with the local and regional community of Sydney as a longstanding place of passive recreation.*[60]

[60] Office of Environment and Heritage, 'Warragamba Supply Scheme'. Accessed at: http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=4580161 on 03/05/2018.

4.6.3 Site survey

For the purposes of this assessment, a field survey of the Warragamba Supply Scheme was undertaken on 8 March 2018. This survey encompassed accessible areas assessed as being potentially impacted by the project, comprising the main dam wall and its associated features, surrounding picnic grounds including Haviland Park (above) and the Terraced Garden. A detailed description of the dam wall is provided below as adapted from the Warragamba Supply Scheme CMP 2010.

The existing dam wall structure comprises a straight gravity wall of mass concrete on sandstone foundations. The upstream face is vertical except near the crest where it is slightly cantilevered, the downstream face is approximately a 45 degree slope except at the crest, which is vertical. The wall is presently 142 metres from its lowest foundation to the crest.

The crest of the dam wall contains five flood control gates, crest bridges, roadway and lift towers. Four concrete piers extend from the top of the dam wall on the downstream face and frame the four original radial gates and central drum gate. The features of the downstream face of the wall are symmetrically arranged around the central drum gate. Two simply detailed original lift towers remain despite the 1990s raising of the wall, and these feature rectangular windows at the top that are surmounted by typical stepped fascia detail and flat roofs. The crest roadway comprises a vehicular road with crane rails and pedestrian pathways to either side, which in turn are bounded by a simple steel balustrade on a low concrete plinth. Remnant machinery, comprising the crest crane, and several memorials and plaques are located on the crest road.

The structure of the dam wall also contains several subcomponents comprising longitudinal and vertical contraction joints, a v-shaped thrust trench below the general foundation level, a cut-off trench below the general foundation level upstream of the dam and silt coffer dam for the low level outlet, a series of drainage and inspection galleries accessed via the electric lift well, a series of lower drainage and inspection galleries, four outlets that draw water from Lake Burragorang, a 14 foot diameter penstock that supplies water to the Hydro-electric plant (which has been decommissioned), and dam strain meters and network of survey stations around the site, within the dam wall and on the downstream face that study the movement of the wall.

Figure 4.12: View north-west to existing bridge on Production Avenue over auxiliary spillway and crest road on the dam wall, note blue crest crane in distance.

Figure 4.13: View north-west from terrace garden picnic area showing the dam wall and towers and downstream face.

Figure 4.14: View down from Crest Road to the Valve House and attached annexe building located to the rear.

Figure 4.15: View west from Production Avenue towards the original blue-painted and track mounted crest crane on the dam wall.

Figure 4.16: View north-west across Haviland Park towards the dam, remnant fountain base seen in distance.

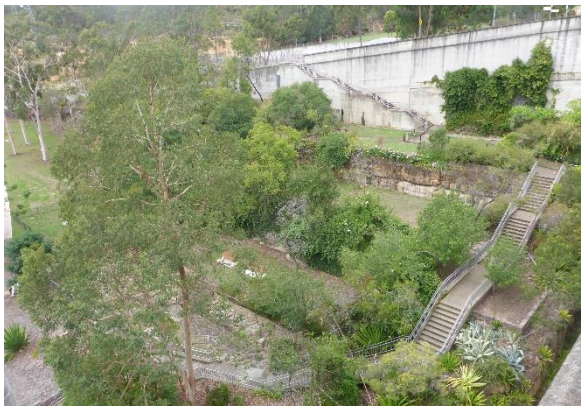


Figure 4.17: View down from Crest Road to existing landscaping and stairs in the Terraced Garden adjacent to the dam wall.

Figure 4.18: 1930 commemorative plaque from the dam's opening, located on Crest Road.

4.7 Jooriland Homestead

Jooriland Homestead has been identified in previous studies as having heritage significance, despite its not being included on any statutory register. Due to these known heritage values, the site has been included here.

4.7.1 Description

Remnants of the former substantial sheep and grazing station known as 'Jooriland' are located in the upper Wollondilly. The property was in use until the 1980s, with the homestead residence occupied into the 1960s. An article published in 'The Land'[61] references historical background taken from a 2006 heritage study prepared for the former NSW Department of Environment and Conservation. This document could not be sourced during the production of this assessment, although the historical context outlined in the article is summarised below:

> *A heritage study prepared in 2006 for the then NSW Department of Environment and Conservation shows John Wild – a former government cattle herdsman at Camden – as the first grantee of land that would become "Jooriland", in the early 1850s. Following Wild's death in 1857 the 12ha riverside block was held by his family until 1875, when it was bought by Edward Moore from Oran Park… He obtained additional grants to build "Jooriland" to its final size and erected the timber homestead that still stands, before selling in 1902 to George and Amelia Egan, who held the property until 1925.*
>
> *Then ensued the first of the property's two tenures by prominent pastoral families, when it was acquired by Denzil (later Sir Denzil) Macarthur-Onslow – a descendant of Merino pioneer John Macarthur - for the family-controlled Camden Park Estates.*
>
> *… Camden Park Estates held "Jooriland", which they ran primarily as a sheep station in conjunction with their Camden dairy interests, until 1936, when it was bought by a Sydney property dealer, Frank Thurecht…in 1939 the property again changed hands, this time to a sibling partnership of the Pye pastoral family.*
>
> *…In 1947 Henry and Richard Pye sold "Jooriland" to another brother, Walter Pye, a prominent Sydney businessman and philanthropist (who later donated his historic home, "Lindesay" at Darling Point, to the National Trust).*

A description of the site included in an article published in 'The Land' in October of 2018[62] states that the property retains the original timber homestead, shearing shed, shearer's quarters, plunge dip and wool press. The property was obtained by the National Parks and Wildlife Service in 1993.

4.7.2 Significance

The Homestead is not listed on any statutory heritage register. To determine the heritage significance of this item a heritage assessment of the Jooriland Homestead should be undertaken by the asset owner. If the site is found to have significance at a local or state level, and therefore be eligible for listing on a statutory register the assessment would also provide recommendations around future management of the site.

[61] Austin, P. 'Painting revives rich Burragorang Hisotry' *The Land* 21 October 2018
[62] Austin, P. 'How Jooriland joined pastoral pyes' stable' *The Land* 21 October 2018

5.0 ARCHAEOLOGICAL ASSESSMENT

5.1 Archaeological potential

This section discusses the potential of the construction study to contain historical archaeological resources. The potential for the survival of archaeological remains is significantly affected by activities which may have caused ground disturbance. This assessment is therefore based on consideration of current ground conditions, and analysis of the historical development of the study area.

'Archaeological potential' refers to the likelihood that an area contains physical remains associated with an earlier phase of occupation, activity or development of that area. This is distinct from 'archaeological significance' and 'archaeological research potential'. These designations refer to the cultural value of potential archaeological remains and are the primary basis of the recommended management actions included in this document.

Excavation works associated with the project are confined to the construction zone only, which was the focus of the following archaeological assessment. Potential upstream and downstream impacts would be associated with increased periods of inundation, which would have minimal impact on subsurface archaeological remains.

5.1.1 Summary of historic land-use

To assess the potential extent of archaeological evidence within the study area, the primary phases of development, and potential associated land uses, are summarised below:

- Phase 1 (c.1800 – c.1900): Early land grants and rural development
- Phase 2 (c.1900 - 1940): Urban expansion/Warragamba Dam.

5.1.2 Known impacts

Several factors must be considered when assessing archaeological potential of the study area. The landscape surrounding the site of the Warragamba Dam has undergone substantial modification through construction and upgrades. These works have resulted in impact to evidence of the construction of the original Warragamba Emergency Scheme and construction areas.

The construction of the auxiliary spillway in the late 1990s removed the construction terraces that formerly held the ice making plant, concrete mixing plant, mechanical workshop and cement silos.[63] Construction of the Warragamba Deep-Water Storage Access infrastructure in the early 2000s impacted on the site of the former chlorination plant, WPS009 and part of the former substation.[64]

5.1.3 Discussion of archaeological potential

The following section will discuss the potential for the study area to contain archaeological remains associated with historical phases of development of the study area.

[63] Graham Brooks and Associated Pty Ltd June 2010 p. 279
[64] Ibid

Phase 1: Early land grants and rural development

There is **nil to low potential** that archaeological evidence of land clearance, and modification for agricultural or pasturing purposes, pre-dating the construction of the Warragamba Dam, would be located within the study area. Evidence for these types of activities are typically ephemeral and are therefore likely to have been disturbed by ongoing modification of the landscape through construction. Archaeological remains may include the following:

- Evidence of tree clearance (tree boles, etc.)
- Evidence of cultivation (postholes, plough marks in subsoils, etc)
- Evidence of the formalisation of agricultural precinct boundaries, such as postholes associated with early fence lines.

Phase 2: Urban expansion/Warragamba Dam

The Warragamba Supply Scheme CMP 2010 identified several locations with the potential to contain an archaeological resource. The following potential archaeological resources are located within the construction footprint of the proposed works:[65]

- The original construction township from the Warragamba Emergency Scheme and early years of site testing and establishment for Warragamba Dam – this was originally located on the ridge to the east of the river and is now mostly outside the ownership boundaries of the dam site
- Evidence of the construction and operation of the Warragamba Emergency Scheme including the power station, chlorination and alum plant, batching plant and support sheds, which remain on the eastern back of the river
- The single men's quarters and site of the wet canteen from the Warragamba Dam construction township on either side of the road to the Dam lookout
- Staff barracks on the eastern side of the entrance road adjacent to Haviland Park
- Junior staff quarters on the northern side of the road to the conference centre
- The aggregate bins, aerial ropeway and depot in the area now occupied by Haviland Park
- Evidence of former roads and stores area to the east of the auxiliary spillway
- Evidence associated with the 10-tonne cableway in the Terraced Gardens
- Evidence associated with the 18-tonne cableway on the eastern side of the dam[66] and the upper and lower tail tower foundations on the western side of the dam.

A summary of the archaeological potential of Warragamba Dam is included in Table 5.1 and is illustrated in Figure 5.1.

[65] Graham Brooks and Associates Pty Ltd, June 2010 p.278
[66] Ibid

Table 5.1: Summary of archaeological potential

Phase	Potential archaeological remains	Level of disturbance	Archaeological potential
1: Early land grants	Evidence of land clearance, and modification for agricultural or pasturing purposes including tree boles, plough marks and fence lines.	High level of disturbance through 20th century construction activity	Nil to low
2: Warragamba Dam	Evidence of the original emergency scheme (power station, chlorination and alum plant, batching plant and support sheds) and construction camp. Remains may include: • building platforms, retaining walls, guttering and drainage, artefact deposits and possibly some building footings • concrete slabs and plinths, disused services and pipelines, former roadways (some with bitumen or gravel surfaces), concrete pathways and steps, dry packed retaining walls, artefact deposits and evidence of rock cuttings.[67]	Localised disturbance through demolition and later construction activities	Moderate to high
2	Remains of the Warragamba Dam construction camp including: • Evidence of the single men's barracks including footings, roads, paths, disused services and artefact deposits • evidence of former anchor tunnel, tail tower footings and pathways • evidence of junior and senior staff barracks including footings, services, artefact deposits and landscaping features.[68]	Localised disturbance through demolition and later construction activities	Moderate to high
2	Evidence of the construction of Warragamba Dam including: • The carpenter's stores and Folly Creek suspension bridge including concrete slabs and footings, pits, services and the concrete slab and anchor tunnel for the suspension bridge • Former roads and road surfaces • Footings and disused services associated with the former offices • Evidence of the 18 and 10 tonne cableways including concrete slab footings, tracks and buffer stops of the 18 tonne cableway travelling tail tower; footings of the former electricity sub-station; the west-bank block anchor for the Warragamba Gorge suspension bridge; and the slab footing of the former compressor house.	Heavy localised impact through construction of the auxiliary spillway in the 1990s Construction of the Warragamba Deep-Water Storage Access Infrastructure in the early 2000s impacted on the site of the former chlorination plant and substation Construction of the visitor's centre in 2008 impacted some of the archaeology associated with the McCann's Island aerial ropeway under Haviland Park	Moderate to high

[67] Graham Brooks and Associates Pty Ltd, June 2010 p.278
[68] Ibid

Phase	Potential archaeological remains	Level of disturbance	Archaeological potential
	• The current terraced gardens contain the space formerly occupied by the travelling 10 tonne cableway tower and its tracks and may also contain footing slabs from the former compressors, pumps and coolers • Evidence of the original upstream coffer dam.[69]		

[69] Graham Brooks and Associates Pty Ltd, June 2010 p.278

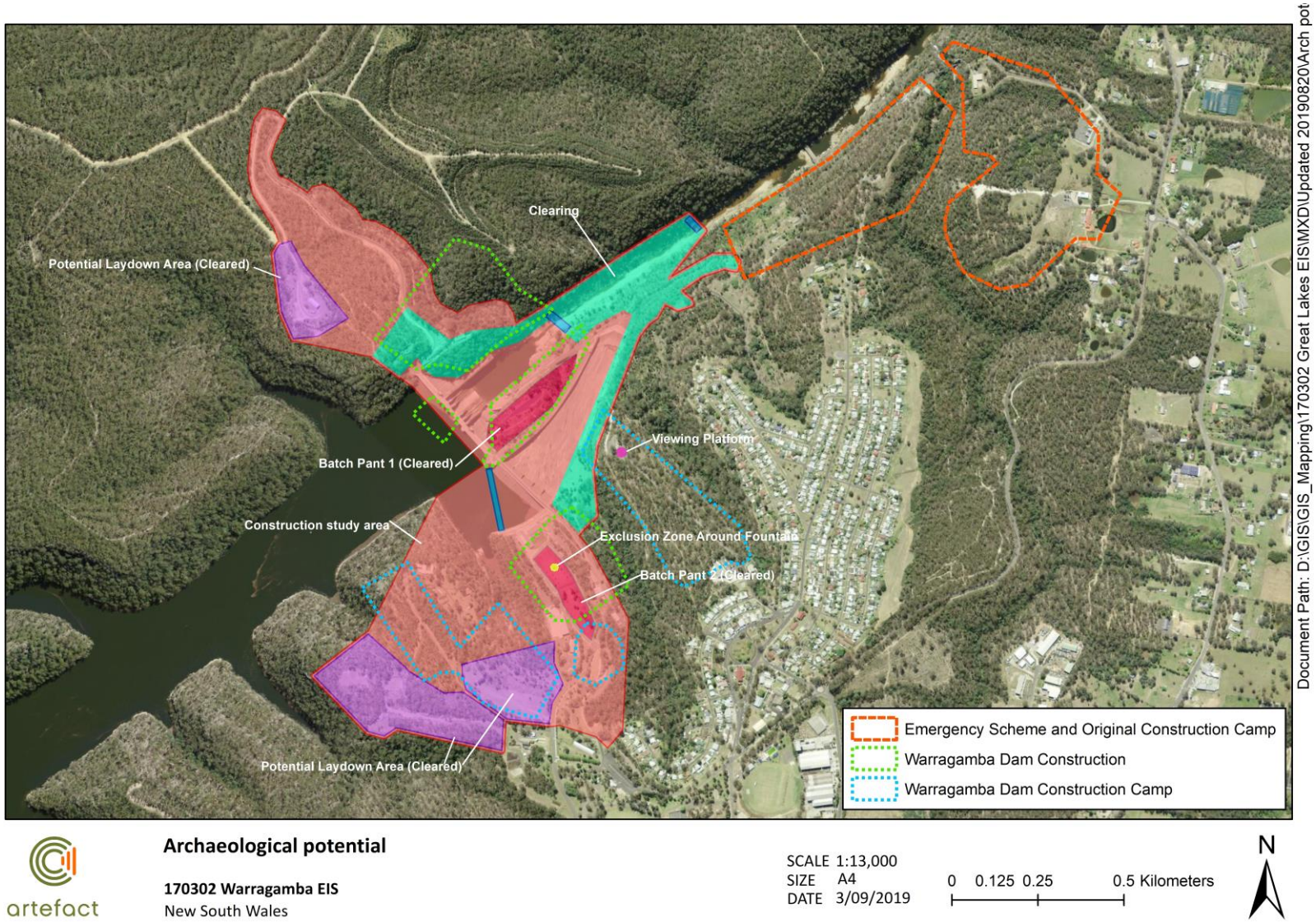


Figure 5.1: Overview of location of potential archaeological resources (see Table 5.1 for discussion of archaeological potential)

5.2 Archaeological significance

Archaeological significance refers to the heritage significance of known or potential archaeological remains. As with other types of heritage items, archaeological remains should be managed in accordance with their significance. In situations where development is proposed, this can influence the degree of impact that may be acceptable or the level of investigation and recording that may be required.

While archaeological remains often form an integral component of the overall significance of a heritage place, it is necessary to assess them independently from above ground and other historic elements. Assessing the heritage value of archaeological remains is made more difficult by the fact that their extent and nature is often unknown. It becomes necessary for judgement to be made based on expected or potential attributes. The NSW Heritage Branch document *Assessing Significance for Historical Archaeological sites and 'Relics'*[70] provides the framework for the following significance assessment. A summary of the criteria is included in Table 5.2.

Table 5.2: Overview of NSW Heritage Branch archaeological significance criteria

Heritage Branch archaeological significance criteria	Meaning
Archaeological Research Potential (NSW Heritage Criterion e)	Archaeological research potential is the ability of the archaeological evidence, through analysis and interpretation, to provide information about a site that could not be derived from any other source, written or otherwise, and which contributes to the archaeological significance of the site and its 'relics'. The integrity of a site, the state of preservation of archaeological material and deposits will also be relevant.
Association with individuals or groups of historical importance (NSW Heritage Criteria a, b and d)	Archaeological remains may have associations with individuals, groups and events which may transform mundane places or objects into significant items through the association with important historical occurrences.
Aesthetic or technical significance (NSW Heritage Criterion c)	Whilst the technical value of archaeology is usually considered as 'research potential' aesthetic values are not usually considered to be relevant to archaeological sites. This is often because until a site has been excavated, its actual features and attributes may remain unknown. It is also because aesthetic is often interpreted to mean attractive, as opposed to the broader send is sensory perception or 'feeling' as expressed in the *Burra Charter*. Nevertheless, archaeological excavations which reveal highly intact and legible remains in the form of aesthetically attractive artefacts, aged and worn fabric ad remnant structures, may allow both professionals and the community to connect with the past through tangible physical evidence.

[70] Heritage Branch Department of Planning *Assessing Significance for Historical Archaeological Sites and 'Relics'* December 2009 p11-14

Heritage Branch archaeological significance criteria	Meaning
Ability to demonstrate the past through archaeological remains (NSW Heritage Criteria a, c, f and g)	Archaeological remains have an ability to demonstrate how a site was used, what processes occurred, how work was undertaken and the scale of an industrial practice of other historic occupation. They can demonstrate the principle characteristics of a place or process that may be rare or common. A site may best demonstrate these aspects at the time of excavation. It may also be possible to explain the nature of the site and demonstrate past practises via public interpretation with before, during, or after excavation.

5.2.1 Assessment against the NSW heritage assessment guidelines

The construction study area has been assessed as having **moderate to high** potential to contain an archaeological resource associated with the construction of the Warragamba Emergency Scheme and construction camp and township of the 1930s to 1960s.

The assessment of the significance of the potential archaeological resource contained within the study area against the NSW heritage assessment criteria is outlined in Table 5.3.

Table 5.3: Consideration against NSW heritage assessment criteria

Criteria	Discussion	Local	State
A – Historical Significance An item is important in the course or pattern of the local area's cultural or natural history.	The Warragamba Supply Scheme has played a fundamental role in providing water to metropolitan Sydney from 1940, through the Emergency Scheme at a time of great need and during protracted record drought and since with the construction of Warragamba Dam in ensuring security of water supply. The construction of the Emergency Scheme narrowly averted failure of the Sydney's water supply and was constructed in record time using nearly all the Boards available resources and manpower.[71] The construction of the Warragamba Dam was the single factor that led to the settlement of the township of Warragamba. Archaeological evidence associated with the Emergency Scheme, construction of Warragamba Dam, and the individuals who were involved in the construction works, would contribute to our knowledge of the cultural history of the area. The potential archaeological resource within the study area, if found to be significantly intact and legible, may have significance at a **local** level.	✓	-
B – Associative Significance An item has strong or special associations with the life or works of a person, or group of persons, of importance in the local area's cultural or natural history	The construction of the Warragamba Supply Scheme between the years 1937 and 1961, necessitated the employment of a large body of labourers and tradesmen who lived at the construction sites with their families. The number of employees at the Emergency Scheme was up to 2,000 and up to 1,700 for Warragamba Dam, numbers which represents a major influx to the population of the local area. The township that emerged during the construction of the Dam, and the workers and their descendants, continue to have strong associations with the site.[72] The potential archaeological resource within the study area, if found to be significantly intact, may have significance at a **local** level.	✓	-

[71] Graham Brooks and Associated June 2010 p. 296
[72] Graham Brooks and Associated June 2010 p. 297

Criteria	Discussion	Local	State
C – Aesthetic Significance An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in the local area.	The potential archaeological remains within the study area have little potential for aesthetic significance. Although it is recognised that exposed *in situ* archaeological remains may have distinctive/attractive visual qualities and have visual characteristics with the ability to connect communities and individuals to the past through tangible remains, the potential archaeological remains at the study area are likely to be ephemeral. The potential archaeological resource does not meet the local significance threshold under this criterion.	–	–
D – Social Significance An item has strong or special association with a community or cultural group in the local area for social, cultural or spiritual reasons	Warragamba Dam is recognised and significant part of the historic built environment of the local area. The Dam and surrounding area have strong links and continued association with Warragamba township, with some of the residents having direct association with its construction and ongoing operations. Archaeological evidence associated with former workers and inhabitants of the construction camps and Warragamba township may have resonance with the descendants of these individuals. The potential archaeological resource may meet the **local** significance threshold under this criterion.	✓	-
E – Research Potential An item has potential to yield information that will contribute to an understanding of the local area's cultural or natural history	Archaeological remains associated with the construction of the Supply Scheme between 1937 to 1961 have the potential to demonstrate aspects of its planning and construction. Remains may include remnant structures and/or modified landscapes associated with the provision of plant and equipment, employee accommodation and camp services, and routes of access for the supply of stores and materials. Remains may include: • remnant road alignments - The principal means of access to the dam construction site for transporting men, equipment, stores and materials • remains of the Emergency Scheme camp and barracks • remains of the substation and other infrastructure • evidence of the travelling tail towers and cableway - Remnant features of this use include the broad, sweeping, cleared platform, upper tail tower and rails/tracks. Potential archaeological evidence contained within the subject site is likely to contribute to knowledge on several questions relevant to major or broader research questions relating to NSW history, such as: • Developing local, regional and national economies – Environment; cultural landscape – Activities associated with the interactions between humans, human societies and the shaping of their physical surroundings. The potential archaeological resource within the study area, if found to be significantly intact and legible, may have significance at a **local** level.	✓	-
F – Rarity An item possesses uncommon, rare or endangered aspects of the local area's cultural or natural history	The study area has the potential to contain evidence of a significant 20th century engineering achievement, and the development of a landscape created for the specific purpose of managing the water supply of Sydney. Should an archaeological resource associated with this phase of development be present and intact, it would be relatively rare. The potential archaeological resource within the study area, if found to be significantly intact and legible, may have significance at a **local** level.	✓	-

Criteria	Discussion	Local	State
G – Representative An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places of cultural or natural environments (or the cultural or natural history of the local area).	The construction technologies used at Warragamba represent a culmination of the technology and experience associated with dams constructed in New South Wales through to this period. Key representative attributes include the use of rope and cableways, the building of camps and township to house labourers and tradesmen, building of cottages to house salaried staff, the construction of terraced platforms for plant and machinery, mechanisation of concrete production, the construction of purpose built road of access to transport men, supplies and materials to the site, the building of permanent infrastructure such as water supply and the use of electricity to power plant, equipment and township.[73] The potential archaeological resource within the study area, if found to be significantly intact and legible, may have significance at a **local** level.	✓	–

5.2.2 Statement of archaeological significance

Prior to the construction of the Warragamba Emergency Scheme in the 1940s the study area was occupied by agricultural land. It is unlikely that archaeological remains pre-dating early 20th century development have been retained.

The construction study area study area has moderate to high potential to contain an archaeological resource associated with the construction of the Warragamba Emergency Scheme, including earlier structures, evidence of former technologies, and the workers construction camp and township which developed throughout the 1930s to 1960s. There is potential that archaeological remains associated with these developments are retained within the study area. This resource, if found to be substantially intact, would reach the local significance threshold primarily for its historical, social and technological values.

[73] Graham Brooks and Associated June 2010 p. 299

6.0 PROJECT DESCRIPTION

6.1 The project

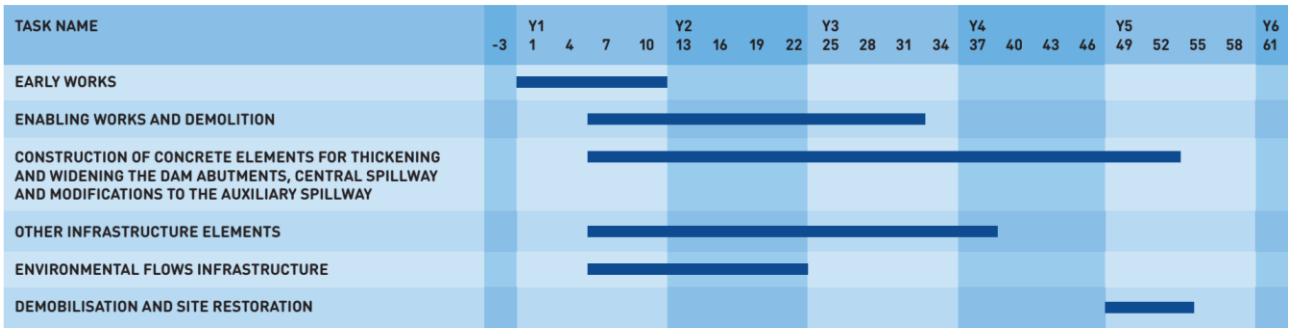
An overview of the Warragamba Dam Raising project is provided in Section 1.2 and detailed in the EIS (Chapter 5). The Project would provide temporary storage capacity for large inflow events into Lake Burragorang (Warragamba Catchment) to facilitate downstream flood mitigation and includes infrastructure to enable environmental flows. Additional construction and operational details are provided below.

6.1.1 Construction

The Project would include the following main activities and elements:

- demolition or removal of parts of the existing Warragamba Dam, including the existing drum and radial gates,
- thickening and raising of the dam abutments
- thickening and raising of the central spillway
- new gates or slots to control discharge of water from the FMZ
- modifications to the auxiliary spillway
- environmental flow infrastructure.

A preliminary construction program is shown below with construction anticipated to be completed within four to five years.



Proposed dam changes and the construction area are shown on Figure 6.1 and 6.2.

6.1.2 Operations

The Project would delay downstream flooding, which would reduce current downstream flood peaks and increase the time taken for downstream water levels to recede. The dam would be subject to the following operational regimes, depending on the water level:

i. Normal operations

Current operations would apply when the reservoir level is at or lower than the FSL, which is when the water level in the dam is at or below RL[74] 116.7 metres.

ii. Flood operations

Flood operations would apply when the water level is higher than the FSL. The FMZ would have sufficient storage to accommodate up to a 1 in 40 chance in a year flood. For larger floods the FMZ would be filled and uncontrolled discharge would occur over the central spillway, and potentially, auxiliary spillway of the dam. Operational objectives are to:

- maintain the structural integrity of the dam
- minimise risk to life
- maintain Sydney's water supply
- minimise downstream impact of flooding to properties
- minimise environmental impact
- minimise social impact.

[74] RL (reduced level) – metres above mean sea level

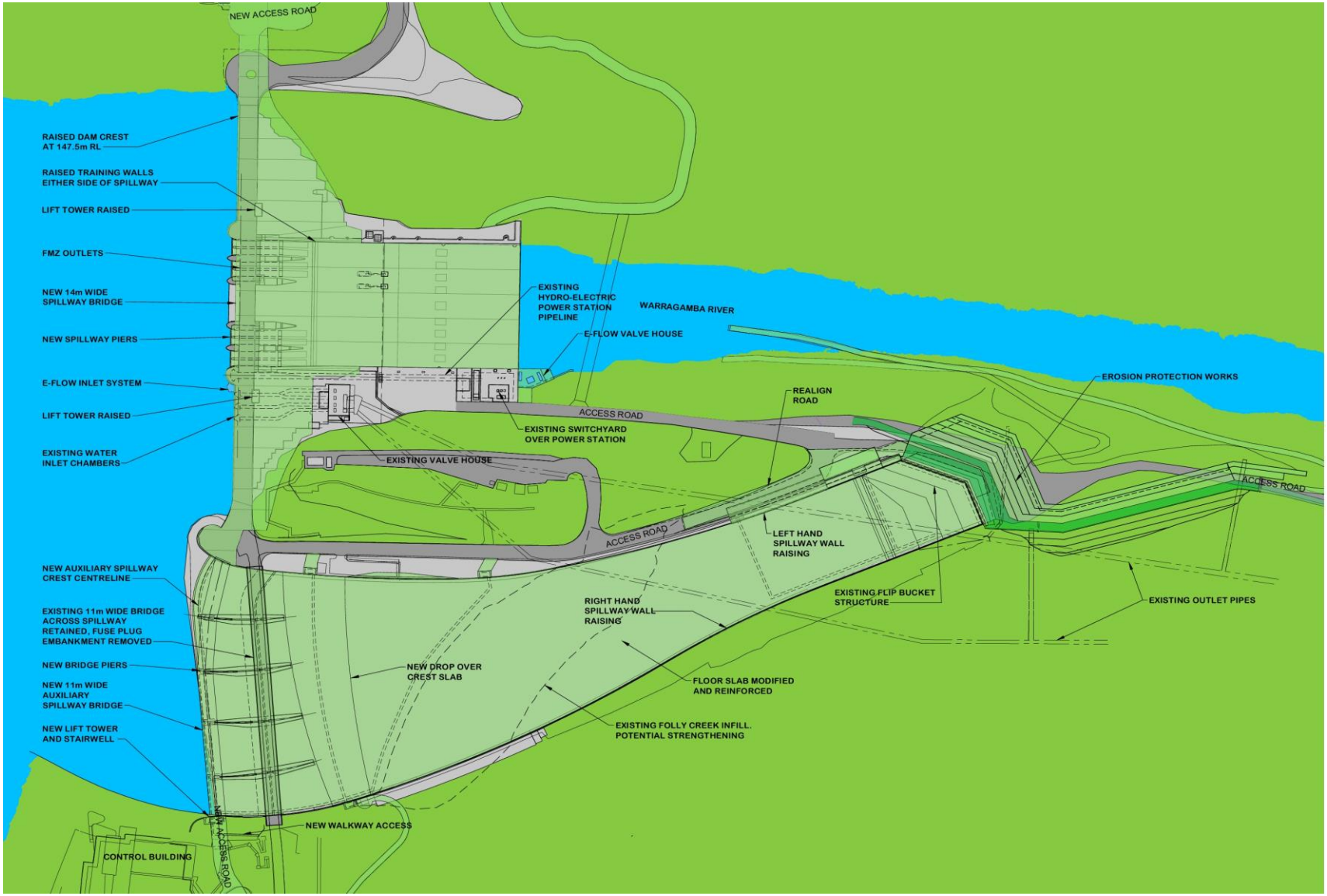


Figure 6.1: Modified dam from the Project works

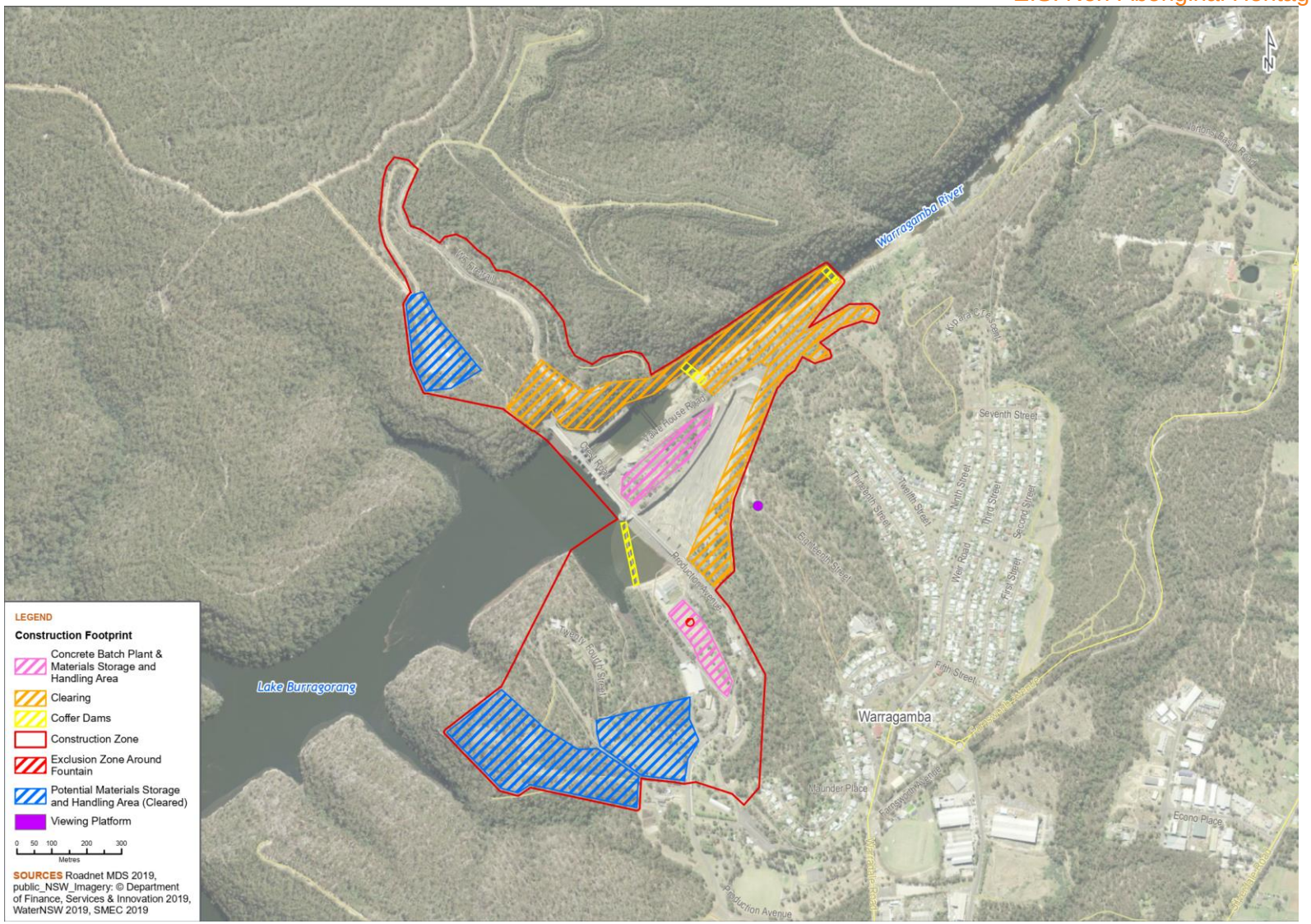


Figure 6.2: Construction area

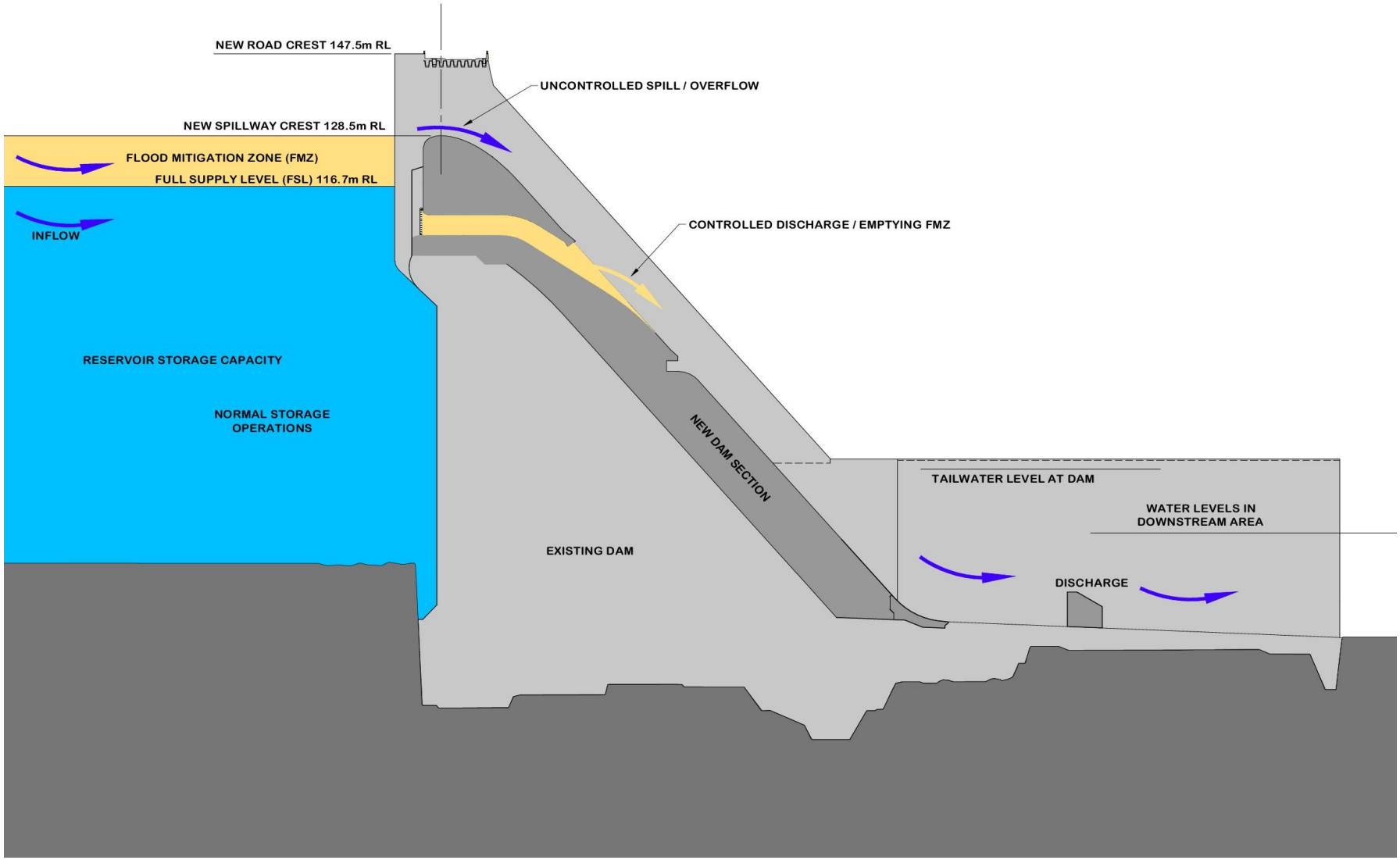


Figure 6.3: Dam operations

7.0 HERITAGE IMPACT ASSESSMENT

7.1 Methodology

This assessment has been prepared using the Statements of Heritage Impact 2002,[75] prepared by the NSW Heritage Office, contained within the NSW Heritage Manual, as a guideline.

7.1.1 Impact terminology

A detailed assessment is provided for direct, potential direct, indirect and archaeological impacts. Each type of impact is described in Table 7.1.

Table 7.1: Terminology for heritage impact types

Impact	Definition
Direct	Impacts resulting from works located within the curtilage boundaries of the heritage item.
Potential direct	Impacts resulting from increased noise, vibrations and construction works located outside the curtilage boundaries of the heritage item.
Indirect	Impact to views, vistas and setting of the heritage item resulting from proposed works outside the curtilage boundaries of the heritage item.
Archaeological	Impacts to potential archaeological remains located within the curtilage boundaries of the heritage item.

Specific terminology and corresponding definitions are used in this assessment to consistently identify the magnitude of the project's direct, indirect or potentially direct impacts on heritage items or archaeological remains. The terminology and definitions are based on those contained in guidelines produced by the International Council on Monuments and Sites (ICOMOS) [76] and are shown in Table 7.2.

Table 7.2: Terminology for assessing the magnitude of heritage impact

Magnitude	Definition
High	Actions that would have a long-term and substantial impact on the significance of a heritage item. Actions that would remove key historic building elements, key historic landscape features, or significant archaeological materials, thereby resulting in a change of historic character, or altering of a historical resource. These actions cannot be fully mitigated.
Moderate	This would include actions involving the modification of a heritage, including altering the setting of a heritage item or landscape, partially removing archaeological resources, or the alteration of significant elements of fabric from historic structures. The impacts arising from such actions may be able to be partially mitigated.

[75] NSW Heritage Office 2002
[76] Including the document *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties*, ICOMOS, January 2011.

Magnitude	Definition
Low	Actions that would results in the slight alteration of heritage buildings, archaeological resources, or the setting of an historical item. The impacts arising from such actions can usually be mitigated.
Neutral	Actions that would have no heritage impact.
Positive	Actions that would have no heritage impact and may result in positive outcomes.

7.1.2 Impact assessment guidelines

This report has been prepared in accordance with the following documents:

- Heritage Office and Department of Urban Affairs and Planning 1996. NSW Heritage Manual.
- ICOMOS 2011. Guidance on Heritage Impact Assessments for Cultural World Heritage Properties.
- ICOMOS 2013. The Burra Charter.
- NSW Heritage Office 2002. Statements of Heritage Impact. Update to the NSW Heritage Manual.

CMPs for specific heritage items, where they exist, have been referred to in regard to assessing against conservation policies.

7.1.3 Assessing flooding impacts

Potential impacts on identified heritage items within the study area have been assessed for Project construction and operations. State and locally listed heritage items have been assessed using legislation and guidelines listed in Section 7.1.2.

World Heritage and National Heritage places within the study area have been assessed for potential impacts using the criteria of the *Matters of National Environmental Significance Significant Impact Assessment Guidelines 1.1*. A separate assessment has been prepared to address potential impacts to the World and National listed Greater Blue Mountains Area[77] including the NHL nominated Great Blue Mountains Area – Additional Values. This assessment is included in Appendix J of the EIS.

The impact assessment for the operational downstream study area focused on listed heritage items located within the downstream areas that would be inundated by discharge of the Flood Mitigation Zone. In this zone, heritage items may experience flood events for an extended period. For listed heritage items outside the zone of impact of the Flood Mitigation Zone discharge area, heritage items would potentially experience a positive impact due to the reduced extent, duration and depth of flooding (compared to if the dam wall was raised).

The Joorilands Homestead (unlisted potential heritage item) would also be inundated under the existing PMF and the project has potential to extend periods of temporary inundation during flood events.

[77] SMEC *World Heritage Area Assessment –Warragamba Dam Raising Project* report prepared for WaterNSW, 11 October 2019

7.1.4 Mitigation and management measures

Management measures have been recommended in Section 8 to mitigate potential impact to archaeological resources. These recommendations utilise the following guidelines:

- NSW Heritage Manual (Heritage Office and Department of Urban Affairs and Planning 1996)
- Interpreting Heritage Places and Items: Guidelines (NSW Heritage Office 2005)
- Heritage Interpretation Policy (NSW Heritage Office 2005).

7.2 Potential impacts to listed sites during construction

This section provides an assessment of impact for Project construction and operations on any listed heritage items that are located within the construction study area. The curtilages of listed heritage items within the construction study area are shown in Figure 7-1.

As outlined in Section 2.0, heritage register searches that a total of **988** listed heritage items are located within the study area, including the following:

- EPBC Act (11):
    - World Heritage List – 3
    - National Heritage List – 5
    - Commonwealth Heritage List – 3
- NSW Heritage Act (184):
    - State Heritage List – 68
    - NSW Historic Shipwreck Database – 40
    - Section 170 Heritage and Conservation Registers – 76
- Local Environmental Plans – 793.

In some instances, a single place is represented on several statutory lists, or has its curtilage split and listed more than once. Where curtilages are split, an assessment was undertaken for the entire combined curtilage.

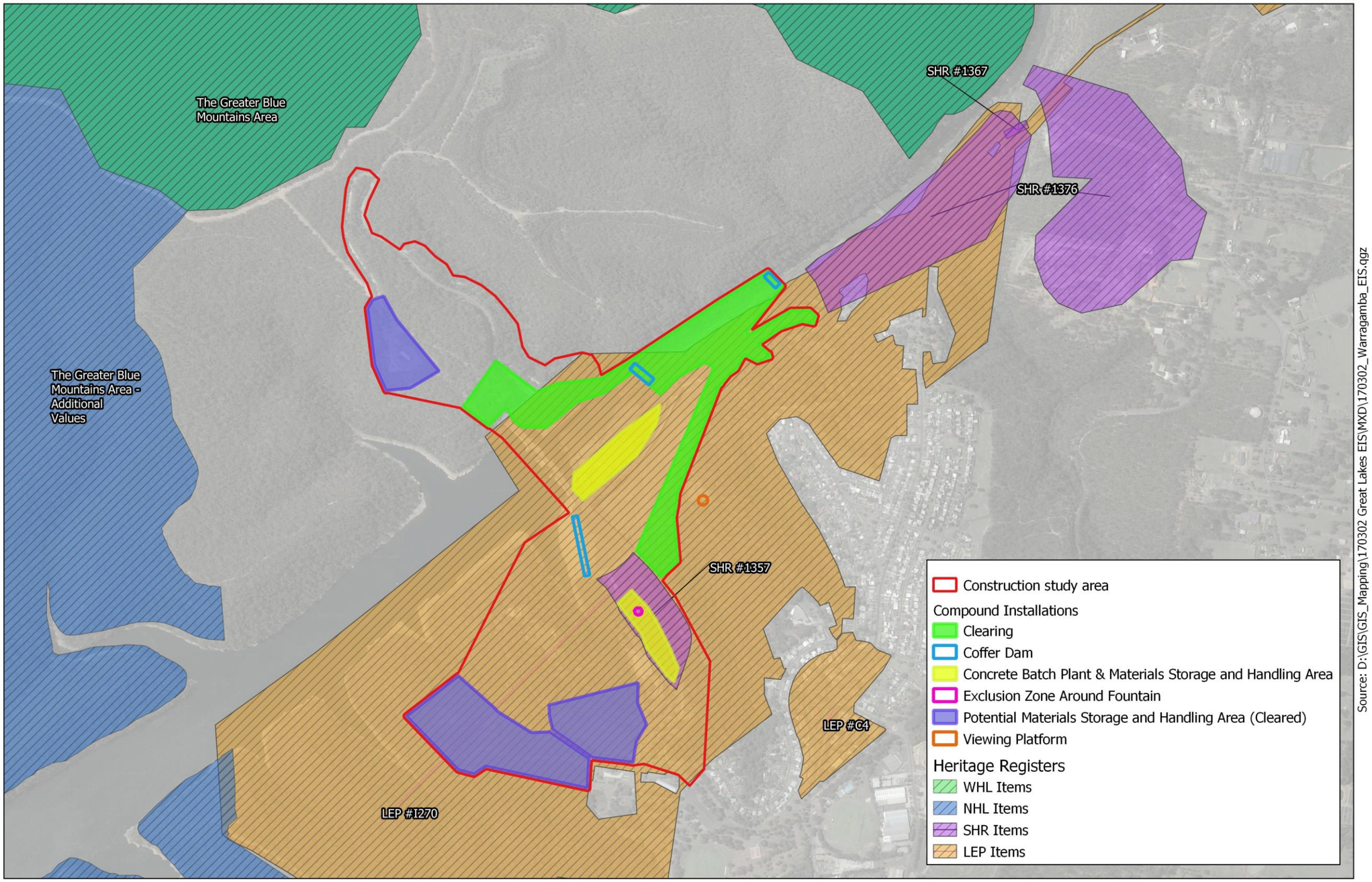


Figure 7-1: Map showing heritage curtilages located within and in proximity to the construction study area

7.2.1 Warragamba Dam - Haviland Park (SHR No. 01375)

The project would result in a range of direct (physical) and indirect (visual) impacts to the SHR listed Haviland Park, which is located within the Warragamba Supply Scheme and immediately east of the dam wall site. Covering an area of approximately 10 acres, the recreational space within Haviland Park contains rows of tree plantings, an original concrete fountain base (fountain no longer operable and upper section removed), remnant sections of the dry packed stone retaining wall that surrounded the site and facilities for public use, along with potential for historical archaeology relating to the area's former use as the construction site for the dam. Remnant construction evidence remains within Haviland Park, including existing terraced road alignments and associated machinery.

7.2.1.1 Direct (physical) impact assessment

The proposed raising of the dam wall would result in construction of a new bridge over the auxiliary spillway. The proposed temporary use of a large portion of land within Haviland Park as a laydown area/batching plant during construction works would result in a range of direct physical impacts, both temporary and permanent. Batching plant facilities would consist of:

- hardstand area with drainage to environmental control ponds
- concrete testing and geotechnical laboratory
- weighbridge and office
- materials storage bins and sheds (for aggregates, sand, fly ash and other materials)
- silos, mixers, conveyors, above ground tanks, control facilities and dust control facilities
- water and material chilling plant
- connections to communication, power and water supply services
- other environmental controls if required (e.g. noise walls).

It is considered that this would include removal of vegetation and ground excavations across the site. Due to bushfires in 2001 and a major storm event in 2018 that uprooted many of the more recent plantings (angophoras), the vegetation within Haviland Park is largely non-original. However, the existing vegetation continues to contribute to the cultural landscape character and setting of the park. The remnant concrete base of the original fountain, the centrepiece in the design of the park that is identified in the Warragamba Supply Scheme CMP 2010 as being a component of primary significance to the Warragamba Supply Scheme, would be retained and protected for the duration of the project.

It is noted that Haviland Park has undergone a series of modifications over time. The northern and western sections of Haviland Park was previously impacted during the construction of the auxiliary spillway between 1998 and 2004, which resulted in excavation of the northern section of the park including removal of roads, car parks and some of the landscaped area, removal of the children's playground and picnic shelter located at the western end of the park, and removal of most exotic plantings and features to allow use of the park as a construction site. The December 2001 bushfire resulted in the loss of many of the remaining original elements within Haviland Park, including several buildings and original plantings throughout the site. In 2007, the Operations and Visitor Information Centre was constructed on the northern portion of the site, which involved associated landscaping works.

It is understood the selection of Haviland Park as the location for a potential laydown area/batching plant is based on the historic use of this area over time as a construction site, along with the limited

availability of cleared areas within the Warragamba Supply Scheme site. The project would result in an overall high direct (physical) impact to the SHR listed Haviland Park heritage item for the duration of the project.

7.2.1.2 Indirect (visual) impact assessment

The project would result in indirect (visual) impact to the SHR listed Haviland Park for the duration of the project. The establishment of a batching plant and introduction of large machinery in Haviland Park during the project would also obscure significant views from the approaches towards the dam along Farnsworth Avenue, although this indirect (visual) impact would be temporary in nature.

The project would result in an overall temporary moderate indirect (visual) impact to the SHR listed Haviland Park heritage item.

7.2.1.3 Conservation policy

The following discussion provides an assessment of the project against key relevant policies relating to Haviland Park that are contained in the Warragamba Supply Scheme CMP 2010.

***Policy** – Maintain Public Access*

Maintain public access to the designated picnic areas of the Warragamba Dam site including Haviland Park and ensure visitors can view the dam wall in its setting.

There would be no public access to Haviland Park for the duration of the construction of project. It is noted this impact would be temporary in nature, and the use of Haviland Park as a public space would be reinstated upon completion of construction.

***Policy** – Landscape and Setting*

Manage and maintain the cultural landscape areas of the Warragamba Dam site. Manage the natural landscape features of the Warragamba Dam site to reinforce presence and symbolism of the dam wall which adds greatly to the natural drama of the local topography.

Establishment of a potential laydown area/batching plant within Haviland Park would require the introduction of machinery and equipment in the locality, which would temporarily impact on the landscape and visual setting of the heritage item. The dam wall itself would become a construction site, so these significant views would be further modified during construction. It is noted this impact would be temporary and views reinstated on finalisation of the project.

***Policy** – Views*

Maintain key views to and from the Dam wall and water body.

Establishment of a potential laydown area/batching plant within Haviland Park would result in storage of machinery and equipment in the locality, which could temporarily obstruct views towards the dam wall and water body from the park and approaches along the surrounding access roads. The dam wall itself would become a construction site, so these significant views would be further modified

during construction. It is noted this impact would be temporary and views reinstated on finalisation of the project.

***Policy** – Historical Archaeology*

Recognise the potential for historical archaeology within the site, identify it proactively and manage it as an integral component of the heritage value of the Warragamba Dam site.

***Policy** – Excavation*

Minimise impacts to significant archaeological resources when new work is planned and interpret those that embody key aspects of the significance of the Warragamba Dam site.

It is considered that the proposed potential laydown area/batching plant within Haviland Park would require in ground excavations throughout the site to support the introduction of services and drainage infrastructure. This area has been identified as having historic archaeological potential, being the location of the original construction site for the dam.

***Policy** – Archival Recording*

Undertake archival recording within the heritage curtilage of Warragamba Dam prior to undertaking major works, including conservation works.

As illustrated in the policy above, the Warragamba Supply Scheme CMP 2010 outlines the requirement for the preparation of an Archival Recording prior to any changes or works within the heritage curtilage of Warragamba Dam. This includes changes to Haviland Park. Mitigation measures to carry out detailed archival recording as part of the project are covered in Section 8.0.

7.2.2 Warragamba Emergency Scheme (SHR No. 01376)

7.2.2.1 Direct (physical) impact assessment

The Warragamba Emergency Scheme is identified as a 'primary' element of significance in the Warragamba Supply Scheme CMP 2010. The project would not involve any direct (physical) impacts to key components within the emergency scheme comprising the weir and later diversion tunnel, pumping station, Megarrity's Creek Bridge, former construction platform, balance reservoir or early dam model.

Indirect physical impacts are associated with flood events, which are not considered to result in any additional impact to the current flood conditions as the volume of water discharged into Warragamba River by the dam would not change. For most events, there would be a reduction in the peak flow discharged by the dam which would lessen any risk of damage to the heritage item.

The project would result in a low direct (physical) impact to the SHR listed Warragamba Emergency Scheme heritage item.

7.2.2.2 Indirect (visual) impact assessment

The project would involve clearing and removal of vegetation in proximity to the heritage curtilage of the Warragamba Emergency Scheme, including a proposed laydown area to the south-west. This would result in minor alteration to the current landscape setting of the item. The landscape setting has been identified as playing an important role in defining the character and setting of the Warragamba Emergency Scheme. It is noted that revegetation and landscaping works following completion of the project would mitigate associated indirect (visual) impacts. Moreover, it is noted that surrounding areas of bushland have been cleared and modified over time.

The project would result in an overall low indirect (visual) impact to the SHR listed Warragamba Emergency Scheme heritage item.

7.2.2.3 Conservation policy

The following discussion provides an assessment of the project against key relevant policies relating to the Warragamba Emergency Scheme that are contained in the Warragamba Supply Scheme CMP 2010.

Policy *– Landscape and Setting*

Manage and maintain the cultural landscape areas of the Warragamba Dam site. Manage the natural landscape features of the Warragamba Dam site to reinforce presence and symbolism of the dam wall which adds greatly to the natural drama of the local topography.

As discussed, clearing and removal of vegetation both in proximity to the heritage curtilage of the Warragamba Emergency Scheme would result in limited change to the cultural landscape setting of the item, although it is noted that revegetation and landscaping works following completion of the project would mitigate associated indirect (visual) impacts.

7.2.3 Warragamba Supply Scheme (WaterNSW Section 170 Heritage and Conservation Register No. 4580161)

The project would result in a range of direct (physical) and indirect (visual) impacts to the Section 170 Heritage and Conservation Register listed and State significant Warragamba Supply Scheme. The Warragamba Supply Scheme CMP 2010 defines the heritage curtilage of the Warragamba Supply Scheme as a complex comprising the dam wall (including Valve House, Hydro-electric Power Station and various components of the west and east training walls and auxiliary spillway), Lake Burragorang and operating area including western bank, the area downstream of the dam wall including elements of the Warragamba Emergency Scheme comprising Weir, Pumping Station No.9 and Balance Reservoir, the Terraced Garden and Haviland Park, Production Office and works depot area including former barracks area generally bounded by Farnsworth Avenue, Weir Road and Thirteenth Street, and pipelines to Prospect.

7.2.3.1 Direct (physical) impact assessment

The project would involve varying degrees of impact to individual components within the overall heritage item, with the main heritage impacts focused around the dam wall and its associated features including the crest crane, equipment, commemorative plaques and memorials, the Valve House, landscaped areas of Haviland Park and the Terraced Garden to the east, and the 18 tonne upper tail tower located on the western bank of the dam. Impact to Haviland Park is covered in the

previous Section 7.2.1, and it is assessed that the project would result in a high impact to this component.

The project would result in permanent physical changes to the dam wall and its current configuration and features. Raising the wall would involve preparation of the downstream face and buttressing the wall with additional cast-in situ unreinforced concrete by up to 19 metres thick. This would directly impact original fabric of the dam wall itself. The drum and radial gates associated mechanical and electrical infrastructure, and portions of the piers within the main spillway would be removed and replaced. The radial gates and drum gates are elements identified in the Warragamba Supply Scheme CMP 2010 as features of primary significance despite some modification. The lift towers on both abutments, also of primary significance, would be raised by around 17 metres, and a pathway between 12 to 15 metres wide would be built along the top of the abutments to connect with the approaches.

The proposed raising of the dam wall would result in changes to significant features on the crest road including the crest crane and associated equipment, and several commemorative plaques/memorials. This involves requirement to remove the crest crane, which is one of the original and practical features of the crest road. The blue-painted and track mounted structure has been retained historically for maintenance works along the crest and gates and emergency operations and is assessed in the Warragamba Supply Scheme CMP 2010 as being of primary significance to the Warragamba Supply Scheme. The crest storage area was previously relocated with the construction of the auxiliary spillway. Removal of the crest crane would represent a direct (physical) impact to the heritage significance and intactness of the Warragamba Supply Scheme complex.

The project would require relocation of plaques and memorials on the crest roadway, including the rectangular polished terrazzo/concrete memorial with brass plaques commemorating the works and the significant persons involved. The memorial, which was unveiled at the opening ceremony of the dam in October 1960, was previously relocated during the construction of the auxiliary spillway. The relocation of memorials and plaques to new locations on the raised dam would not result in any additional impacts to the heritage significance of the Warragamba Supply Scheme complex.

The proposed raising of the dam wall and associated modifications to the left abutment access would also impact the 18 tonne upper tail tower remaining on the western bank of the dam. The 18 tonne upper tail tower demonstrates the original construction and operations processes of the dam and is identified in the Warragamba Supply Scheme CMP 2010 as being of primary significance to the Warragamba Supply Scheme. The project has been developed to allow for the relocation of the 18 tonne upper tail tower to a proposed new position along the crane rails on the terrace around 30 metres upstream. Retention of the 18 tonne upper tail tower would represent a positive heritage outcome.

The proposed buttressing works to the dam wall would result in minor encroachments into the site of the adjacent terraced gardens, which constituted part of Haviland Park prior to the construction of the auxiliary spillway. This component, featuring ornamental gardens that reflect an ongoing evolution in garden design since the dam's construction, is identified in the Warragamba Supply Scheme CMP 2010 as being of primary significance to the Warragamba Supply Scheme. The terraced garden consists of a central lawn defined by low sandstone walls and surrounded by ornamental planting beds featuring a variety of garden plantings and succulents and contains a series of stairs and pathways. The proposed establishment of a laydown area/batch plant in this location could result in the removal of vegetation and significant landscape elements, along with ground excavations, and direct impacts to significant fabric within the Warragamba Supply Scheme.

The project would result in a high direct (physical) impact to the Section 170 Heritage and Conservation Register Warragamba Supply Scheme heritage item.

7.2.3.2 Indirect (visual) impact assessment

Raising the wall with abutments for 17 metres would involve preparation of the downstream face and buttressing the wall in mass concrete by up to 19 metres thick. The increase in height and width of the wall would result in visual changes to the dam's profile and modifications to aspects and machinery and equipment that are evocative of the original design of the dam wall, which are identified in the Warragamba Supply Scheme CMP 2010 as being of primary significance to the Warragamba Supply Scheme. It is noted the relative dimensions would be proportionately retained and the design would adopt a smooth profile, and that the dam wall has been previously raised and subject to change over time in order to maintain the item's ongoing role and significant use.

The demolition of the original crest crane would result in a visual change to the Warragamba Supply Scheme. Dependent on the final design option selected, however, a new fit for purpose crane would be installed. However, the overall loss of the crest crane would diminish the visual qualities and intactness of the dam site.

The project would involve clearing of bushland and vegetation adjacent to the dam and its surrounds. The Warragamba Supply Scheme CMP 2010 describes that the built element of the dam contrasts to both the natural and modified vegetated slopes of the valley, which highlights the scale and mass of the dam wall itself, and the surrounding vegetated landscape is identified as playing an important role in defining the landscape character and setting of the Warragamba Supply Scheme. Clearing of vegetation, as such, would result in visual changes that would diminish the landscape setting of the dam, although it is noted that revegetation and landscaping works following completion of the project would mitigate associated indirect (visual) impacts. Moreover, it is noted that surrounding areas of bushland have been cleared and modified over time with the construction of the dam and subsequent changes.

The project would result in an overall moderate indirect (visual) impact to the Section 170 Heritage and Conservation Register Warragamba Supply Scheme heritage item.

7.2.3.3 Conservation policy

The following provides an assessment of the project against key relevant policies relating to the Warragamba Supply Scheme that are contained in the Warragamba Supply Scheme CMP 2010.

***Policy** – Landscape and Setting*

Manage and maintain the cultural landscape areas of the Warragamba Dam site. Manage the natural landscape features of the Warragamba Dam site to reinforce presence and symbolism of the dam wall which adds greatly to the natural drama of the local topography.

The project, comprising the dam works and associated laydown area/batching plants, would result in changes to the landscape and setting of the Warragamba Supply Scheme. This includes clearing areas of vegetation on the surrounding slopes of the valley, and removal of vegetation and plantings within sites that have been designated as laydown area/batching plants. The removal of bushland and plantings would result in a direct impact to the landscape quality and setting of Warragamba Supply Scheme, although it is noted that revegetation and landscaping works following construction activities of the project would be able to reinstate the cultural landscape and setting of the dam and mitigate associated indirect (visual) impact.

***Policy** – Demolition*

Do not demolish elements of Primary heritage significance. Avoid impacts to elements of Contributory significance where possible. Where there is doubt about whether an item can be demolished, seek advice from a suitability qualified heritage specialist.

The project would require relocation or demolition of the crest crane and 18 tonne upper tail tower machinery elements, both of which are identified as items of primary significance within the Warragamba Supply Scheme. Equipment and machinery to be demolished also includes the radial gates and drum gate. These elements are identified in the Warragamba Supply Scheme CMP 2010 as features of primary significance despite some modification.

These elements are evocative of the original design and operations of the dam, and the demolition of these elements would result in a direct impact to the intactness and integrity of the Warragamba Supply Scheme. Given the project would allow for the ongoing use and functionality of the dam, which is a key part of the item's heritage significance, these impacts could be acceptable with adequate mitigation measures, as covered in Section 8.0.

***Policy** – New Construction*

New construction within the Warragamba Dam site heritage curtilage, is acceptable provided the new work has been assessed by a heritage specialist and adverse heritage impacts have been minimised.

The preparation of this non-Aboriginal heritage assessment to address the impact of the proposed Warragamba Dam Wall Raising complies with the requirement of this policy regarding new construction. New construction encompasses the raising of the dam wall, lift towers and training walls and auxiliary spillway walls, a new spillway bridge, new piers and bridge over the raised main overflow spillway, new outlet conduits with gates and baulks, and a new e-flows infrastructure component. These new elements have been designed to respond to the existing form and overall proportions of the dam wall and associated infrastructure to respect the dam's original design, scale and materiality. The mitigation measures covered in Section 8.0 would assist in ensuring the appropriateness of new construction on the heritage significance of the Warragamba Supply Scheme.

***Policy** – Equipment & Machinery*

Where equipment or machinery needs to be replaced, continue the existing practice of leaving the original equipment in situ and fitting the new equipment or machinery next to it unless this will result in negative heritage impacts to items of Primary or Contributory heritage significance.

The proposed raising of the dam wall would require removal of the crest crane located on the existing crest road of the dam wall and relocation of the 18 tonne upper tail tower on the western bank. In keeping with the above policy, there is an opportunity for the crest crane to be relocated elsewhere on site so that original and significant machinery and equipment is retained within the curtilage of the Warragamba Supply Scheme heritage item for interpretive purposes. Mitigation measures to retain, interpret and archivally record significant equipment and machinery are covered in Section 8.0.

Policy *– Interpretation*

Continue to develop interpretation programmes for the Warragamba Supply Scheme.

The extensive changes proposed in and around the dam wall would provide an opportunity for the changes to be interpreted and incorporated into the existing interpretation provided at the Warragamba Dam site by WaterNSW. This includes interpretation at the Operations and Visitor Information Centre and surrounding areas of public access comprising Haviland Park, the Terraced Garden, and various nearby lookout locations. This interpretation could form part of the narrative of the overall evolution of the place. Mitigation measures to explore and implement interpretation provisions are covered in Section 8.0.

Policy *– Archival Recording*

Undertake archival recording within the heritage curtilage of Warragamba Dam prior to undertaking major works, including conservation works.

As illustrated in the policy above, the Warragamba Supply Scheme CMP 2010 outlines the requirement for the preparation of an Archival Recording prior to any changes or works within the heritage curtilage of Warragamba Dam. Mitigation measures to carry out detailed archival recording as part of the project are covered in Section 8.0.

7.2.4 Warragamba Supply Scheme and Warragamba Emergency Scheme (LEP No. I270)

The project would result in a range of high direct (physical) and moderate indirect (visual) impacts within the LEP curtilage of the Warragamba Supply Scheme and Warragamba Emergency Scheme heritage item.

Impact to the Warragamba Emergency Scheme is covered in the assessment under its SHR listing, refer to Section 7.2.2. Impact to the Warragamba Supply Scheme is covered in the assessment under its Section 170 Heritage and Conservation Register listing, refer to Section 7.2.3.

7.3 Operation impacts – upstream

7.3.1 Greater Blue Mountains Area (WHL Place ID 105127)

The main impacts to the WHL Greater Blue Mountains Area relate to areas upstream of the dam wall that are within the proposed inundation levels. These areas of the item's curtilage would be directly impacted by the retention of flood waters at an increased level in areas over an extended period. The potential impacts of the project to the significance and values of the Greater Blue Mountains Area has been assessed in a separate report provided in Appendix J of the EIS.

7.3.2 The Greater Blue Mountains Area (NHL Place ID 105999)

As covered above, the potential impacts of the project to the significance and values of the Greater Blue Mountains Area have been assessed in the report provided in Appendix J of the EIS.

7.3.3 The Greater Blue Mountains Area - Additional Values (NHL Place ID 105696)

The potential impacts of the project to the significance and values of the Greater Blue Mountains Area Additional Values have been assessed in the report provided in Appendix J of the EIS.

7.3.4 Joorilands (unlisted potential heritage item)

The Joorilands Homestead is located within the inundation zone of the existing dam. The homestead would also be inundated under the existing PMF for the project. The raising of the dam wall therefore has the potential to result in extended periods of inundation to the site during flood events. The homestead site is currently uninhabited, and the structures are therefore not being maintained. It is therefore assumed that the potential impact of an extended inundation period would result in additional deterioration of the structures that remain standing within the homestead site.

7.4 Operation impacts – downstream

The following sections provide analysis and assessment of the levels and types of anticipated impacts of the project on listed heritage items that are located downstream of Warragamba Dam. Within the operational downstream areas, impact assessment is particularly focused on listed heritage items located within the downstream Flood Mitigation Zone discharge area. In this zone, heritage items may experience flood events for an extended period.

During large rainfall events when the storage level rises above Full Supply Level, flood operations mode would commence. In this mode, flood inflows to Lake Burragorang would be captured and temporarily stored (increasing water levels in Lake Burragorang and upstream tributaries). The raised dam would provide an airspace (called a Flood Mitigation Zone) to temporarily capture around 965 gigalitres of water during a flood event. Water would be discharged in a controlled manner via the gated conduits until the dam level returns to Full Supply Level. Flood Mitigation Zone operating protocols would guide this process and be developed for approval by the relevant regulatory authorities.

Currently, flooding in the Hawkesbury-Nepean Valley can be extensive dependent on the size of the rain event. Many heritage items are within or in proximity of the Hawkesbury-Nepean River and/or its tributaries and may experience impacts from flooding. Flooding may cause direct or indirect impacts to heritage items from depth of flooding, length of flooding and velocity of flood waters. For downstream areas, there are two phases of the operation of the project that may potentially result in impacts (including benefits) including:

- changes in peak flooding extents, depths, duration and velocities
- changes in flooding extents durations and velocities during the discharge of the Flood Mitigation Zone.

7.4.1 Impacts to heritage items from existing flood events

Table 7.3 below provides a summary of the number of listed heritage items that are currently affected by flooding events. Note due to the unavailability of mapped Section 170 Heritage and Conservation Register curtilages on the SHI database, items on Section 170 Heritage and Conservation Registers have not been included in the table counts below (many of these items are covered by LEP or SHR listings).

Table 7.3: Summary of listed heritage items affected by flood events for existing conditions, including the probable maximum precipitation (PMP)

Heritage List	1 in 5	1 in 10	1 in 20	1 in 100	PMP
World Heritage List	2	2	2	3	3
National Heritage List	4	4	4	4	5
Commonwealth	0	0	0	2	3
State Heritage Register	24	27	30	40	67
Local Environmental Plan	222	239	266	395	813

7.4.2 Impacts to heritage items from changes in peak flooding due to the project

To assess any changes in impacts from changes in peak flooding, heritage items were mapped and for each flood event, the flooding extents for both the existing situation and with the project were overlain. Changes in the number of heritage items impacted by flooding due to the project were then identified.

Table 7.4 below provides a summary of the number of listed heritage items that would be affected by the nominated flooding events following implementation of the project. Note that due to the unavailability of mapped Section 170 Heritage and Conservation Register curtilages on the SHI database, items on Section 170 Heritage and Conservation Registers have not been included in the table counts below (although many of these items are also covered by LEP or SHR listings).

Table 7.4: Summary of listed heritage items affected by flood events under the proposed design, including the probable maximum precipitation (PMP)

Heritage List	1 in 5	1 in 10	1 in 20	1 in 100	PMP
World Heritage List	2	2	2	3	3
National Heritage List	4	4	4	4	5
Commonwealth	0	0	0	0	3
State Heritage Register	16	19	23	29	67
Local Environmental Plan	192	207	228	270	793

Table 7.5: Comparative table showing difference between heritage items affected by existing conditions and proposed design, including the probable maximum precipitation (PMP)

Heritage List	1 in 5		1 in 10		1 in 20		1 in 100		PMP	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
World Heritage List	2	2	2	2	2	2	3	3	3	3
National Heritage List	4	4	4	4	4	4	4	4	5	5
Commonwealth	0	0	0	0	0	0	2	0	3	3
State Heritage Register	24	16	27	19	30	23	40	29	67	67
Local Environmental Plan	222	192	239	207	266	228	395	270	813	793

In summary, the above table demonstrates a reduction in the number of Commonwealth, State and LEP listed heritage items that would experience flooding with the project for all events apart from the Probable Maximum Flood. The reduction in the number of heritage items affected by flooding ranged between about 10 and 30 percent of the total number of heritage items depending upon the type of heritage item and size of the event. The largest decrease was for the 1 in 100 chance in a year (1% AEP) flood event. As well as a reduction in the number of heritage items directly impacted by flooding, generally heritage items that would continue to be impacted by flooding would experience:

- a shorter duration of flooding
- a reduction in the depth of flooding
- the same or lower flood water velocities.

Overall, the project would result in a direct (physical) positive impact to downstream heritage items due to a reduction in peak flooding impacts for most events.

7.4.3 Potential downstream impact to heritage items

As discussed in Section 7.4 all flood inflows into Warragamba Dam would typically be temporarily captured in the Flood Mitigation Zone and then released at a constant rate (about 100 GL/day) once flood levels in the downstream Hawkesbury-Nepean River had peaked. Consequently, areas downstream would be impacted for longer by low level flooding. The length of lower level flooding would last between one and seven days depending on the size of the flood event.

Changes in water levels have been assessed to identify where downstream potential impacts could be expected. As the Hawkesbury River widens as it approaches the lower estuarine areas and tidal influences begin to dominate water levels closer to the ocean, potential downstream impacts decrease with distance downstream until they become negligible. Based on an assessment of the hydrographs at various downstream cross-sections, the change in water levels downstream would range from about 200 to 400 mm at Wisemans Ferry and decrease to less than 100 mm immediately downstream of Wisemans Ferry. As the typical tidal range in this section of the river is about 1.6 metres, an increase in water levels by about 100 mm would not cause any additional flooding which may impact heritage items.

This section identifies listed heritage items downstream that may be flooded for extended periods of time, generally between one to seven days longer than the current situation. The following listed heritage items downstream have the potential to be impacted:

- 3 WHL items (including 2 declared places and 1 buffer zone)
- 4 NHL items (including 2 listed places and 2 nominated places)
- 15 SHR items
- 184 LEP items
- 1 SEPP item
- 17 Section 170 Heritage and Conservation Register items.

These items are listed in Table 7.6 and are illustrated in the following Figure 7.2 to Figure 7.5. The sections that follow these figures provide a description of the range of impacts on these items.

Table 7.6: Listed heritage items which may be impacted by inundation downstream

Item Name	Item/Listing Number	Significance
Australian Convict Sites (Old Great North Road)	WHL 106209	World
Australian Convict Sites (Old Great North Road Buffer Zone)	WHL 106209	World
The Greater Blue Mountains Area	WHL 105127	World
The Greater Blue Mountains Area	NHL 105999	National
The Greater Blue Mountains Area - Additional Values	NHL 105696	National
Great North Road, Wisemans Ferry to Bucketty	NHL 106318	National
Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves	NHL 105817	National
Warragamba Emergency Scheme	SHR 01376	State
Hawkesbury River Railway Station group	SHR 01166	State
HMAS Parramatta shipwreck and memorials	SHR 01676	State
Ebenezer Church (Uniting), Old Schoolhouse, Cemetery & Tree	SHR 00138	State
Hawkesbury River Rail Bridge and Long Island Group	SHR 01040	State
Emu Plains (Nepean River) Underbridge	SHR 01830	State
Victoria Bridge	SHR 01950	State
Cattai Estate	SHR 00982	State
Scheyville National Park	SHR 01817	State
Great Drain and two house sites	SHR 01402	State
Stannix Park House, cattle tanks and site	SHR 00598	State
Clydesdale - Grand House, Barn & Cottage	SHR 00674	State
Australiana Pioneer Village	SHR 01683	State

Item Name	Item/Listing Number	Significance
Barrenjoey Head Lightstation	SHR 00979	State
Macquarie Arms Inn (former)	SHR 00282	State
House and slab barn	LEP I466	Local
Windsor Bridge	LEP I276	Local
The Toll House	LEP I150	Local
House	LEP I204	Local
House	LEP I391	Local
House	LEP I167	Local
House	LEP I377	Local
Slab barn	LEP I465	Local
Hawkesbury Agricultural College River Farm	LEP I23	Local
House and barn	LEP I378	Local
'Reibycroft'	LEP I348	Local
'Rose Park'	LEP I72	Local
William Daley's grave	LEP I73	Local
Former manse and farm house	LEP I310	Local
'Sunny Farm'	LEP I345	Local
Cottage	LEP I498	Local
Barrenjoey Heritage Conservation Area	LEP C1	Local
McKell Park,lower, upper, cabbage palms and World War II gun and emplacements	LEP 225	Local
Felton Mathew Marked Tree	LEP I91	Local
Slab hut ruin and quarry site	LEP A9	Local
Drainage trench and gate (part of Cattai Estate)	LEP A8	Local
Old Caddie Homestead foundations (part of Cattai Estate)	LEP A10	Local
'Stoneleigh'	LEP I331	Local
Seymours Creek Mangrove wetland	LEP 205	Local
Cattai Estate ('Caddie House', barn, silo and outbuildings part of Cattai Estate)	LEP I74	State
House and slab barns	LEP I309	Local
House and slab barn	LEP I467	Local

Item Name	Item/Listing Number	Significance
Slab barn	LEP I306	Local
Slab barns	LEP I307	Local
Crosslands Reserve	LEP 564	Local
'Prestonville'	LEP I322	Local
'Macquarie Arms Inn' complex (former inn and slab barn)	LEP I00282	State
'Samuel Cox's House'	LEP I278	Local
Slab cottage and slab barn	LEP I468	Local
Waddell Ridge group,dwelling remains, cistern, benchmark, rock inscription, field terracing, road t*	LEP A1	Local
House	LEP I1006	Local
Slab barn	LEP I288	Local
'Jonlyn'	LEP I255	Local
'Lynwood'	LEP I303	Local
'Myrtle Cottage' and slab barn	LEP I284	Local
'Clarendon' (servants' quarters)	LEP I21	Local
'Riverside', slab-barn	LEP I508	Local
House	LEP I133	Local
Convict built road (Mr Sharps Track)	LEP A14	Local
Brown's Cemetery	LEP I134	Local
Slab barn	LEP I129	Local
'Lilburndale'	LEP I512	Local
'Peacocks'	LEP I132	Local
'Dargle'	LEP I130	Local
Davidson's Dairy	LEP I425	Local
Former public wharf remains	LEP A10	Local
Ruins of house	LEP A17	Local
'Penrose', ruins	LEP I431	Local
House, 'Glenworth Valley'	LEP 24	Local
Remains of stone walling	LEP 22	Local
Mill Creek Mill ruins	LEP A70	Local
Grave of Owen Maloney	LEP 23	Local

Item Name	Item/Listing Number	Significance
'Stannix Park'	LEP I00598	State
'Coromandel'	LEP I334	Local
Ruins of Merrymount	LEP A5	Local
'Rockleigh'	LEP I335	Local
Cattai Horseworks (part of Cattai Estate)	LEP A11	Local
'The Ridge', quarry site	LEP A7	Local
Hope Farm Windmill, Hope Farm Mill Granary and Stockmans Cottage foundations (part of Cattai Estate)	LEP A6	State
'Hope Farm House', 'Hope Farm Cottage', outbuilding and mill ruins (part of Cattai Estate)	LEP I75	Local
Residence and barn	LEP I373	Local
'Portland Head Farm'	LEP I333	Local
'Kelso Park'	LEP I192	Local
'Pagewood'	LEP I193	Local
'Rocky Hall'	LEP I395	Local
'Bungool' (Riverside Oaks Golf Course)	LEP I71	Local
Great drain and stone cut foundations	LEP A25	State
'Pickwick Park'	LEP I338	Local
Holy Trinity Church, graveyard and wharf	LEP 158	Local
Nine huts at Mullet Creek	LEP 177	Local
Shipwreck, HMAS Parramatta	LEP A1	State
House and wharf, previously Greenmans Inn	LEP 110	Local
Woodbury's House	LEP 159	Local
Seven houses	LEP 130	Local
Timber and steel bridge over Mill Creek and ruins of Bailey's Mill	LEP 58	Local
Site of George Peat's Inn	LEP A18	Local
House	LEP I35	Local
Waterfront cottages	LEP C4	Local
Seidler House	LEP 685	State
Nine huts at Mullet Creek	LEP 177	Local
Hawkesbury River railway bridge (includes pylons of former Hawkesbury River railway bridge)	LEP 176	State

Item Name	Item/Listing Number	Significance
Nine huts at Mullet Creek	LEP 177	Local
Cable ferry	LEP 59	Local
Nine huts at Mullet Creek	LEP 177	Local
Bents Basin Inn site	LEP 28	State
Winbourne	LEP 138	Local
Blaxland's Crossing at Nepean River	LEP I289	Local
Ruins of Bailey's Mill	LEP A27	Local
Blaxland's Farm	LEP I269	Local
Remnants of former farm homestead ('Pemberton')	LEP 27	Local
Ravenswood	LEP I268	Local
Table Rock Lookout	LEP 141	Local
Warragamba Supply Scheme and Warragamba Emergency Scheme	LEP I270	State
Hawkesbury River Rail Bridge and Long Island group	LEP A19	State
Fire trail	LEP A6	Local
Prison building	LEP 573	Local
Boat shed	LEP A9	Local
Weir	LEP 848	Local
'Harmony Farm'	LEP I388	Local
Jetty	LEP A4	Local
Scenic road through bushland	LEP 187	Local
St Thomas' Anglican Church	LEP I374	Local
Brooklyn Park	LEP 209	Local
Waterfront, seawall, wharf, trees and 1889 railway bridge construction site	LEP A36	Local
Peats Ferry Road bridge	LEP A22	Local
'White Rock', house	LEP 565	Local
Singleton's Mill	LEP A56	Local
Kangaroo Point	LEP 99	Local
'Taracoonee'	LEP 186	Local
Nature Reserve,bushland	LEP 245	Local
'Gentleman's Halt'	LEP 251	Local

Item Name	Item/Listing Number	Significance
St John of God Hospital (former 'Belmont Park', mansion, garden, building, gatehouse and curtilage)	LEP I412	Local
Gentleman's Halt Inn ruins	LEP A23	Local
Punt Road, Nepean River	LEP 147	Local
Nepean River	LEP 870	Local
Cottage	LEP 832	Local
“Osborne”, homestead, barn, outbuildings and plantings	LEP 6	Local
Remains of George Peat's farmhouse	LEP A30	Local
'Spring Hill Farm' (house and barn)	LEP I311	Local
'Hawkesbury Retreat'	LEP I511	Local
'The Windsor Tavern'	LEP I151	Local
Brown's boat shed	LEP A17	Local
'Tall Trees'	LEP I405	Local
Singleton's Mill	LEP A56	Local
'Trevallyn'	LEP I158	Local
Stone dairy	LEP I136	Local
'The Pines' (residence and trees)	LEP I24	Local
House	LEP I205	Local
Rexford	LEP I135	Local
'Berry Hill', house	LEP I128	Local
'Rosemont'	LEP I459	Local
Cable ferry	LEP I138	Local
Cable ferry	LEP I196	Local
House and slab barn	LEP I462	Local
Cable ferry	LEP I208	Local
Uniting church and cemetery	LEP I190	Local
House	LEP I170	Local
The Parsonage, uniting church and cemetery	LEP I191	Local
Cable ferry	LEP I203	Local
Barn	LEP I275	Local
Private burial ground	LEP A4	Local

Item Name	Item/Listing Number	Significance
House ruins	LEP A63	Local
Ballast heap	LEP A5	Local
Pedestrian street	LEP 330	Local
'Ukamurra'	LEP I323	Local
Cable ferry	LEP 796	Local
Fords Farm	LEP 566	Local
House	LEP 207	Local
House	LEP 216	Local
Waterfront, seawall, wharf, trees and 1889 Railway Bridge construction site	LEP 332	Local
The Lodge	LEP A72	Local
'Macquarie Retreat'	LEP I325	Local
Bradleys Beach	LEP A34	Local
Hawkesbury River Rail Bridge and Long Island group	LEP A19	State
Cemetery, church ruins and memorial	LEP A3	Local
Hawkesbury River Railway Station group (Brooklyn Railway Platform and Station)	LEP 227	State
Vehicular cable ferry	LEP A8	Local
Slab barn	LEP I464	Local
Thompson Square	LEP I00126	State
Concrete house	LEP 58	Local
Uniting Church (including former schoolhouse) and Uniting Church Cemetery	LEP I00138	State
House and slab barn	LEP I463	Local
Georgian farmhouse	LEP I25	Local
House and slab barn	LEP I308	Local
Slab barn	LEP I129	Local
Victoria Bridge	LEP 146	State
Railway Bridge	LEP 668	Local
Cottage and outbuildings	LEP 113	Local
Chestnut - dwelling, slab cottage and trees	LEP 8	Local
Tyreel - dwelling and barn	LEP 10	Local

Item Name	Item/Listing Number	Significance
Rowing Course	LEP 148	Local
Federation farmhouse and trees	LEP 12	Local
Slab barn	LEP I270	Local
House and slab barns	LEP I461	Local
Australiana Pioneer Village	LEP I01683	State
Monument to Aboriginal people	LEP I372	Local
Slab hut	LEP I76	Local
Old Northern Road	LEP A12	Local
House and slab barns	LEP I346	Local
State Environmental Planning Policy (Sydney Region Growth Centres) 2006	SEPP 1	Local
Eastern Creek Bridge	S170 4309513	Local
Old Windsor Road and Windsor Road Heritage Precincts	S170 4301011	State
Hawkesbury River Bridge	S170 4309511	State
Hawkesbury River Bridge, Windsor	S170 4309589	State
River Farm	S170 4730011	Local
Sackville Ferry Crossing, Sackville	S170 4311606	Local
Brooklyn (Long Island) Archaeological Site	S170 4803221	State
Brooklyn Former Railway Platform (Long Island)	S170 4803221	Local
Hawkesbury River Rail Bridge and Long Island Group	S170 4800130	State
Hawkesbury River Railway Station Group	S170 4801021	State
Peats Ferry Road Bridge over Hawkesbury River	S170 4309666	State
Cottage	S170 3490019	Local
Emu Plains (Nepean River) Underbridge	S170 4801576	State
Penrith Weir	S170 4550169	Local
Victoria Bridge over Nepean River	S170 4301653	State
Emu Plains (Lapstone Ck) Underbridge	S170 4803210	Local
Warragamba Supply Scheme	S170 4580161	State

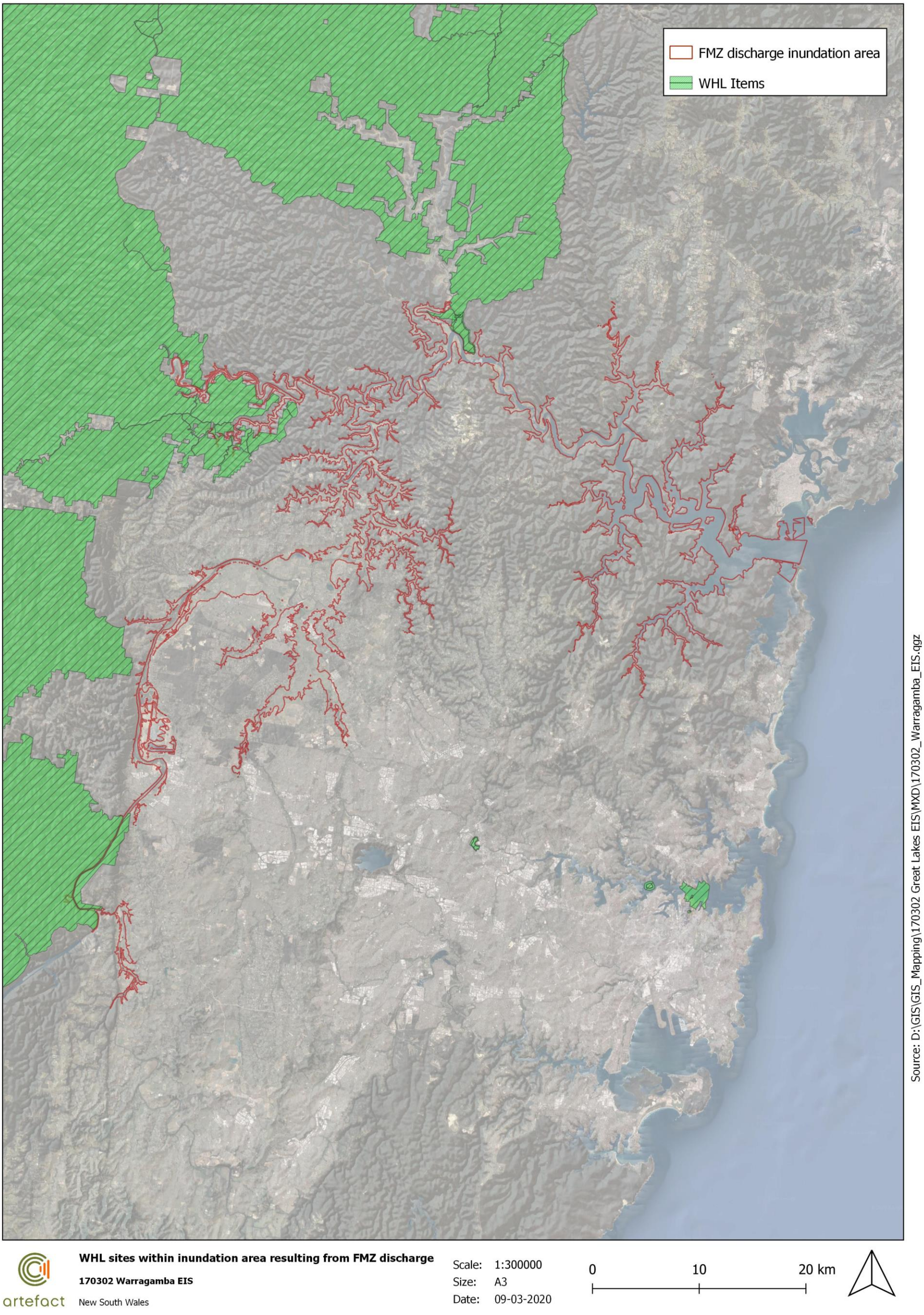


Figure 7.2: WHL sites within inundation area resulting from FMZ discharge

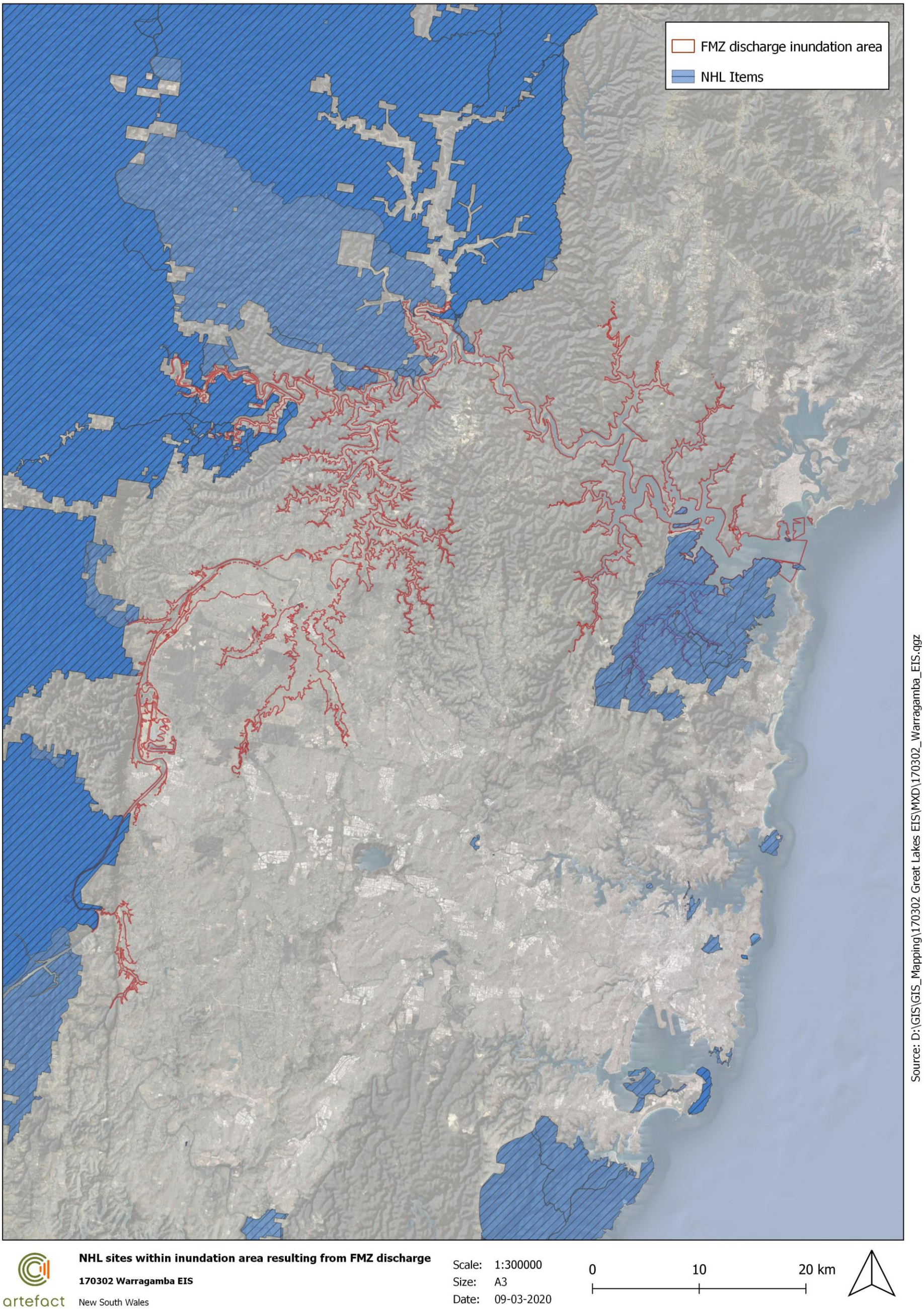


Figure 7.3: NHL sites within inundation area resulting from FMZ discharge

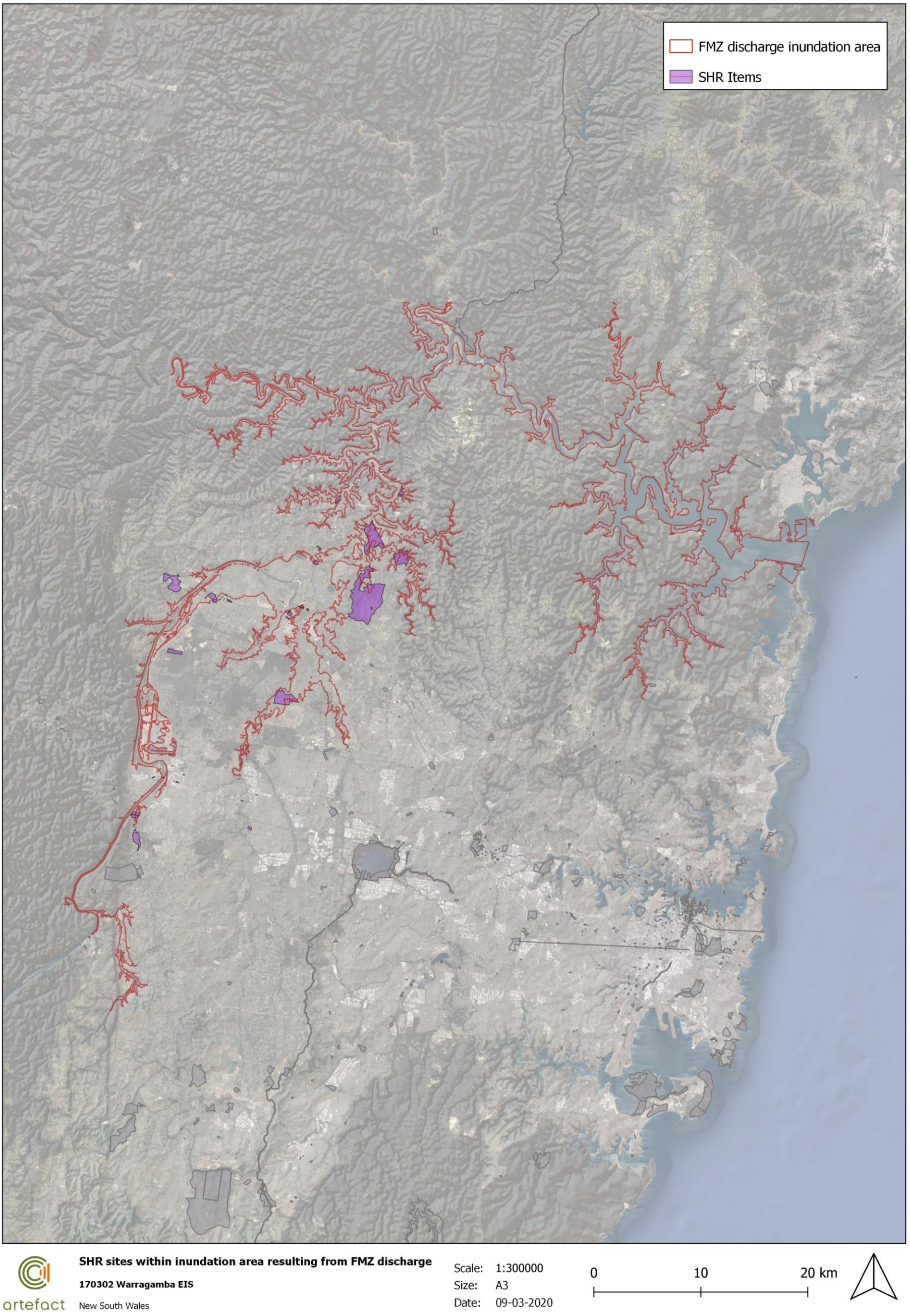


Figure 7.4: SHR sites within inundation area resulting from FMZ discharge

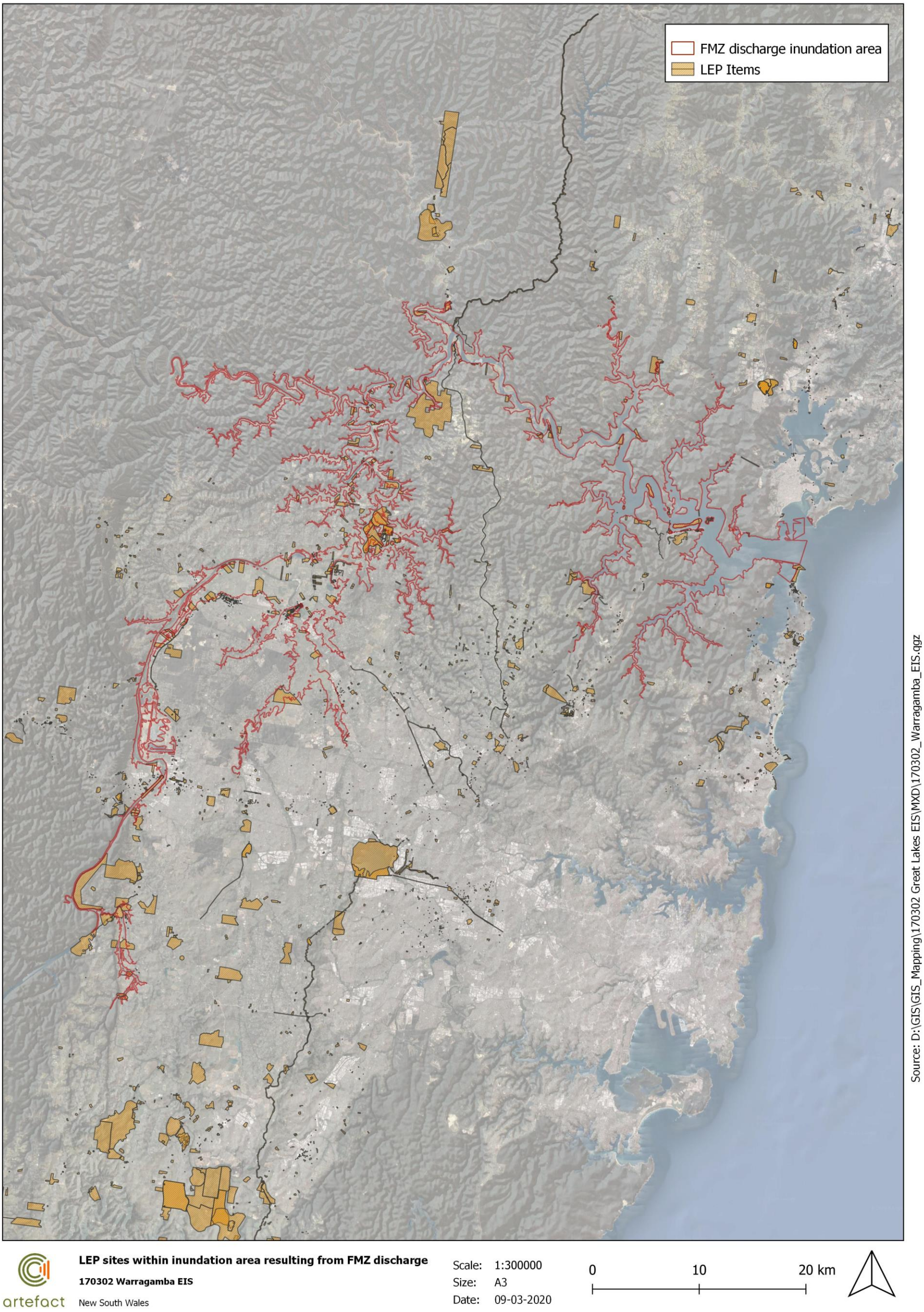


Figure 7.5: LEP sites within inundation area resulting from FMZ discharge

7.4.3.1 Built heritage items

The heritage items potentially impacted by downstream operational impacts encompass a range of built heritage items, including houses, cottages, churches, barns, huts, walls, bridges, wharves, homestead complexes, outbuildings, toll houses, headstones, graves, ruins, villages and conservation areas. These items are of ranging material and construction typologies including timber, brick, stone, concrete, steel and iron. While some of these heritage items are associated with early European settlement, other items have been more recently constructed. It is also noted that many items would likely contain moveable heritage items. While some historic structures are durable and relatively resistant to flooding, many are at risk from flood damage and inappropriate remedial works. Permeable materials like timber, lime mortars, plasters and soft bricks are at greater risk of impact. The level of impact on individual items would be dependent on several factors including the construction, permeability and materiality of the item, its structural and fabric condition, the nature of any moveable heritage items, and the depth and velocity of the low level floodwaters downstream. It is noted there would be reduced impacts from the reduction in peak flooding levels, durations and velocities.

For most heritage (archaeological and built) items impacted by the discharge of the Flood Mitigation Zone, impacts would consist of minor flooding of low points (e.g. Waterways) within the curtilage of the heritage item, rather than direct flooding of the item itself. Most heritage items in close proximity to the river or its tributaries were constructed at higher elevations to avoid the impacts of flooding. As impacts would mainly involve longer inundations within existing flood events and associated flooding levels, it is anticipated that impacts would not be above minor in nature (in comparison to existing flooding conditions). The only built heritage items located in the areas impacted downstream are designed to cope with minor flooding and include:

- Rowing Course (LEP Item No.148) – while the rowing course would be unable to be used during flooding events, the course itself would not be affected
- Windsor Bridge (LEP Item No. I276) – The water level resulting from the flood events would be below the deck level of the bridge and the bridge would remain open.
- Cable Ferry (Wisemans Ferry) (LEP Item No. 796) – Wisemans Ferry is expected to remain open and would not be impacted by the discharge.

It is anticipated that potential impacts on built heritage items downstream would be low (in comparison to existing flooding conditions). Impacts to built heritage items downstream would be managed in accordance with the measures identified in Section 8.0.

7.4.3.2 Archaeological items

The archaeological items potentially impacted downstream include sites of former slab huts, cottages, homesteads, inns, boat sheds, churches and mills, drains and drainage trenches, horse works, ballast heaps, convict built roads, fire trails, burial grounds, quarry sites and conservation areas. These items are of varying material and construction typologies including timber, brick, stone, concrete, steel and iron. While some of these archaeological items were constructed by and are associated with early European settlement, other items are associated with more recent development. The level of impact on individual items would be dependent on several factors including the construction, permeability and materiality of the archaeological resource, its fabric condition, whether the archaeological resource is located beneath existing structures or otherwise on a vacant undeveloped site, and the depth and velocity of floodwaters.

As impacts would mainly involve longer inundations within existing flood events and associated flooding levels, it is anticipated that impacts on archaeological items downstream would be low (in comparison to existing flooding conditions). Impacts to archaeological items downstream would be managed in accordance with the measures identified in Section 8.0.

7.4.3.3 Landscape items

A range of landscape items have the potential to be impacted downstream, including nature reserves and bushland, significant trees, paddocks and pastures within farms and homestead complexes and natural features like the Nepean River, the Scheyville National Park and Kangaroo Point. These items are of varying typologies. While some of these heritage items are associated with the natural integrity and intactness of the item, others are associated with landscape features that have been created by human settlement. The level of impact on individual items would be dependent on several factors including the presence and amount of vegetation cover and/or trees within the landscape element, and the depth and velocity of floodwaters.

For landscape heritage items downstream, impacts would consist of minor flooding of low points (e.g. waterways) within the curtilage of the item, rather than direct flooding. These areas are generally riparian or wetland/swamp areas and have adapted to inundation by flood waters.

As impacts would mainly involve longer inundations within existing flood events and associated flooding levels, it is anticipated that impacts on landscape items downstream would be low (in comparison to existing flooding conditions). Impacts to landscape items downstream would be managed in accordance with the measures identified in Section 8.0.

7.4.3.4 Maritime items and shipwrecks

The areas potentially impacted downstream encompass a range of maritime heritage items, including shipwrecks and remains of wharves, piers and seawalls. These items are of ranging material and construction typologies including timber, brick, stone, concrete, steel and iron. While some of these heritage items were constructed by and are associated with early European settlement, other items are more recent. The level of impact on individual items would be dependent on several factors including the construction, permeability and materiality of the item, its structural and fabric condition, nature of the wreck, and the depth and velocity of floodwaters.

As impacts would mainly involve longer inundations within existing flood events and associated flooding levels, it is anticipated that impacts on maritime items and shipwrecks downstream would be low (in comparison to existing flooding conditions). Impacts to maritime items downstream would be managed in accordance with the measures identified in Section 8.0.

7.4.4 World or National listings

7.4.4.1 Greater Blue Mountains Area (WHL Place ID 105127)

Portions of the Greater Blue Mountains Area would potentially be subject to flooding events downstream of the dam. The potential impact of the project to the significance and values of the Greater Blue Mountains Area are the subject of a separate assessment. See Appendix J of the EIS for this assessment.

7.4.4.2 The Greater Blue Mountains Area (NHL Place ID 105999)

As covered above, the potential impact of the project to the significance and values of the Greater Blue Mountains Area has been addressed in a separate assessment, and conclusions have not been included in this report. See Appendix J of the EIS for this assessment.

7.4.4.3 The Greater Blue Mountains Area - Additional Values (NHL Place ID 105696)

The potential impacts of the project to the significance and values of the nominated Greater Blue Mountains Area Additional Values has been subject to a separate assessment. See Appendix J of the EIS for this assessment.

7.4.4.4 Australian Convict Sites (Old Great North Road) and buffer zone (WHL Place ID 106209)

Direct (physical) impact assessment

Impact of the project to the WHL Australian Convict Sites (Old Great North Road) is not considered to be significant. The proposed Probable Maximum Flood associated with the dam raising would only marginally encroach on the curtilage of the WHL item, the affected sections of which are not associated with significant elements or components, and instead comprise portions of the Hawkesbury-Nepean Rivers, Settlers Road, Wisemans Ferry Road and nearby private properties and farm land. A small section of a WHL item's Buffer Zone is within the area potentially impacted downstream. The Buffer Zone may therefore be affected by a variety of potential indirect impacts associated with low level flood waters being present for an extended period. It is considered potential impacts would be minimal in nature. The main area of the item's heritage curtilage would not be affected.

The project would result in a low direct (physical) impact to the WHL Australian Convict Sites (Old Great North Road).

Indirect (visual) impact assessment

It is not anticipated that the project would result in any visual changes to the portions of the Australian Convict Sites (Old Great North Road) heritage curtilage and Buffer Zone that are within the study area. No permanent changes are proposed within the World (and National) heritage property. It is considered potential indirect (visual) impact associated with flooding and the localised effect of retention of low level flood waters for an extended period would not result in additional adverse impact to the heritage item. The localised affected areas of the item's heritage curtilage currently experience flood events.

The project would result in a neutral indirect (visual) impact to the WHL Australian Convict Sites (Old Great North Road).

EPBC Major Guideline Questions

The *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (2013) pose a series of questions to assist in the clarification of whether to refer an action should be referred to the Minister.

These questions have been considered with reference to the potential impacts associated with the proposed action as follows:

1. *Are there any matters of national environmental significance located in the area of the proposed action (noting that 'the area of the proposed action' is broader than the immediate location where the action is undertaken; consider also whether there are any matters of national environmental significance adjacent to or up/ downstream from the immediate location that may potentially be impacted)?*

Yes, the proposed action would occur in proximity to the Australian Convict Sites (Old Great North Road), involving parts of the curtilage closest to the Hawkesbury-Nepean. Only the Australian Convict Sites (Old Great North Road) Buffer Zone has the potential to be impacted by flooding.

2. *Considering the proposed action at its broadest scope (that is, considering all stages and components of the action, and all related activities and infrastructure), is there potential for impacts, including indirect impacts, on matters of national environmental significance?*

No permanent impacts to World Heritage values associated with the Australian Convict Sites (Old Great North Road) are anticipated by the proposed action. Significant elements and components within the heritage item are located outside of the proposed PMF associated with the dam raising. There is potential for minor indirect impact associated with portions of the WHL Buffer Zone being within the area impacted by flooding downstream.

3. *Are there any proposed measures to avoid or reduce impacts on matters of national environmental significance (and if so, is the effectiveness of these measures certain enough to reduce the level of impact below the 'significant impact' threshold)?*

The project largely avoids impact on the World (or National) heritage values associated with the Australian Convict Sites (Old Great North Road). This is due to the existing flood event conditions at the site location, and the location of significant elements of the item (comprising the Old Great North Road itself) that are located outside of the proposed PMF associated with the dam raising and potential impact downstream. As there is not anticipated to be a significant impact to the heritage item, no specific measures have been recommended to reduce impact on the Old Great North Road component of the Australian Convict Sites World heritage item.

4. *Are any impacts of the proposed action on matters of national environmental significance likely to be significant impacts (important, notable, or of consequence, having regard to their context or intensity)?*

No. The proposed action is not expected to impact on matters of national environmental significance.

Significant Impact Criteria

The Significant Impact Criteria outlined in the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (2013)* are intended to assist in determining whether the impacts of a proposed action on any matter of national environmental significance are likely to be significant impacts. Table 7.7 presents an assessment against the heritage values for the Australian Convict Sites (Old Great North Road).

Table 7.7: Assessment against Significant Impact Criteria

Significant Impact Criteria	Impact to Australian Convict Sites (Old Great North Road)
Permanently remove, destroy, damage or substantially alter the fabric of a World Heritage property	No – construction works associated with the project would not take place within the curtilage of the heritage item. The proposed action would not result in impact to the fabric of the Great North Road. The PMF encroaches only slightly on the curtilage of the heritage item in areas that do not contain significant elements or components.
Permanently remove, destroy, damage or substantially alter the fabric of a National Heritage Place in a manner which is inconsistent with relevant values	No – as above, significant fabric associated with the Great North Road heritage item are outside the PMF. The heritage values of the place would remain unaffected.

Significant Impact Criteria	Impact to Australian Convict Sites (Old Great North Road)
Extend, renovate, refurbish or substantially alter a World Heritage property or National Heritage Place in a manner which is inconsistent with relevant values	No – the proposed action would not alter fabric associated with the heritage item.
Permanently remove, destroy, damage or substantially disturb archaeological deposits or artefacts in a World Heritage property or National Heritage Place	No - as above, significant components of the Great North Road are outside the PMF. It is not anticipated that significant archaeological remains directly associated with the heritage item would be affected by the proposed action.
Involve activities in a World Heritage property or National Heritage Place with substantial and/or long–term impacts on its values	No – the proposed action would not result in substantial or long-term impact to the heritage values of the heritage item.
Involve construction of buildings or other structures within, adjacent to, or within important sight lines of, a World Heritage property or National Heritage Place which are inconsistent with relevant values	No – the proposed action would not visually alter the heritage item.
Make notable changes to the layout, spaces, form or species composition in a garden, landscape or setting of a World Heritage property or National Heritage Place which are inconsistent with relevant values	No – construction works associated with the project would not take place within the curtilage of the heritage item. No change to the fabric of the item, or its setting, would occur as a consequence of the proposed action.
Alter the setting of a World Heritage property or National Heritage Place in a manner that is inconsistent with relevant values	No - as above, significant fabric associated with the Great North Road heritage item are outside the PMF. The heritage values of the place would remain unaffected.

7.4.4.5 Great North Road, Wisemans Ferry to Bucketty (NHL Place ID 106318)

The assessed heritage impact on the values of the nominated Great North Road, Wisemans Ferry to Bucketty heritage item are covered above for its World Heritage listing (refer to Section 7.4.4.4). The project would not result in any significant impact or benefit to the Great North Road, with both the existing and with project Probable Maximum Flood only encroaching upon a very minor portion of the southern and eastern boundary of the item's curtilage. These areas of low impact are located at a considerable distance from significant elements within the Great North Road. Overall, the proposed action would not result in any significant impacts or benefits to the Great North Road, Wisemans Ferry to Bucketty NHL item.

7.4.4.6 Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves (NHL Place ID 105817)

Direct (physical) impact assessment

The project would not result in impact to the Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves. These areas are located a considerable distance downstream from the dam and in an area where marine influences and local catchment inflows dominate. Therefore, no or negligible changes in flood levels or regimes have been predicated. No impacts on biodiversity from the project are predicted in these areas.

The project would result in a neutral (physical) impact to the NHL Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves.

Indirect (visual) impact assessment

The project would not result in any visual changes to portions of the Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves. These areas are located a considerable distance downstream from the dam and in an area where marine influences and local catchment inflows dominate. Therefore, no or negligible changes in flood levels or regimes have been predicated. No impacts on visual amenity from the project are predicted in these areas.

The project would result in a neutral (visual) impact to the NHL Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves.

EPBC Major Guideline Questions

The *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (2013) pose a series of questions to assist in the clarification of whether to refer an action should be referred to the Minister.

These questions have been considered with reference to the potential impacts associated with the proposed action as follows:

1. *Are there any matters of national environmental significance located in the area of the proposed action (noting that 'the area of the proposed action' is broader than the immediate location where the action is undertaken; consider also whether there are any matters of national environmental significance adjacent to or up/ downstream from the immediate location that may potentially be impacted)?*

Yes, the proposed action would occur in proximity to the Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves, involving parts of the curtilage closest to the Hawkesbury River and tributaries.

2. *Considering the proposed action at its broadest scope (that is, considering all stages and components of the action, and all related activities and infrastructure), is there potential for impacts, including indirect impacts, on matters of national environmental significance?*

No impacts to National Heritage values associated with the Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves are anticipated by the proposed action.

3. *Are there any proposed measures to avoid or reduce impacts on matters of national environmental significance (and if so, is the effectiveness of these measures certain enough to reduce the level of impact below the 'significant impact' threshold)?*

The proposed action is not considered to result in an impact to National Heritage values associated with the Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves that are more than minor in nature, due to the existing flood event conditions at the site location and the overall negligible flood level rise that would occur.

4. *Are any impacts of the proposed action on matters of national environmental significance likely to be significant impacts (important, notable, or of consequence, having regard to their context or intensity)?*

No. The proposed action is not expected to impact on matters of national environmental significance.

Significant Impact Criteria

The Significant Impact Criteria outlined in the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (2013)* are intended to assist in determining whether the impacts of a

proposed action on any matter of national environmental significance are likely to be significant impacts. Table 7.7 presents an assessment against the heritage values for the Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves.

Table 7.8: Assessment against Significant Impact Criteria

Significant Impact Criteria	Impact to Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves
Permanently remove, destroy, damage or substantially alter the fabric of a World Heritage property	No - construction works associated with the project would not take place within the curtilage of the heritage item. Negligible changes in flood levels within the heritage item have been predicated. The proposed action would not alter the heritage item.
Permanently remove, destroy, damage or substantially alter the fabric of a National Heritage Place in a manner which is inconsistent with relevant values	No – as above, the item is located a considerable distance downstream from the construction study area, negligible changes in flood levels are predicted with the park and nature reserves. Overall, the heritage values of the place would remain unaffected.
Extend, renovate, refurbish or substantially alter a World Heritage property or National Heritage Place in a manner which is inconsistent with relevant values	No – as above, the heritage values of the place would remain unaffected.
Permanently remove, destroy, damage or substantially disturb archaeological deposits or artefacts in a World Heritage property or National Heritage Place	No – potential impact to the heritage item through flooding is negligible. It is not anticipated that significant archaeological remains associated with the heritage item would be affected by the proposed action.
Involve activities in a World Heritage property or National Heritage Place with substantial and/or long–term impacts on its values	No - the proposed action would not result in substantial or long-term impact to the heritage values of the heritage item.
Involve construction of buildings or other structures within, adjacent to, or within important sight lines of, a World Heritage property or National Heritage Place which are inconsistent with relevant values	No – the construction study area would not be visible from the heritage item and would not impact on significant sight lines or its setting.
Make notable changes to the layout, spaces, form or species composition in a garden, landscape or setting of a World Heritage property or National Heritage Place which are inconsistent with relevant values	No - construction works associated with the project would not take place within the curtilage of the heritage item. No change to the fabric of the item, or its setting, would occur because of the proposed action.
Alter the setting of a World Heritage property or National Heritage Place in a manner that is inconsistent with relevant values	No – the item is located a considerable distance downstream from the construction study area and negligible changes in flood levels are predicted with the park and nature reserves. Overall, the setting of the heritage item would remain unaffected.

7.4.5 Summary of downstream impacts

Overall, this assessment has identified that the impact of the project downstream would generally result in a reduction of the number of heritage items that would be flooded during the nominated flooding events, or otherwise a reduction in the depth and duration of flooding for other heritage items. Note that the extent of the listed curtilage pf the WHL and NHL items shown on Figure 7.2 and Figure 7.3 makes this reduction difficult to illustrate. However, it is noted that additional impacts would occur

to heritage items within the areas potentially subject to downstream impacts, where low level flooding would be extended in duration. This includes a range of built heritage, landscape, archaeological and maritime items. Management measures associated with these impacts are included in Section 8.0.

7.5 NSW Register of Shipwrecks

The level of impact on individual items would be dependent on several factors including the construction, permeability and materiality of the item, its structural and fabric condition, nature of the wreck, and the depth and velocity of floodwaters.

Despite the unknown condition of and generalised location of the wrecks and maritime items in the Nepean and Hawkesbury Rivers and associated tributaries, impacts would mainly involve longer inundations within existing flood events and associated flooding levels. Therefore, it is anticipated that impacts on maritime items and shipwrecks downstream would be low (in comparison to existing flooding conditions). Impacts to maritime items downstream would be managed in accordance with the measures identified in Section 8.0.

7.6 Assessment of impact to archaeological remains

The proposed works include several activities with the potential to impact on archaeological remains, including vegetation clearance, demolition, levelling and construction works.

Project activities within areas identified as having potential to contain archaeological remains associated with the Warragamba Dam construction camp include:

- Vegetation clearance for potential materials storage and handling area

Vegetation clearance on the north-westernmost edge of the area of archaeological potential. Excavation works associated with the construction study area may result in impact to archaeological remains associated with the Warragamba Dam construction camp through vegetation removal associated with the establishment of material storage areas. It is not anticipated that these works would result in a substantial impact to potential remains.

Excavation works associated with the construction study area identified as having potential to impact archaeological remains associated with construction of the Warragamba Dam include:

- The establishment of two concrete batch plants and areas for materials storage and handling
- Vegetation clearance north of the river
- Construction of the raised dam wall and spillway.

Much of the archaeological evidence associated with the construction of the Warragamba Dam was removed in the 1990s during construction of the ancillary spillway, although there are portions of the study area which retain archaeological potential. It is considered that construction works and vegetation removal near the dam would result in a moderate impact to archaeological remains.

7.7 Cumulative impact

This assessment has identified that the overall impact of the project across a century of flood events would largely be considered positive in most cases. Downstream of the Warragamba Dam Raising, listed items of local, State, National and World heritage significance would see positive benefits from the proposed dam wall raising and flood mitigation measures in terms of a reduction or otherwise avoidance of inundation in nominated flooding events.

The cumulative impact of the project around the dam itself within the construction study area is considered to result in a series of localised impacts during construction of works and following completion that would represent moderate to high direct (physical) and indirect (visual) impacts, including to the State listed Haviland Park and Section 170 Heritage and Conservation Registers listed Warragamba Supply Scheme. The impacts outlined above, including those within the construction areas of the project, are partially offset by the positive impacts downstream that reduces the number of listed heritage items affected by flooding events.

It is noted additional indirect impacts would occur to listed heritage items within the area impacted by discharge from the Flood Mitigation Zone where flooding events would be extended in duration. This includes a range of built heritage, landscape, archaeological and maritime items. The cumulative impact of these items being inundated for an extended period, although generally of a minor nature, would ultimately be dependent on the condition, construction and typology of each item, and managed in accordance with the measures identified in Section 8.0.

The project would likely have a cumulative impact on the WHL and NHL Greater Blue Mountains Area relating to areas upstream of the dam wall that would be directly impacted by the retention of flood waters at an increased level in some areas. Potential impacts of the project to the significance and values of the Greater Blue Mountains Area will be subject to a separate assessment to this report, which will address cumulative impact. See Appendix J of the EIS for this assessment.

8.0 MANAGEMENT OF NON-ABORIGINAL HERITAGE

Mitigation and management measures are provided below, and relevant listed heritage items concerned summarised for easy reference. These management measures would be implemented to address heritage impacts on non-Aboriginal heritage sites and areas of archaeological potential within the study area.

Table 8.1: Mitigation and management measures

	Measure Guidelines	Would apply to
1	Where possible, consideration should be given to conserve and avoid impact to elements of primary significance and heritage items within the construction study area. Where impact and/or removal is unavoidable, the subsequent measures would be enacted.	Haviland Park Warragamba Supply Scheme: • Directly impacted parts of the item of primary significance including buildings, machinery and equipment, plaques and memorials, and setting. The adjacent terraced garden on eastern bank
2	Photographic Archival Recording and reporting would be carried out in accordance with the NSW Heritage Office's How to Prepare Archival Records of Heritage Items (1998), and Photographic Recording of Heritage Items Using Film or Digital Capture (2006) The record would be prepared by a suitably qualified heritage consultant using archival-quality material. Records for SHR listed items would be held at the NSW Heritage Council and State Library. Records for LEP-listed items would be held by the local Council and local library. A copy of the record would be held by the owner of the asset.	Haviland Park: • The fabric of the park and its significant elements • The setting of the park including views to and from the dam wall Warragamba Supply Scheme: • Directly impacted parts of the item • The interior, exterior and setting of the dam wall itself and associated structures, including approaches • The fabric and setting of machinery and equipment to be removed or altered • The fabric and setting of memorials and plaques to be removed or altered • The fabric and setting of affected significant buildings • The fabric and setting of adjacent terraced garden on eastern bank
3	Appropriate heritage interpretation would be incorporated into the design for the project in accordance with the NSW Heritage Manual, the NSW Heritage Office's Interpreting Heritage Places and Items: Guidelines (August 2005), and the NSW Heritage Council's Heritage Interpretation Policy.	Warragamba Dam site: • Key locations on site including Operations and Visitor Information Centre, Haviland Park and associated lookouts • Key locations off site including Lake Burragorang lookout
4	A Heritage Interpretation Strategy for the project would be incorporated into future designs and planning. Opportunities for interpretive displays in appropriate locations would be explored	Warragamba Dam site: • Key locations on site including Operations and Visitor Information Centre, Haviland Park and associated lookouts • Key locations off site including Lake Burragorang lookout
5	An appropriately qualified and experienced heritage architect would provide independent review periodically throughout detailed design.	Construction study area in relation to all heritage items

Measure	Guidelines	Would apply to
6	The project design would be sympathetic to impacted items (including retained significant elements) and surrounding heritage items by minimising impacts to sight lines, views and setting.	Construction study area in relation to all heritage items
7	Except for heritage significant elements affected by the project, direct impact on other heritage significant items elements would be avoided.	Construction study area in relation to all heritage items
8	Where heritage significant items or elements are to be retained within the construction study area, detailed design would consider appropriate adaptive reuse or interpretive use to be developed in consultation with a heritage architect.	Construction study area in relation to all heritage items
9	A moveable heritage item strategy (including a salvage strategy) would be prepared for the Warragamba Supply Scheme. The strategy would be prepared by a suitably qualified heritage consultant in consultation with WaterNSW and include a comprehensive record of significant elements to be impacted. This would include items, machinery and equipment, and commemorative plaques and memorials contained within curtilage of the Warragamba Dam site. The moveable heritage item strategy would form part of a broader interpretation strategy for the Warragamba Supply Scheme.	Warragamba Supply Scheme (including but not limited to impacted significant machinery, equipment, plaques and memorials)
10	Fabric of primary and contributory significance of items proposed for removal would be identified and catalogued according to the significant fabric strategy prior to design development and would be re-used or salvaged where possible. Where not re-used within the design of the project, the significant fabric strategy would indicate appropriate storage locations as well as appropriate off-site locations where the salvaged elements may be reused in the future. Where large elements are impacted a sample of fabric may be appropriate.	Warragamba Supply Scheme (including but not limited to impacted significant machinery, equipment, plaques and memorials)
11	Methodologies for the removal of existing structures and construction of new structures and infrastructure would be developed to minimise direct (physical) and indirect (visual) impacts to other elements within the curtilages of the heritage items or to heritage items located near works. These methodologies would be included within the overall Construction Environmental Management Plan (CEMP).	Construction study area in relation to all heritage items
12	Site remediation measures related to construction sites would be incorporated within the Urban Design and Landscape Plan. The objective of the remediation would be to minimise long-term impacts on the visual amenity of the items by recreating a sympathetic environment. A landscape scheme would be prepared for the SHR listed Haviland Park to re-instate planting and landscaping within and around the item's curtilage. The scheme would consider appropriate plantings. Any boundary wall treatment would be designed in consultation with a heritage architect.	Construction study area in relation to all heritage items Haviland Park

Measure	Guidelines	Would apply to
13	An archaeological research design would be prepared and implemented to identify the need for archaeological testing or monitoring. Archaeological mitigation measures recommended in the archaeological research design would be carried out in accordance with Heritage Council guidelines, and where identified in the archaeological research design, would be supervised by a suitably qualified Excavation Director. An Unexpected Finds Policy would be implemented during the project to manage and mitigate potential impacts to the potential archaeological resource.	Warragamba Supply Scheme Haviland Park
14	Ancillary works required by the project related to batch plant, laydown areas, power supply, drainage facilities and any other works would be designed and constructed to minimise impacts on heritage items and areas of archaeological potential as much as feasible within the context of the project.	Construction study area Haviland Park
15	Design and construction within the SHR curtilage of Haviland Park would consider the recommendations of the Warragamba Supply Scheme CMP 2010 and the significant fabric strategy.	Haviland Park
16	Design and construction within the Section 170 Heritage and Conservation Register curtilage of the Warragamba Supply Scheme would consider the recommendations of the Warragamba Supply Scheme CMP 2010 and the significant fabric strategy.	Warragamba Supply Scheme

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APPENDIX A - WORLD, NATIONAL AND COMMONWEALTH HERITAGE PRINCIPLES

Schedule 5—Australian World Heritage management principles

(regulation 10.01)

1 General principles

1.01 The primary purpose of management of natural heritage and cultural heritage of a declared World Heritage property must be, in accordance with Australia's obligations under the World Heritage Convention, to identify, protect, conserve, present, transmit to future generations and, if appropriate, rehabilitate the World Heritage values of the property.

1.02 The management should provide for public consultation on decisions and actions that may have a significant impact on the property.

1.03 The management should make special provision, if appropriate, for the involvement in managing the property of people who:

(a) have a particular interest in the property; and

(b) may be affected by the management of the property.

1.04 The management should provide for continuing community and technical input in managing the property.

2 Management planning

2.01 At least 1 management plan should be prepared for each declared World Heritage property.

2.02 A management plan for a declared World Heritage property should:

(a) state the World Heritage values of the property for which it is prepared; and

(b) include adequate processes for public consultation on proposed elements of the plan; and

(c) state what must be done to ensure that the World Heritage values of the property are identified, conserved, protected, presented, transmitted to future generations and, if appropriate, rehabilitated; and

(d) state mechanisms to deal with the impacts of actions that individually or cumulatively degrade, or threaten to degrade, the World Heritage values of the property; and

(e) provide that management actions for values, that are not World Heritage values, are consistent with the management of the World Heritage values of the property; and

(f) promote the integration of Commonwealth, State or Territory and local government responsibilities for the property; and

(g) provide for continuing monitoring and reporting on the state of the World Heritage values of the property; and

(h) be reviewed at intervals of not more than 7 years.

3 Environmental impact assessment and approval

3.01 This principle applies to the assessment of an action that is likely to have a significant impact on the World Heritage values of a property (whether the action is to occur inside the property or not).

3.02 Before the action is taken, the likely impact of the action on the World Heritage values of the property should be assessed under a statutory environmental impact assessment and approval process.

3.03 The assessment process should:

(a) identify the World Heritage values of the property that are likely to be affected by the action; and

(b) examine how the World Heritage values of the property might be affected; and

(c) provide for adequate opportunity for public consultation.

3.04 An action should not be approved if it would be inconsistent with the protection, conservation, presentation or transmission to future generations of the World Heritage values of the property.

3.05 Approval of the action should be subject to conditions that are necessary to ensure protection, conservation, presentation or transmission to future generations of the World Heritage values of the property.

3.06 The action should be monitored by the authority responsible for giving the approval (or another appropriate authority) and, if necessary, enforcement action should be taken to ensure compliance with the conditions of the approval.

Schedule 5B—National Heritage management principles

(regulation 10.01E)

1 The objective in managing National Heritage places is to identify, protect, conserve, present and transmit, to all generations, their National Heritage values.

2 The management of National Heritage places should use the best available knowledge, skills and standards for those places, and include ongoing technical and community input to decisions and actions that may have a significant impact on their National Heritage values.

3 The management of National Heritage places should respect all heritage values of the place and seek to integrate, where appropriate, any Commonwealth, State, Territory and local government responsibilities for those places.

4 The management of National Heritage places should ensure that their use and presentation is consistent with the conservation of their National Heritage values.

5 The management of National Heritage places should make timely and appropriate provision for community involvement, especially by people who:

(a) have a particular interest in, or association with, the place; and

(b) may be affected by the management of the place.

6 Indigenous people are the primary source of information on the value of their heritage and the active participation of indigenous people in identification, assessment and management is integral to the effective protection of indigenous heritage values.

7 The management of National Heritage places should provide for regular monitoring, review and reporting on the conservation of National Heritage values.

Schedule 7B—Commonwealth Heritage management principles

(regulation 10.03D)

1 The objective in managing Commonwealth Heritage places is to identify, protect, conserve, present and transmit, to all generations, their Commonwealth Heritage values.

2 The management of Commonwealth Heritage places should use the best available knowledge, skills and standards for those places, and include ongoing technical and community input to decisions and actions that may have a significant impact on their Commonwealth Heritage values.

3 The management of Commonwealth Heritage places should respect all heritage values of the place and seek to integrate, where appropriate, any Commonwealth, State, Territory and local government responsibilities for those places.

4 The management of Commonwealth Heritage places should ensure that their use and presentation is consistent with the conservation of their Commonwealth Heritage values.

5 The management of Commonwealth Heritage places should make timely and appropriate provision for community involvement, especially by people who:

(a) have a particular interest in, or associations with, the place; and

(b) may be affected by the management of the place;

6 Indigenous people are the primary source of information on the value of their heritage and that the active participation of indigenous people in identification, assessment and management is integral to the effective protection of indigenous heritage values.

7 The management of Commonwealth Heritage places should provide for regular monitoring, review and reporting on the conservation of Commonwealth Heritage values.

APPENDIX B - LEP ITEMS WITHIN STUDY AREA

Item Name	LEP Item No.	LGA	Relationship to study area
SEPP Amendment (Hawkesbury Growth Centres Precinct Plan) 2017	1	-	Downstream
SEPP (Marsden Park Precinct Amendment) 2013	1	-	Downstream
Farmhouse and outbuildings	2	Penrith	Downstream
SEPP (Marsden Park Precinct Amendment) 2013	3	-	Downstream
“Osborne”, homestead, barn, outbuildings and plantings	6	Penrith	Downstream
Chestnut - dwelling, slab cottage and trees	8	Penrith	Downstream
Tyreel - dwelling and barn	10	Penrith	Downstream
Federation farmhouse and trees	12	Penrith	Downstream
Agnes Banks Nature Reserve	15	Penrith	Downstream
Castlereagh Public School (Former)	20	Penrith	Downstream
Remains of stone walling	22	Central Coast	Downstream
Grave of Owen Maloney	23	Central Coast	Downstream
House, 'Glenworth Valley'	24	Central Coast	Downstream
Shadforth Monument (former pioneer's monument)	24	Liverpool	Downstream
Farmhouse, Garden Planting & Natural Vegetation	26	Penrith	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Greendale Roman Catholic Cemetery	26	Liverpool	Downstream
Remnants of former farm homestead ('Pemberton')	27	Liverpool	Downstream
Bents Basin Inn site	28	Liverpool	Downstream
Bents Basin Inn site	28	Liverpool	Downstream
Olive trees	39	Penrith	Downstream
Former Cranebrook Public School	40	Penrith	Downstream
Johnson's Cottage	41	Penrith	Downstream
St Thomas' Anglican Church (former) & Palm Trees	42	Penrith	Downstream
Emu Hall , dwelling, outbuildings and trees	51	Penrith	Downstream
St Peter's cemetery	51	Central Coast	Downstream
Grave of John Donovan	52	Central Coast	Downstream
Former police station residence	52	Penrith	Downstream
Lawson's Inn site (former 'The Thistle' site)	53	Liverpool	Downstream
Cottage	55	Penrith	Downstream
Lower Hawkesbury Wesleyan Chapel and site	56	Central Coast	Downstream
Timber and steel bridge over Mill Creek and ruins of Bailey's Mill	58	Central Coast	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Concrete house	58	Penrith	Downstream
Cable ferry	59	Central Coast	Downstream
Emu Plains Railway Station	59	Penrith	Downstream
Roadworks	60	Central Coast	Downstream
Weatherboard house	60	Penrith	Downstream
Former Australian Arms Inn	61	Penrith	Downstream
Former Union Inn including trees	63	Penrith	Downstream
Stone house	64	Penrith	Downstream
Westbank - house	65	Penrith	Downstream
"Yodalla", house and garden	66	Penrith	Downstream
Lewers Bequest and Penrith Regional Art Gallery, houses and garden	69	Penrith	Downstream
Huntington Hall – dwelling and garden	71	Penrith	Downstream
Melrose Hall	73	Penrith	Downstream
Orange Grove - cottage	74	Penrith	Downstream
War Memorial, Emu Park	75	Penrith	Downstream
Emu Plains Public School (former) including trees	76	Penrith	Downstream
St. Paul's Anglican Church and Emu Plains General Cemetery	78	Penrith	Downstream
Yamba - Cottage	80	Penrith	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Uniting Church	82	Penrith	Downstream
Edwardian cottage	83	Penrith	Downstream
Sandstone cottage	84	Penrith	Downstream
Emu Plains Assembly Hall	85	Penrith	Downstream
Gwandalan – dwelling and garden	92	Penrith	Downstream
Workmen's cottages	94	Penrith	Downstream
Madang Park – dwelling and trees	95	Penrith	Downstream
Kangaroo Point	99	Hornsby	Downstream
Edinglassie - House	108	Penrith	Downstream
House and wharf, previously Greenmans Inn	110	Central Coast	Downstream
Site of Edinglassie	112	Penrith	Downstream
Cottage and outbuildings	113	Penrith	Downstream
Londonderry Cemetery	115	Penrith	Downstream
Seven houses	130	Central Coast	Downstream
Irrigation canal	137	Penrith	Downstream
Winbourne	138	Penrith	Downstream
Winbourne	138	Penrith	Downstream
Table Rock Lookout	141	Penrith	Downstream
Pumping station (former)	144	Penrith	Downstream
Victoria Bridge	146	Penrith	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Punt Road, Nepean River	147	Penrith	Downstream
Rowing Course	148	Penrith	Downstream
House & garden	151	Penrith	Downstream
House	157	Central Coast	Downstream
Holy Trinity Church, graveyard and wharf	158	Central Coast	Downstream
Edwardian cottage	158	Penrith	Downstream
Woodbury's House	159	Central Coast	Downstream
The Lodge	159	Penrith	Downstream
Victorian house	160	Penrith	Downstream
Craithes - dwelling, trees, outbuildings and carriage loop	161	Penrith	Downstream
Combewood - house, garden and original entrance drive	163	Penrith	Downstream
Thornton Hall	166	Penrith	Downstream
Hawkesbury River railway bridge (includes pylons of former Hawkesbury River railway bridge)	176	Central Coast	Downstream
Nine huts at Mullet Creek	177	Central Coast	Downstream
Nine huts at Mullet Creek	177	Central Coast	Downstream
Nine huts at Mullet Creek	177	Central Coast	Downstream
'Berowra Waters Inn'	183	Hornsby	Downstream
'Taracoonee'	186	Hornsby	Downstream
Station Master's House (former)	187	Penrith	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Scenic road through bushland	187	Hornsby	Downstream
Penrith Railway Station	188	Penrith	Downstream
Penrith Council Chambers (former)	189	Penrith	Downstream
Rex Jones Memorial	193	Hornsby	Downstream
High Street Shop - Former Fulton's Store	197	Penrith	Downstream
High Street Shop	198	Penrith	Downstream
High Street Shop	199	Penrith	Downstream
Lower Hawkesbury Wesleyan Chapel and site	202	Central Coast	Downstream
Seymours Creek Mangrove wetland	205	Hornsby	Downstream
House	206	Hornsby	Downstream
House	207	Hornsby	Downstream
Brooklyn Park	209	Hornsby	Downstream
Victorian Villa	214	Penrith	Downstream
House	216	Hornsby	Downstream
House	217	Hornsby	Downstream
Mimosa - dwelling, fence and garden	219	Penrith	Downstream
Former Stables, Mimosa	220	Penrith	Downstream
McKell Park,lower, upper, cabbage palms and World War II gun and emplacements	225	Hornsby	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Margaret Farm- house, barn and tannery site	226	Penrith	Downstream
Margaret Farm- house, barn and tannery site	226	Penrith	Downstream
Hawkesbury River Railway Station group (Brooklyn Railway Platform and Station)	227	Hornsby	Downstream
Railway shelter shed	228	Hornsby	Downstream
House	229	Hornsby	Downstream
Leeholme Horse Stud Rotunda	232	Penrith	Downstream
Cottage	234	Penrith	Downstream
Tannery Pits(Former) & Well – Thompson Tannery Site	235	Penrith	Downstream
Nature Reserve,bushland	245	Hornsby	Downstream
'Gentleman's Halt'	251	Hornsby	Downstream
Penrith Ambulance Station	256	Penrith	Downstream
Peachtree Creek Bridge	257	Penrith	Downstream
Explorers Memorial	258	Penrith	Downstream
Museum of Fire (former Penrith Power Station)	259	Penrith	Downstream
Castlereagh Road	261	Penrith	Downstream
Castlereagh Road Alignment	261	Penrith	Downstream
Castlereagh Road	261	Penrith	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Castlereagh Road	261	Penrith	Downstream
Regentville Mansion & Vinyard Terracing Site	271	Penrith	Downstream
Glenleigh	273	Penrith	Downstream
Regentville Workers' Terrace	276	Penrith	Downstream
St Marys Railway Station	282	Penrith	Downstream
St. Marys Public School	307	Penrith	Downstream
Wagon Wheel Hotel	308	Penrith	Downstream
Victoria Park and Memorial	310	Penrith	Downstream
Rose Cottage and slab hut	318	Penrith	Downstream
Torquay - House	319	Penrith	Downstream
Wallacia Hotel	325	Penrith	Downstream
Former St. Andrews Anglican Church	326	Penrith	Downstream
Arms of Australia Inn	327	Penrith	Downstream
Pedestrian street	330	Hornsby	Downstream
Waterfront, seawall, wharf, trees and 1889 Railway Bridge construction site	332	Hornsby	Downstream
Crosslands Reserve	564	Hornsby	Downstream
'White Rock', house	565	Hornsby	Downstream
Fords Farm	566	Hornsby	Downstream
Prison building	573	Hornsby	Downstream
'Bobbin Inn' (Ku-ring-gai Chase National Park)	576	Hornsby	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Wool Pack Inn Ruin	654	Penrith	Downstream
Brick farmhouse, trees & orchard	659	Penrith	Downstream
Cottage	660	Penrith	Downstream
House	664	Penrith	Downstream
Federation cottage	665	Penrith	Downstream
International style house & garden	666	Penrith	Downstream
Sandstone railway culvert	667	Penrith	Downstream
Railway Bridge	668	Penrith	Downstream
Former St David's Anglican Church	673	Penrith	Downstream
Community Hall	675	Penrith	Downstream
Farmhouse	676	Penrith	Downstream
Site of Windmill	680	Penrith	Downstream
Seidler House	685	Penrith	Downstream
Tafe Building	689	Penrith	Downstream
Red Cow Hotel	690	Penrith	Downstream
Institute of Arts (Former)	692	Penrith	Downstream
Cottage	695	Penrith	Downstream
Former Prospect Electricity Building	701	Penrith	Downstream
High Street Shop (Former Bank of NSW	713	Penrith	Downstream
High Street Shop	714	Penrith	Downstream
High Street Shop	715	Penrith	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
High Street Shop	716	Penrith	Downstream
High Street Shop	717	Penrith	Downstream
High Street Shop	718	Penrith	Downstream
High Street Shop	719	Penrith	Downstream
High Street shop	720	Penrith	Downstream
High Street Shop	721	Penrith	Downstream
High Street Shop	722	Penrith	Downstream
Wiseman's Ferry Inn, including grounds	795	Hornsby	Downstream
Cable ferry	796	Hornsby	Downstream
Cottage	798	Penrith	Downstream
Cottage	799	Penrith	Downstream
Gothic revival cottage	800	Penrith	Downstream
Cottage	801	Penrith	Downstream
Bennett Wagon	805	Penrith	Downstream
House	810	Penrith	Downstream
Cottage	811	Penrith	Downstream
House	812	Penrith	Downstream
The Willows - House	815	Penrith	Downstream
Marcel Breuer Torin factory building	827	Penrith	Downstream
Bennetts Wagons	829	Penrith	Downstream
Cottage	832	Hornsby	Downstream
Llandilo Public School	841	Penrith	Downstream
Luddenham Road Alignment	843	Penrith	Downstream
Canine Council dwelling	846	Penrith	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Cottage	847	Penrith	Downstream
Weir	848	Penrith	Downstream
Hall	850	Penrith	Downstream
Post Office	851	Penrith	Downstream
School	852	Penrith	Downstream
High Street Shop	855	Penrith	Downstream
Explosive Storehouse	869	Penrith	Downstream
Nepean River	870	Penrith	Downstream
Memorial Cairn	228 & 229	Penrith	Downstream
Government stockyard site	A068	Penrith	Downstream
Government stockyard site	A068	Penrith	Downstream
Site of Dungarth and plantings	A081	Penrith	Downstream
Shipwreck, HMAS Parramatta	A1	Central Coast	Downstream
Waddell Ridge group,dwelling remains, cistern, benchmark, rock inscription, field terracing, road t*	A1	Hornsby	Downstream
Former public wharf remains	A10	Central Coast	Downstream
Kiosk, teahouse	A10	Hornsby	Downstream
Old Caddie Homestead foundations (part of Cattai Estate)	A10	The Hills	Downstream
Cattai Horseworks (part of Cattai Estate)	A11	The Hills	Downstream
Old Northern Road	A12	The Hills	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Ruins of Singleton's Mill	A12	Central Coast	Downstream
Tidal bath remains	A12	Hornsby	Downstream
Brick cistern	A122	Blacktown	Downstream
Convict built road (Mr Sharps Track)	A14	The Hills	Downstream
Governor Phillip Memorial	A15	Hornsby	Downstream
Brown's boat shed	A17	Hornsby	Downstream
Ruins of house	A17	Central Coast	Downstream
Site of George Peat's Inn	A18	Central Coast	Downstream
Hawkesbury River Rail Bridge and Long Island group	A19	Hornsby	Downstream
Hawkesbury River Rail Bridge and Long Island group	A19	Hornsby	Downstream
Original section of road and culvert	A2	The Hills	Downstream
Peats Ferry Road bridge	A22	Hornsby	Downstream
Gentleman's Halt Inn ruins	A23	Hornsby	Downstream
Thompson’s Tannery site (former)	A236	Penrith	Downstream
Thompson’s Tannery site (former)	A236	Penrith	Downstream
Great drain and stone cut foundations	A25	The Hills	Downstream
Ruins of Bailey's Mill	A27	Central Coast	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Cemetery, church ruins and memorial	A3	Hornsby	Downstream
Remains of George Peat's farmhouse	A30	Hornsby	Downstream
Bradleys Beach	A34	Hornsby	Downstream
Waterfront, seawall, wharf, trees and 1889 railway bridge construction site	A36	Hornsby	Downstream
Jetty	A4	Hornsby	Downstream
Private burial ground	A4	The Hills	Downstream
Ruins of Merrymount	A5	The Hills	Downstream
Ballast heap	A5	Hornsby	Downstream
Police Station (former)	A53	Penrith	Downstream
Singleton's Mill	A56	Hornsby	Downstream
Singleton's Mill	A56	Hornsby	Downstream
Chimney	A57	Hornsby	Downstream
Fire trail	A6	Hornsby	Downstream
Hope Farm Windmill, Hope Farm Mill Granary and Stockmans Cottage foundations (part of Cattai Estate)	A6	The Hills	Downstream
House ruins	A63	Hornsby	Downstream
Berkshire Park Homestead Site	A662	Penrith	Downstream
'The Ridge', quarry site	A7	The Hills	Downstream
Fretus Hotel ruins	A7	Hornsby	Downstream
Mill Creek Mill ruins	A70	Hornsby	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Wiseman's Ferry Cemetery	A71	Hornsby	Downstream
The Lodge	A72	Hornsby	Downstream
Sandstone well/soak	A73	Hornsby	Downstream
Drainage trench and gate (part of Cattai Estate)	A8	The Hills	Downstream
Vehicular cable ferry	A8	Hornsby	Downstream
Luddenham Homestead Site	A849	Penrith	Downstream
Boat shed	A9	Hornsby	Downstream
Slab hut ruin and quarry site	A9	The Hills	Downstream
Pitt Town Conservation Area	C1	Hawkesbury	Downstream
Pitt Town Conservation Area	C1	Hawkesbury	Downstream
Pitt Town Conservation Area	C1	Hawkesbury	Downstream
Pitt Town Conservation Area	C1	Hawkesbury	Downstream
Pitt Town Conservation Area	C1	Hawkesbury	Downstream
Pitt Town Conservation Area	C1	Hawkesbury	Downstream
Pitt Town Conservation Area	C1	Hawkesbury	Downstream
Pitt Town Conservation Area	C1	Hawkesbury	Downstream
Pitt Town Conservation Area	C1	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Barrenjoey Heritage Conservation Area	C1	Northern Beaches	Downstream
Pitt Town Conservation Area	C1	Hawkesbury	Downstream
North Street Conservation Area	C3	Hawkesbury	Downstream
North Street Conservation Area	C3	Hawkesbury	Downstream
Waterfront cottages	C4	Northern Beaches	Downstream
Thompson Square Conservation Area	C4	Hawkesbury	Downstream
Hornseywood	HCA1	Penrith	Downstream
Hornseywood	HCA1	Penrith	Downstream
Mulgoa Road	HCA5	Penrith	Downstream
Park Road	HCA6	Penrith	Downstream
'Loder House'	I00003	Hawkesbury	Downstream
House	I00005	Hawkesbury	Downstream
'Toxana'	I00014	Hawkesbury	Downstream
St Matthew's Anglican Church, rectory, cemetery and stables	I00015	Hawkesbury	Downstream
St Matthew's Anglican Church, rectory, cemetery and stables	I00015	Hawkesbury	Downstream
'Peninsula House' and observatory	I00028	Hawkesbury	Downstream
'Hobartville' (including outbuildings)	I00035	Hawkesbury	Downstream
Macquarie Arms Hotel	I00041	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
'Mountain View'	I00044	Hawkesbury	Downstream
House	I00045	Hawkesbury	Downstream
House	I00045	Hawkesbury	Downstream
'Clear Oaks'	I00058	Hawkesbury	Downstream
House	I00107	Hawkesbury	Downstream
House	I00108	Hawkesbury	Downstream
House	I00109	Hawkesbury	Downstream
Former Peninsula Inn	I00110	Hawkesbury	Downstream
Shop	I00126	Hawkesbury	Downstream
House	I00126	Hawkesbury	Downstream
"The Doctor's House"	I00126	Hawkesbury	Downstream
House	I00126	Hawkesbury	Downstream
Former School of Arts	I00126	Hawkesbury	Downstream
Thompson Square	I00126	Hawkesbury	Downstream
Shop	I00126	Hawkesbury	Downstream
House	I00126	Hawkesbury	Downstream
Shop	I00126	Hawkesbury	Downstream
Shop	I00126	Hawkesbury	Downstream
House	I00126	Hawkesbury	Downstream
Thompson Square	I00126	Hawkesbury	Downstream
House	I00126	Hawkesbury	Downstream
Former Coffey's Inn	I00126	Hawkesbury	Downstream
Uniting Church (including former schoolhouse) and Uniting Church Cemetery	I00138	Hawkesbury	Downstream
Houses	I00142	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
House	I00150	Hawkesbury	Downstream
'The Reverend Turner Cottage' (formerly 'Oxalis Cottage')	I00202	Hawkesbury	Downstream
'The Reverend Turner Cottage' (formerly 'Oxalis Cottage')	I00202	Hawkesbury	Downstream
'Macquarie Arms Inn' complex (former inn and slab barn)	I00282	Hawkesbury	Downstream
'Rose Cottage'	I00358	Hawkesbury	Downstream
Former 'Bird in the Hand Inn'	I00373	Hawkesbury	Downstream
'Bowman House'	I00468	Hawkesbury	Downstream
'Stannix Park'	I00598	Hawkesbury	Downstream
'Stannix Park'	I00598	Hawkesbury	Downstream
Shops	I00610	Hawkesbury	Downstream
Simmons Hardware Store	I00667	Hawkesbury	Downstream
House	I00681	Hawkesbury	Downstream
Uniting Church and Hall	I00735	Hawkesbury	Downstream
Mackenzie House	I00735	Hawkesbury	Downstream
Former Methodist Parsonage	I00735	Hawkesbury	Downstream
'Claremont Cottage'	I00738	Hawkesbury	Downstream
House	I00753	Hawkesbury	Downstream
'Windsor Court House'	I00804	Hawkesbury	Downstream
Stables at rear of police station	I01018	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Richmond Railway Station	I01236	Hawkesbury	Downstream
Windsor Railway Station	I01287	Hawkesbury	Downstream
Post and telegraph office and stables	I01410	Hawkesbury	Downstream
Australiana Pioneer Village	I01683	Hawkesbury	Downstream
Richmond Park Pavilion and statue	I01808	Hawkesbury	Downstream
House	I01843	Hawkesbury	Downstream
McQuade Park	I01851	Hawkesbury	Downstream
McQuade Park	I01851	Hawkesbury	Downstream
War Memorial, Wilberforce Park	I01868	Hawkesbury	Downstream
House	I1		DOWNSTREAM
House	I1	Hawkesbury	Downstream
Grandstand	I10	Hawkesbury	Downstream
Gate post at 'Kamilario' at entrance to Richmond Public School	I100	Hawkesbury	Downstream
House	I1006	Hawkesbury	Downstream
Slab barn	I1007	Hawkesbury	Downstream
'Vicky's House'	I101	Hawkesbury	Downstream
House	I102	Hawkesbury	Downstream
House	I103	Hawkesbury	Downstream
House	I104	Hawkesbury	Downstream
House	I106	Hawkesbury	Downstream
House	I107	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
House	I108	Hawkesbury	Downstream
House	I109	Hawkesbury	Downstream
East Richmond Railway Station	I11	Hawkesbury	Downstream
House	I110	Hawkesbury	Downstream
Regent Theatre	I111	Hawkesbury	Downstream
House	I112	Hawkesbury	Downstream
Shop	I113	Hawkesbury	Downstream
Commercial Hotel	I114	Hawkesbury	Downstream
Shop	I115	Hawkesbury	Downstream
Westpac Bank	I116	Hawkesbury	Downstream
'Chalmers Building'	I117	Hawkesbury	Downstream
House	I118	Hawkesbury	Downstream
House	I12	Hawkesbury	Downstream
Court house and police station	I121	Hawkesbury	Downstream
Shop	I122	Hawkesbury	Downstream
House	I123	Hawkesbury	Downstream
'The cottage'	I124	Hawkesbury	Downstream
'Eltham'	I125	Hawkesbury	Downstream
House	I126	Hawkesbury	Downstream
House	I127	Hawkesbury	Downstream
'Berry Hill', house	I128	The Hills	Downstream
House	I128	Hawkesbury	Downstream
'Berry Hill', house	I128	The Hills	Downstream
Slab barn	I129	The Hills	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Anglican church hall and cemetery	I129	Hawkesbury	Downstream
Slab barn	I129	The Hills	Downstream
House	I13	Hawkesbury	Downstream
Former 'Black Horse Inn'	I130	Hawkesbury	Downstream
'Dargle'	I130	The Hills	Downstream
Church	I131	The Hills	Downstream
Royal Hotel	I131	Hawkesbury	Downstream
'Peacocks'	I132	The Hills	Downstream
St Monica's Roman Catholic Church	I132	Hawkesbury	Downstream
House	I133	The Hills	Downstream
Brown's Cemetery	I134	The Hills	Downstream
St Peter's Anglican Church	I134	Hawkesbury	Downstream
Rexford	I135	The Hills	Downstream
Stone dairy	I136	The Hills	Downstream
Bank and stables	I136	Hawkesbury	Downstream
'Anschau House'	I138	Hawkesbury	Downstream
Cable ferry	I138	The Hills	Downstream
'Uralla'	I139	Hawkesbury	Downstream
Grounds and landscaping surrounding 'Hobartville'	I14	Hawkesbury	Downstream
House	I140	Hawkesbury	Downstream
House	I141	Hawkesbury	Downstream
Houses	I142	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
House	I143	Hawkesbury	Downstream
House	I144	Hawkesbury	Downstream
House	I145	Hawkesbury	Downstream
Railway cottage	I146	Hawkesbury	Downstream
House	I147	Hawkesbury	Downstream
'Lock Up' ruins	I148	Hawkesbury	Downstream
'Josieville'	I15	Hawkesbury	Downstream
The Toll House	I150	Hawkesbury	Downstream
'The Windsor Tavern'	I151	Hawkesbury	Downstream
House	I152	Hawkesbury	Downstream
House	I153	Hawkesbury	Downstream
The Bell Inn	I154	Hawkesbury	Downstream
Windsor Presbyterian Cemetery	I155	Hawkesbury	Downstream
Former Barrack Wall	I157	Hawkesbury	Downstream
'Trevallyn'	I158	Hawkesbury	Downstream
Public school	I159	Hawkesbury	Downstream
Public school	I159	Hawkesbury	Downstream
'Inew Cottage'	I16	Hawkesbury	Downstream
House	I160	Hawkesbury	Downstream
'Sunny Brae'	I161	Hawkesbury	Downstream
House	I164	Hawkesbury	Downstream
House	I165	Hawkesbury	Downstream
Hannabas Dairy	I166	Hawkesbury	Downstream
House	I167	Hawkesbury	Downstream
House	I168	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
House	I169	Hawkesbury	Downstream
House	I17	Hawkesbury	Downstream
House	I170	Hawkesbury	Downstream
House	I171	Hawkesbury	Downstream
House	I173	Hawkesbury	Downstream
House	I174	Hawkesbury	Downstream
House	I175	Hawkesbury	Downstream
Shop	I176	Hawkesbury	Downstream
Former house	I177	Hawkesbury	Downstream
Former house	I178	Hawkesbury	Downstream
Avenue of trees east and west side of street	I18	Hawkesbury	Downstream
House and shop	I180	Hawkesbury	Downstream
Shop	I181	Hawkesbury	Downstream
Shop	I182	Hawkesbury	Downstream
House and shop	I183	Hawkesbury	Downstream
Former house	I184	Hawkesbury	Downstream
Bank	I185	Hawkesbury	Downstream
Bank	I186	Hawkesbury	Downstream
Bank	I187	Hawkesbury	Downstream
'Fitzroy Hotel'	I188	Hawkesbury	Downstream
Shop	I189	Hawkesbury	Downstream
House	I19	Hawkesbury	Downstream
Uniting church and cemetery	I190	The Hills	Downstream
Shop	I190	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Shop	I191	Hawkesbury	Downstream
The Parsonage, uniting church and cemetery	I191	The Hills	Downstream
'Kelso Park'	I192	The Hills	Downstream
'Bussell Bros'	I192	Hawkesbury	Downstream
Shop	I193	Hawkesbury	Downstream
'Pagewood'	I193	The Hills	Downstream
Shop	I194	Hawkesbury	Downstream
Former shop	I195	Hawkesbury	Downstream
Former shop	I196	Hawkesbury	Downstream
Cable ferry	I196	The Hills	Downstream
Shop	I197	Hawkesbury	Downstream
Shop	I198	Hawkesbury	Downstream
Royal Exchange Hotel	I199	Hawkesbury	Downstream
House	I20	Hawkesbury	Downstream
O'Brien's Building	I201	Hawkesbury	Downstream
Residence and post office	I202	The Hills	Downstream
Former inn	I202	Hawkesbury	Downstream
'The Royal Theatre' (former)	I203	Hawkesbury	Downstream
Cable ferry	I203	The Hills	Downstream
House	I204	Hawkesbury	Downstream
House	I204	The Hills	Downstream
House	I205	Hawkesbury	Downstream
House	I205	The Hills	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
House	I207	Hawkesbury	Downstream
House	I208	Hawkesbury	Downstream
Cable ferry	I208	The Hills	Downstream
House	I209	Hawkesbury	Downstream
'Clarendon' (servants' quarters)	I21	Hawkesbury	Downstream
House	I210	Hawkesbury	Downstream
Residence and surgery	I211	Hawkesbury	Downstream
House	I212	Hawkesbury	Downstream
House	I213	Hawkesbury	Downstream
House	I214	Hawkesbury	Downstream
House	I215	Hawkesbury	Downstream
Shop	I216	Hawkesbury	Downstream
'Mrs Cope's Cottage'	I217	Hawkesbury	Downstream
Bandstand rotunda	I218	Hawkesbury	Downstream
Former Windsor Council Chambers	I219	Hawkesbury	Downstream
Cemetery	I22	Hawkesbury	Downstream
'Tates Hotel'	I220	Hawkesbury	Downstream
'Learholm'	I222	Hawkesbury	Downstream
Shop	I223	Hawkesbury	Downstream
House	I224	Hawkesbury	Downstream
House	I225	Hawkesbury	Downstream
House	I226	Hawkesbury	Downstream
'Glenroy'	I227	Hawkesbury	Downstream
Houses	I228	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Railway Hotel	I229	Hawkesbury	Downstream
Hawkesbury Agricultural College River Farm	I23	Hawkesbury	Downstream
House	I230	Hawkesbury	Downstream
House	I231	Hawkesbury	Downstream
'Mountain View'	I232	Hawkesbury	Downstream
Former Windsor Grammar School	I233	Hawkesbury	Downstream
Former Windsor Post Office	I235	Hawkesbury	Downstream
Former inn	I237	Hawkesbury	Downstream
Former Masonic Hall	I239	Hawkesbury	Downstream
'The Pines' (residence and trees)	I24	Hawkesbury	Downstream
Houses	I240	Hawkesbury	Downstream
House	I241	Hawkesbury	Downstream
House	I242	Hawkesbury	Downstream
House	I243	Hawkesbury	Downstream
Dedication stone, Hawkesbury Hospital	I245	Hawkesbury	Downstream
Shop and dwelling	I246	Hawkesbury	Downstream
House	I247	Hawkesbury	Downstream
'Woodside' (former Melville Cottage)	I248	Hawkesbury	Downstream
Georgian farmhouse	I25	Hawkesbury	Downstream
House	I251	Hawkesbury	Downstream
Former St Matthew's School	I252	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
'Jonlyn'	I255	Hawkesbury	Downstream
'Fairfield House'	I256	Hawkesbury	Downstream
Fairfield House Gateway	I257	Hawkesbury	Downstream
House and outbuildings	I258	Hawkesbury	Downstream
Windsor Roman Catholic Cemetery	I259	Hawkesbury	Downstream
House	I26	Hawkesbury	Downstream
'Fitzroy Cottage'	I260	Hawkesbury	Downstream
House	I261	Hawkesbury	Downstream
St Matthew's Roman Catholic Church	I262	Hawkesbury	Downstream
House	I263	Hawkesbury	Downstream
'Crescentville'	I264	Hawkesbury	Downstream
'Riverview Cottage'	I265	Hawkesbury	Downstream
'Hill Crest'	I266	Hawkesbury	Downstream
'Lindfield House'	I267	Hawkesbury	Downstream
Charleville	I267	Wollondilly	Downstream
Ravenswood	I268	Wollondilly	Downstream
'Fairview'	I268	Hawkesbury	Downstream
House	I269	Hawkesbury	Downstream
Blaxland's Farm	I269	Wollondilly	Downstream
House	I27	Hawkesbury	Downstream
Slab barn	I270	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Warragamba Supply Scheme and Warragamba Emergency Scheme	I270	Wollondilly	Upstream & Downstream
House	I271	Hawkesbury	Downstream
House	I272	Hawkesbury	Downstream
House	I272	Hawkesbury	Downstream
'Bridgeview'	I274	Hawkesbury	Downstream
Barn	I275	Hawkesbury	Downstream
Windsor Bridge	I276	Hawkesbury	Downstream
Cottage	I277	Hawkesbury	Downstream
'Samuel Cox's House'	I278	Hawkesbury	Downstream
House	I28	Hawkesbury	Downstream
Pitt Town Hardware Produce and Fuel store	I280	Hawkesbury	Downstream
Scots Uniting Church	I281	Hawkesbury	Downstream
St James' Anglican Church	I283	Hawkesbury	Downstream
'Myrtle Cottage' and slab barn	I284	Hawkesbury	Downstream
'Vine House'	I285	Hawkesbury	Downstream
'Bona Vista' (house and slab barns)	I286	Hawkesbury	Downstream
House	I287	Hawkesbury	Downstream
Slab barn	I288	Hawkesbury	Downstream
Blaxland's Crossing at Nepean River	I289	Wollondilly	Downstream
'Tara'	I29	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
'Strathmore' (cottage and slab barn)	I290	Hawkesbury	Downstream
Pitt Town Public School and residence	I291	Hawkesbury	Downstream
Slab barn	I292	Hawkesbury	Downstream
House, former shop and former slab barn	I293	Hawkesbury	Downstream
'Royville'	I294	Hawkesbury	Downstream
'Grenville Cottage'	I296	Hawkesbury	Downstream
'Wilbows Stone Cottage'	I298	Hawkesbury	Downstream
'Lone Acre'	I299	Hawkesbury	Downstream
House	I3	Hawkesbury	Downstream
House	I30	Hawkesbury	Downstream
Cemetery	I301	Hawkesbury	Downstream
Cemetery	I302	Hawkesbury	Downstream
'Lynwood'	I303	Hawkesbury	Downstream
'Huxley's Blacksmith Shop'	I304	Hawkesbury	Downstream
Slab barn	I306	Hawkesbury	Downstream
Slab barns	I307	Hawkesbury	Downstream
House and slab barn	I308	Hawkesbury	Downstream
House and slab barns	I309	Hawkesbury	Downstream
House	I31	Hawkesbury	Downstream
Former manse and farm house	I310	Hawkesbury	Downstream
'Spring Hill Farm' (house and barn)	I311	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Cemetery	I312	Hawkesbury	Downstream
'Killarney Homestead'	I313	Hawkesbury	Downstream
Cottage	I314	Hawkesbury	Downstream
'McGraths Hill Inn'	I315	Hawkesbury	Downstream
Pair of cottages	I316	Hawkesbury	Downstream
Pair of cottages	I316	Hawkesbury	Downstream
Former hotel	I318	Hawkesbury	Downstream
House	I319	Hawkesbury	Downstream
'Benson House'	I32	Hawkesbury	Downstream
Former inn	I320	Hawkesbury	Downstream
'Rhodesia'	I321	Hawkesbury	Downstream
'Prestonville'	I322	Hawkesbury	Downstream
'Ukamurra'	I323	Hawkesbury	Downstream
'Macquarie Retreat'	I325	Hawkesbury	Downstream
House and barn	I328	Hawkesbury	Downstream
House	I33	Hawkesbury	Downstream
'Stoneleigh'	I331	Hawkesbury	Downstream
'Port Erringhi'	I332	Hawkesbury	Downstream
'Portland Head Farm'	I333	Hawkesbury	Downstream
'Coromandel'	I334	Hawkesbury	Downstream
'Rockleigh'	I335	Hawkesbury	Downstream
House	I336	Hawkesbury	Downstream
'Kinlew'	I337	Hawkesbury	Downstream
'Pickwick Park'	I338	Hawkesbury	Downstream
Cottage	I339	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
House	I34	Hawkesbury	Downstream
Former public school	I340	Hawkesbury	Downstream
War Memorial in public reserve	I344	Hawkesbury	Downstream
'Sunny Farm'	I345	Hawkesbury	Downstream
House and slab barns	I346	Hawkesbury	Downstream
House and barn	I347	Hawkesbury	Downstream
'Reibycroft'	I348	Hawkesbury	Downstream
House	I35	Blacktown	Downstream
'Rosmoyne'	I35	Hawkesbury	Downstream
'Kialla'	I36	Hawkesbury	Downstream
Cemetery—St Phillips	I37	Blacktown	Downstream
'Zeta'	I37	Hawkesbury	Downstream
Monument to Aboriginal people	I372	Hawkesbury	Downstream
Residence and barn	I373	Hawkesbury	Downstream
St Thomas' Anglican Church	I374	Hawkesbury	Downstream
Tizzana Winery	I375	Hawkesbury	Downstream
St Thomas' Anglican Cemetery	I376	Hawkesbury	Downstream
House	I377	Hawkesbury	Downstream
House and barn	I378	Hawkesbury	Downstream
'No Mathatha'	I379	Hawkesbury	Downstream
House and former shop	I380	Hawkesbury	Downstream
'Milby Grange'	I381	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
House	I382	Hawkesbury	Downstream
House	I383	Hawkesbury	Downstream
House	I384	Hawkesbury	Downstream
'Harmony Farm'	I388	Hawkesbury	Downstream
House	I39	Hawkesbury	Downstream
House	I391	Hawkesbury	Downstream
'Barrabadeen'	I392	Hawkesbury	Downstream
'Pareora'	I393	Hawkesbury	Downstream
'Primrose Cottage'	I394	Hawkesbury	Downstream
'Rocky Hall'	I395	Hawkesbury	Downstream
Former Police Station	I396	Hawkesbury	Downstream
'Karoola'	I397	Hawkesbury	Downstream
Uniting Church (formerly Methodist Church)	I398	Hawkesbury	Downstream
House	I399	Hawkesbury	Downstream
House	I4	Hawkesbury	Downstream
Railway stationmaster's residence	I403	Hawkesbury	Downstream
Railway station	I404	Hawkesbury	Downstream
'Tall Trees'	I405	Hawkesbury	Downstream
Former police station and residence	I406	Hawkesbury	Downstream
Seventh Day Adventist Church	I407	Hawkesbury	Downstream
'Hill Crest'	I409	Hawkesbury	Downstream
House	I41	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
House	I410	Hawkesbury	Downstream
St John of God Hospital (former 'Belmont Park', mansion, garden, building, gatehouse and curtilage)	I412	Hawkesbury	Downstream
Wooden mile post	I418	Hawkesbury	Downstream
House	I42	Hawkesbury	Downstream
Davidson's Dairy	I425	Hawkesbury	Downstream
Cottage	I43	Hawkesbury	Downstream
'Penrose', ruins	I431	Hawkesbury	Downstream
House	I44	Hawkesbury	Downstream
'Bronte'	I444	Hawkesbury	Downstream
House	I445	Hawkesbury	Downstream
'Blue Gardens'	I446	Hawkesbury	Downstream
House	I45	Hawkesbury	Downstream
'Rosemont'	I459	Hawkesbury	Downstream
'Carsisle'	I46	Hawkesbury	Downstream
House and slab barns	I461	Hawkesbury	Downstream
House and slab barn	I462	Hawkesbury	Downstream
House and slab barn	I463	Hawkesbury	Downstream
Slab barn	I464	Hawkesbury	Downstream
Slab barn	I465	Hawkesbury	Downstream
House and slab barn	I466	Hawkesbury	Downstream
House and slab barn	I467	Hawkesbury	Downstream
Slab cottage and slab barn	I468	Hawkesbury	Downstream
Slab cottage and slab barn	I468	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
House	I469	Hawkesbury	Downstream
House	I47	Hawkesbury	Downstream
House	I470	Hawkesbury	Downstream
House	I471	Hawkesbury	Downstream
House	I472	Hawkesbury	Downstream
House	I473	Hawkesbury	Downstream
House	I474	Hawkesbury	Downstream
House	I475	Hawkesbury	Downstream
'Elourea'	I476	Hawkesbury	Downstream
Shop	I477	Hawkesbury	Downstream
House	I478	Hawkesbury	Downstream
House	I48	Hawkesbury	Downstream
Cottage	I480	Hawkesbury	Downstream
House	I481	Hawkesbury	Downstream
House	I482	Hawkesbury	Downstream
House	I483	Hawkesbury	Downstream
House	I484	Hawkesbury	Downstream
House	I486	Hawkesbury	Downstream
House	I487	Hawkesbury	Downstream
Cottage	I488	Hawkesbury	Downstream
Cottage	I489	Hawkesbury	Downstream
House	I49	Hawkesbury	Downstream
House	I490	Hawkesbury	Downstream
House	I491	Hawkesbury	Downstream
Former Methodist Church	I492	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
House	I493	Hawkesbury	Downstream
House	I495	Hawkesbury	Downstream
The Butcher's Shop	I496	Hawkesbury	Downstream
House	I497	Hawkesbury	Downstream
Cottage	I498	Hawkesbury	Downstream
House	I499	Hawkesbury	Downstream
'Mortimers Cottage'	I5	Hawkesbury	Downstream
House	I50	Hawkesbury	Downstream
House	I500	Hawkesbury	Downstream
House	I501	Hawkesbury	Downstream
'Riverside', slab-barn	I508	Hawkesbury	Downstream
Lower Portland Public School	I509	Hawkesbury	Downstream
House	I51	Hawkesbury	Downstream
St John's Anglican Church	I510	Hawkesbury	Downstream
'Hawkesbury Retreat'	I511	Hawkesbury	Downstream
'Lilburndale'	I512	Hawkesbury	Downstream
Ashlar Morgue Building	I513	Hawkesbury	Downstream
Well structure	I514	Hawkesbury	Downstream
Former house	I516	Hawkesbury	Downstream
Former house	I517	Hawkesbury	Downstream
'Ventiaville'	I518	Hawkesbury	Downstream
House	I52	Hawkesbury	Downstream
House	I54	Hawkesbury	Downstream
House	I55	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
House	I56	Hawkesbury	Downstream
House	I57	Hawkesbury	Downstream
House	I58	Hawkesbury	Downstream
Cottage	I59	Hawkesbury	Downstream
Cottage	I60	Hawkesbury	Downstream
Cottage	I61	Hawkesbury	Downstream
Cottage	I62	Hawkesbury	Downstream
House	I63	Hawkesbury	Downstream
House	I64	Hawkesbury	Downstream
House	I65	Hawkesbury	Downstream
'Pangelis'	I66	Hawkesbury	Downstream
House	I67	Blacktown	Downstream
House	I67	Hawkesbury	Downstream
House	I68	Blacktown	Downstream
House	I68	Hawkesbury	Downstream
House	I69	Blacktown	Downstream
'Rutherglen'	I69	Hawkesbury	Downstream
'The Presbytery'	I7	Hawkesbury	Downstream
House	I70	Blacktown	Downstream
Former Richmond Council Chambers	I70	Hawkesbury	Downstream
'Bungool' (Riverside Oaks Golf Course)	I71	The Hills	Downstream
House	I71	Hawkesbury	Downstream
Former house	I72	Hawkesbury	Downstream
'Rose Park'	I72	The Hills	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Church—St Paul's Anglican Church	I73	Blacktown	Downstream
William Daley's grave	I73	The Hills	Downstream
House	I74	Hawkesbury	Downstream
Cattai Estate ('Caddie House', barn, silo and outbuildings part of Cattai Estate)	I74	The Hills	Downstream
'Hope Farm House', 'Hope Farm Cottage', outbuilding and mill ruins (part of Cattai Estate)	I75	The Hills	Downstream
House	I75	Hawkesbury	Downstream
Slab hut	I76	The Hills	Downstream
House—Redgate	I76	Blacktown	Downstream
Residence and iron works	I76	Hawkesbury	Downstream
House	I77	Hawkesbury	Downstream
Shops—Parrington Terrace	I77	Blacktown	Downstream
Former Butcher Shop	I78	Blacktown	Downstream
'Terry Mount'	I78	The Hills	Downstream
House	I78	Hawkesbury	Downstream
House	I79	Hawkesbury	Downstream
Church—St Andrew's Uniting Church	I79	Blacktown	Downstream
'Montrose'	I79	The Hills	Downstream
Former railway cottage	I8	Hawkesbury	Downstream
House and shop	I80	Blacktown	Downstream
House	I80	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Riverstone Public School (former)	I81	Blacktown	Downstream
House	I81	Hawkesbury	Downstream
Bicentennial Museum—formerly public school, then Masonic Hall	I82	Blacktown	Downstream
McMahon Homestead	I82	Hawkesbury	Downstream
House and slab cottage	I83	Blacktown	Downstream
House	I83	Hawkesbury	Downstream
House	I84	Blacktown	Downstream
School of Arts	I84	Hawkesbury	Downstream
House	I85	Blacktown	Downstream
Former Richmond Rest Home	I85	Hawkesbury	Downstream
Police Station	I86	Blacktown	Downstream
Hall at rear of former Masonic Temple	I86	Hawkesbury	Downstream
Former Masonic Temple	I87	Hawkesbury	Downstream
St Andrew's Uniting Church Hall	I88	Hawkesbury	Downstream
House	I89	Blacktown	Downstream
St Andrew's Uniting Church	I89	Hawkesbury	Downstream
Administrative block, blacksmith shop and stable square	I9	Hawkesbury	Downstream
Administrative block, blacksmith shop and stable square	I9	Hawkesbury	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Administrative block, blacksmith shop and stable square	I9	Hawkesbury	Downstream
Shop (former barn)	I90	Hawkesbury	Downstream
Group of workers' cottages	I90	Blacktown	Downstream
House	I91	Hawkesbury	Downstream
House—Stationmaster's Residence (former)	I91	Blacktown	Downstream
Felton Mathew Marked Tree	I91	The Hills	Downstream
War Memorial	I92	Blacktown	Downstream
House	I92	Hawkesbury	Downstream
Railway Station group	I93	Blacktown	Downstream
Avenue of plane trees along eastern approach to Richmond	I93	Hawkesbury	Downstream
House	I94	Blacktown	Downstream
House	I94	Hawkesbury	Downstream
House	I95	Blacktown	Downstream
House	I95	Hawkesbury	Downstream
House	I96	Hawkesbury	Downstream
House	I96	Blacktown	Downstream
Cemetery—Riverstone General	I97	Blacktown	Downstream
House	I97	Hawkesbury	Downstream
House	I98	Hawkesbury	Downstream
House	I99	Hawkesbury	Downstream
Riverstone Precinct SEPP Amendment 2010	-	-	Downstream

Item Name	LEP Item No.	LGA	Relationship to study area
Runway (Schofields Precinct SEPP Amendment 2012)	-	-	Downstream
Riverstone Precinct SEPP Amendment 2010	-	-	Downstream


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